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Stadium Construction and Minor League Baseball Attendance

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Abstract: *The established literature shows that new stadium construction for major league baseball (MLB) teams can increase attendance, but there are limited studies at the minor league level. We use a data set encompassing all A, AA, and AAA minor league baseball teams from 1992 to 2006 to estimate the impact of stadium construction on minor league attendance. This data set includes almost 200 teams, over half of which constructed a new stadium during the 15-year observation period. Over a ten year period our results show that new stadiums increase attendance by 1.2 million fans at the AAA level, 0.4 million at the AA and high A level, and 0.2 million at short season low A. Additionally, we find evidence that minor and major league baseball are potentially substitutes as increased ticket prices for the nearest MLB team lead to higher minor league attendance. However, a new stadium for local MLB teams does not seem to negatively impact minor league attendance.*

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1. Introduction

Many factors can affect attendance at minor league baseball games. Some of these factors—like the quality of the team roster and the distance to and quality of the Major League Baseball (MLB) affiliate—are not generally controlled by the minor league team. In fact, because minor league baseball teams are so often viewed as simply the training grounds for the MLB affiliate, many in the industry focus on the importance of using promotions to bring fans to the game. The quality and frequency of special promotions at minor league baseball games—such as fireworks and bobblehead giveaways—show the level of creativity that promotions departments are expected to have in order to attract fans to minor league baseball games.

But minor league baseball teams are not limited to adjusting only the quality and frequency of promotions in order to affect attendance. As is often demonstrated in MLB baseball (see Noll 1974, Baade and Tiehen 1990, Lewis 2003, and Horowitz 2007), Gitter and Rhoads (Forthcoming) show that winning minor league baseball teams attract more fans. This simple result suggests there may be more similarities between minor and major league baseball that have yet to be established. In this paper, we explore one more possible similarity between MLB baseball and minor league baseball—building a new stadium for a baseball team can serve as a strategy to attract fans to minor league baseball games. The novelty effect of a new sports stadium or arena is well-documented—fans (and nonfans) enjoy seeing and experiencing a new stadium (Coates and Humphreys 2005). Generally, attendance at new major league sports stadiums increases for a period of about ten years before leveling off as the newness of the facility wears off.

Like MLB teams, minor league teams often receive public support to finance the construction of their new stadium. Marcheck (2004) estimates that public funding is typically on the order of 85% of the construction costs through the sale of public bonds. These bonds are paid in part by team revenues.

Moreover, while public funding of professional sports stadiums is not without public debate (see Siegfried and Zimbalist 2000 and Coates and Humphreys 2008), most of the attention to this phenomenon has occurred for major league teams. In this paper, we focus on identifying and estimating the novelty effect for new and newly renovated minor league baseball stadiums. With more observations of stadium construction in less time than is typical in studies of the novelty effect in MLB stadiums, our analysis of minor league stadiums offers some advantages not possible in the MLB studies. During our sample period of 1992 to 2006, 100 of the 192 minor league stadiums were new or newly renovated. This is considerably more occurrences of new stadium construction than in studies of MLB stadiums, which is limited to no more than about 30 new or newly renovated stadiums. Further, these observations occur in a shorter period of time, so the degree to which time and "culture" change new stadium impacts is minimized. For example, the wave of new stadium construction ushered in by Baltimore's Camden Yards is quite different in nature and design from the multipurpose stadiums of the early 1970s. Shortening the observation period can eliminate some potential impacts from changing tastes and preferences.

By looking at new and newly renovated stadiums at the minor league level, we can provide additional depth to the knowledge of the novelty effect as it has not been examined anywhere besides the major league level of professional sports. Proponents of public stadium construction subsidies often suggest that the benefits from new stadium construction for major league teams are larger than just the additional attendance and concession sales that accrue to the team owner. Major league teams will often have fans reaching across a large population, so providing a minimal level of public funding is often thought to be reasonable, but often not to the extent that is provided (Coates and Humphreys 2008). But minor league baseball teams do not often attract support across a large population, so the benefits that accrue from a minor league baseball team would most likely show up only in increased ticket and concession sales and in serving as a training ground for the MLB affiliate. We thus generate

estimates of the benefits from new minor league stadium construction that can be compared to estimates of major league stadiums and can possibly serve to calibrate the estimates of public benefits accruing from new major league stadium construction.

Finally, we control for the impact of MLB stadium effects on the novelty effect for minor league baseball teams as Gitter and Rhoads (Forthcoming) showed the two are potentially substitutes. New MLB stadium construction can draw minor league fans away from minor league baseball just as new minor league baseball stadium construction can attract MLB fans away from MLB games. Estimating this impact adds more precision to the nature of the substitution effect between minor league baseball and MLB. Considering affiliation effects in addition to the substitution effects can have policy implications in determining optimal construction timing for an MLB franchise and its minor league affiliates.

Our results show that, similar to new MLB stadiums, new minor league baseball stadiums tend to increase attendance, but this increased attendance drops off more slowly than it does for MLB stadiums. We also find that new MLB stadium construction does not take fans from minor league baseball stadiums. In fact, the opposite may be true, as we find increased ticket prices for local MLB teams tend to increase attendance. If ticket prices increase with new stadiums then minor league teams may gain as some fans substitute minor for major league baseball.

With no reason to expect fans of minor and major league baseball to exhibit substantively different behavior, studying policy changes in minor league baseball can allow a robustness check of sorts for the bulk of the existing MLB research. The benefits of generating a body of research in minor league baseball can thus extend to MLB policy makers and executives. The remainder of this paper proceeds as follows. The next section highlights the modeling of the novelty effect in the stadium literature and section 3 describes the data we use in this study. Section 4 provides the econometric

framework for our analysis and section 5 gives results and cost feasibility estimates for a few select stadiums. Finally, section 6 offers concluding remarks and extensions to this work.

2. Literature Review

A growing body of research is slowly beginning to show that many of the same factors that attract fans to MLB games can influence attendance at minor league baseball games. Recently, Gitter and Rhoads (Forthcoming) found that winning brings more fans out to the minor league baseball park. While this result is intuitive, it is a switch from previous findings (Siegfried and Eisenberg 1980) and is contrary to the standard thinking in the industry (Hardballtimes.com 2007). Siegfried and Eisenberg (1980) model 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, and Davis (2006, 2007) looks at location decisions of minor league baseball teams. Finally, Colclough et al (1994) provide the only attempt we have found to measure any kind of novelty effect stemming from minor league baseball stadium construction as they estimate the economic impact of building a minor league baseball stadium through a case study of one team.

The quality of the minor league roster, the location of the team and even the affiliate's success can all effect attendance at minor league baseball games even though the MLB affiliate largely controls these factors. Even so, very little overlap in the direction and magnitude of attendance factors for both MLB and minor league baseball has been identified (Gifis and Sommers 2006). Fans at all levels of baseball show an affinity for seeing more homeruns (Gitter and Rhoads, Forthcoming, Siegfried and Eisenberg, 1980 and Greenstein and Marcum, 1981), and there is increasing evidence to suggest minor league baseball fans are not all that different from MLB fans. The benefits from a unified research agenda are more and more obvious—policy prescriptions can be interchangeable between minor and major league baseball.

Until now, estimating the impact of building a minor league baseball stadium has been limited to studying the direct and indirect economic impacts of the stadium and team on the community. While on a much smaller scale than for MLB stadiums, Colclough et al (1994) get similarly stylized results from a regional input-output model. We aim to keep pushing baseball research in a direction that calls attention to the similarity of fans of MLB and minor league baseball by highlighting the novelty effect of new stadiums on attendance in minor league baseball. To this end, we apply the models developed by Coates and Humphreys (2005) and Clapp and Hakes (2005) for estimating MLB stadium impacts to minor league baseball. Given the results found in other areas of minor league baseball research, perhaps it is not surprising that our results show new stadiums for minor league baseball teams increase attendance. And similar to MLB stadiums the increase in attendance falls over time, but not as quickly as it falls for major league stadiums.

Two contrasting streams of stadium feasibility analysis have emerged in the literature: those results generated in the academic literature, and those results coming from consulting firms. Coates and Humphreys (2008) provide a review of these two literature strands and note how the streams diverge in weighting the intangible benefits flowing from "Big League City" status. A growing literature probes the magnitude of these public and often intangible benefits (Johnson and Whitehead, 2000, Johnson, et al, 2001 and Groothuis et al, 2004). Nevertheless, Coates and Humphreys (2005) provide their own cost feasibility estimates for four MLB baseball stadiums and conclude that government-subsidized baseball stadium construction is inefficient. We offer minor league stadium cost feasibility estimates of our own, and achieve results that are in agreement with other major league analyses generated in the academic literature. The next section describes the data used in this study.

3. Data

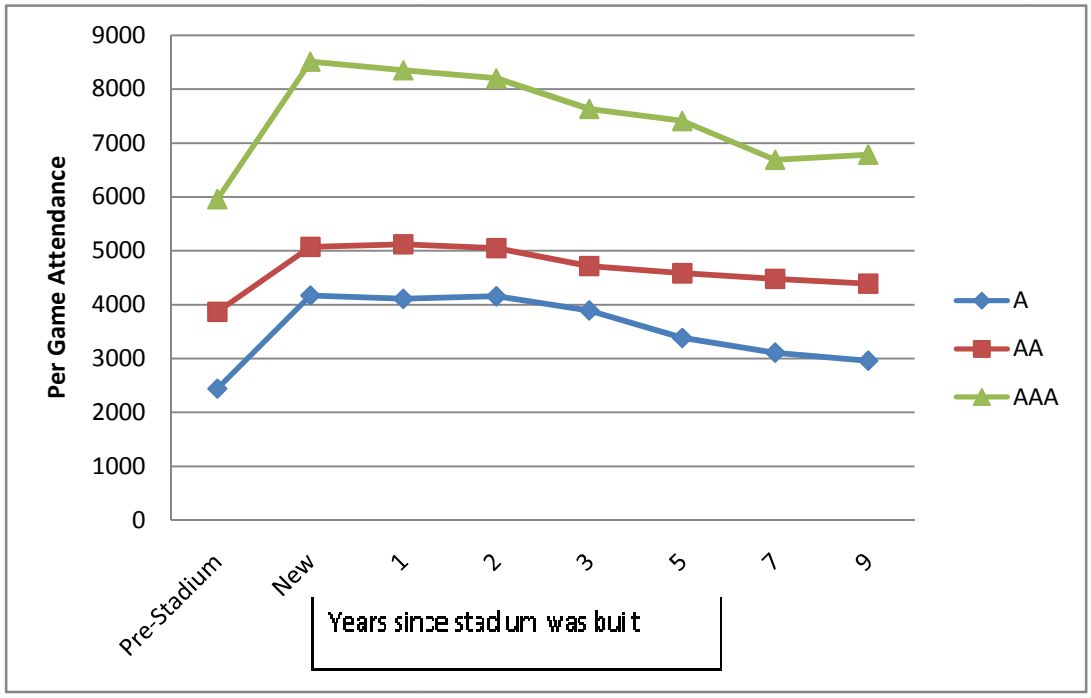
We utilize data from three sources. Attendance and performance data for minor league baseball from 1992 to 2006 was provided by baseball-refence.org (Sports Reference LLC, 2007). The data set is extremely rich as it includes every minor league team at the A, AA, and AAA level for the years 1992-2006. This data set was used previously (Gitter and Rhoads, Forthcoming). The second data set concerns the year of stadium construction. The construction dates for stadiums were obtained from the website BallparkReviews.com. The final source of data was on average MLB ticket prices to control for substitution effects. The prices for all MLB team years 1992-2006 were retrieved through Team Marketing Report (TMR) as part of the Fan Cost Index, which is a basket of goods that a typical family of four might purchase while attending a game.[1] Unfortunately, parallel data is unavailable for minor league teams as TMR has collected only 63 team/year observations in 2005 and 2006 at the minor league level. Instead, like the Winfree and Fort (2008) analysis of minor league hockey, we control for time invariant ticket prices through team fixed effects. We have an unbalanced panel due to team movement and because four teams at each minor league level were added as part of MLB's expansion during the 1990s.

The dependent variable of interest is Average per Game Attendance (APG). The average per game attendance over the sample was 2,461 at the A level, 3,890 at the AA level and 6,017 at the AAA level. Figure 1 below shows the increase that occurs after a stadium is constructed. In the first year of the new stadium, attendance increases to 3,740 for the A level ; 4,900 for the AA level and 7,588 for the AAA level. This represents a 50% increase at the A level and about 25% at both the AA and AAA levels. The increases from new construction remain relatively unchanged for the next two years. After that, the

[1] TMR's Fan Cost Index tracks the cost of attendance for a family of four. In the analysis we use only the MLB ticket price data, but using the Fan Cost Index yields results that are not substantially different. 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.

increase begins to fall steadily, but ten years later attendance is still about 5-10% higher than the average over the sample period.

Figure 1: The Impact of Stadium Construction by Level



In 1992 Camden Yards in Baltimore was opened, ushering in a wave of ball park construction in MLB. 1992 is also the first year of our sample and a similar wave of stadium construction followed in the minor leagues. Table 1 below provides descriptive statistics. Of the 192 teams in the data set, 100 teams built a new stadium during the sample period. Around 4% of the minor league teams in the sample in any given year were playing in a brand new stadium. Similar to Clapp and Hakes (2005) we create dummy variables for stadium age in a given year and we paired some years to cut down on the number of variables. Creating four different two-year groupings for stadium age (3-4, 5-6, 7-8, and 9-10) does not substantially impact the paper's core results.

In a previous analysis of the dataset Gitter and Rhoads (Forthcoming) found that MLB and minor league baseball were potentially substitutes. During the MLB strike years of 1994 and 1995, minor

league baseball attendance increased. Similarly, minor league attendance increased when the closest MLB team within 100 miles raised ticket prices. Variables to control for both potential substitution effects are included in the analysis. Another potential substitution effect is the construction of new MLB stadiums—minor league fans may substitute MLB experience for minor league ones if they enjoy new stadiums. One might expect that new MLB stadiums like Camden Yards in Baltimore may impact attendance for local minor league teams like the Frederick Keys and Bowie Baysox (both within an hour's drive of Camden Yards). In any given year of our sample around 2% of the minor league teams played within 100 miles of a new MLB ball park. Additionally, we control for MLB ticket prices of the teams in the local market (MLB ticket prices), because new MLB stadiums likely increase prices.

Table 1. Descriptive Statistics	**A**		**AA**		**AAA**	
	Mean	**Std Dev**	**Mean**	**Std Dev**	**Mean**	**Std Dev**
Average Per Game Attendance (APG)	2461	1607	3890	1566	6017	2083
(TEAM) Win %	50.0%	0.08	50.0%	0.06	50.2%	0.06
New Stadium#	3.7%	0.19	5.4%	0.23	3.8%	0.19
Stadium 1 year old#	4.1%	0.20	5.6%	0.23	3.8%	0.19
Stadium 2 years old#	4.0%	0.20	5.0%	0.22	3.8%	0.19
Stadium 3-4 Years old#	7.9%	0.27	9.1%	0.29	9.1%	0.29
Stadium 5-6 Years Old#	7.8%	0.27	9.7%	0.30	8.2%	0.28
Stadium 7-8 Years Old#	7.5%	0.26	9.3%	0.29	7.2%	0.26
Stadium 9-10 Years Old#	6.8%	0.25	7.1%	0.26	6.3%	0.24
Final Year of Old Stadium#	1.7%	0.13	1.7%	0.13	2.5%	0.16
Penultimate Year of Old Stadium#	1.5%	0.12	1.5%	0.12	2.3%	0.15
Year 1994#	6.6%	0.25	6.3%	0.24	6.3%	0.24
Year 1995#	6.7%	0.25	6.7%	0.25	6.3%	0.24
New MLB stadium Local#	1.6%	0.13	2.6%	0.16	1.9%	0.14
1 year old MLB stadium Local#	1.9%	0.14	2.4%	0.15	1.9%	0.14
New MLB stadium 2-6 years old#	8.7%	0.28	6.7%	0.25	6.3%	0.24
Local*MLB ticket price$	3.6	4.85	2.9	5.29	2.6	4.56

# indicates the variable is a binary variable which = 1 if true,
$ Local*MLB ticket prices is the average cost of an MLB ticket in $1982-1984 for the nearest MLB team if that MLB team is within 100 miles

4. Econometric Frame Work

To estimate the impact of stadium construction on minor league baseball average per game attendance (APG) we follow the basic econometric framework used to measure stadium construction impacts in major league sports found in Coates and Humphreys (2005) and Clapp and Hakes (2005). We also utilize variables from Gitter and Rhoads (Forthcoming) which estimated the impact of winning percentage on minor league baseball attendance.[2] We then extend the basic framework to include the potential impact of MLB stadium construction on minor league team attendance.

Both papers that estimate MLB stadium construction impacts use binary indicators for the first 10 years of the stadium to measure stadium impacts. Equation (1) below models the effect of new stadium construction. Several indicator variables are included where $Age_{i,k}$ =1 if the stadium is of age "i" or "k" . Just as Clapp and Hakes (2005) utilize indicators for the final year (*Final*) *of* the old stadium and penultimate year (*Penult*), we include two additional binary indicators to control for this.

Our model differs from both MLB papers as they use variables that measure a team's local population and Coates and Humphreys (2005) also include a measure of local income. Both variables control for local market characteristics. We opt instead to use team fixed effects, which also control for local taste for baseball as well as controlling for time invariant population and income. Winfree and Fort (2008) use the same strategy in their estimation of attendance in minor league hockey. Team fixed effects are represented by the variable ($Team_j$), where $Team_j$=1 for team "j" and 0 for all others. Given that our sample is a much shorter period (15 years), time variation in population and income is likely to be less important.

[2] Gitter and Rhoads (Forthcoming) used a dual log estimation to interpret elasticities. In this paper we choose not to use logs to provide results that are easier to interpret in terms of the number of additional fans. The linear form is also used by the works cited in the stadium impact literature. However, using log form does not change the results substantially.

Gitter and Rhoads (Forthcoming) found that winning minor league baseball teams had higher attendance and that minor league attendance increased during the MLB strike in 1994 and 1995. To control for winning percentage we include winning percentage (Win%) in year "t" and add in two additional indicator variables for the years 1994 and 1995 (*Year94 and Year95*) to control for the impact of a strike. Finally, a trend term (*Trend*) *that* equals 0 in the first year of the sample and adds one for each subsequent year controls for the increasing attendance in minor league baseball over the sample period.

Coates and Humphreys (2008) posit that often feasibility studies for stadium construction (particularly those done by non-academic economists) over-estimate economic impacts of new MLB stadium by ignoring the possibility of consumers substituting MLB attendance for other forms of entertainment. Gitter and Rhoads (Forthcoming) got results that were consistent with the hypothesis that MLB is a substitute for minor league baseball; minor league attendance increased during the MLB strike and with the cost of ticket prices in the nearest MLB market (within 100 miles). To estimate the impact of the construction of a new MLB stadium we include 3 additional binary indicators (Age_MLB_i). The three binary indicators measure the impact of new MLB stadiums, one year old MLB stadiums, and MLB stadiums 2 to 6 years old. We only consider MLB stadiums built within 100 miles (local = 1) of the observed minor league team because Gitter and Rhoads (Forthcoming) found that when MLB ticket prices in the local market (within 100 miles) increased so did minor league attendance. But the effects were not significant for teams farther away from an MLB team. New MLB stadiums may attract minor league fans, but they may also be associated with rising MLB ticket prices that may increase the demand for minor league baseball as a substitute for MLB. To control for the price effects of a new stadium we

also include a measure of MLB ticket prices (MLBcost) in real 1982-84$ to control for the substitutability of MLB and minor league baseball.[3] Again this is only done for teams that are within 100 miles.

$$(1) \quad APG_{jt} = \beta_0 + \beta_1 Age_{0jt} + \beta_2 Age_{1jt} + \beta_3 Age_{2jt} + \beta_4 Age_{3,4jt} + \beta_5 Age_{5,6jt} + \beta_6 Age_{7,8jt} + \beta_7 Age_{9,10jt} + \beta_8 Final_{jt} + \beta_9 Penult_{jt} + \beta_{10} Win\%_{jt} + \beta_{11} Year94_t + \beta_{12} Year95_t + \beta_{13} Trend_t + \beta_{14} local * Age\_MLB_{0jt} + \beta_{15} local * Age\_MLB_{1jt} + \beta_{16} local * Age\_MLB_{2,6jt} + \beta_{17} local * \ln(MLBcost)_{jt} + \sum_{j=1}^{n} \alpha_j Team_j + \varepsilon_{jt}$$

Finally, as noted in the previous section the magnitudes of attendance at the different levels (A, AA, and AAA) vary substantially.[4] We therefore estimate each of the regressions by the minor league level. Of course, this technique could cause problems as some teams switched minor league levels during the sample period. Note that 11 teams in our sample period—about 5% of the sample—switched levels and five of these teams also built new stadiums. In regressions not reported here, we find that eliminating those teams from the regression or adding controls for their inclusion does not substantially change the results. Further, those teams' stadium impacts do not appear to differ from other teams that did not change levels. Pooling the data yields results of similar sign and statistical significance. As we will note in the next section, most of the variation between levels is in terms of magnitude of coefficients.

5. Results

In this section, we provide estimates of the coefficients in equation (1). Like Coates and Humphreys (2005) we use these estimates in a comparison of the costs of stadium construction to an estimate of the potential increase in revenue from a new stadium. We provide both generalized estimates for each level using our estimates and a case study of three teams (Cedar Rapids, Jacksonville,

[3] The ticket price measure was collected as part of the Fan Cost Index from Team Marketing Reports Inc.
[4] There are three sub-levels within A: High, Low, and Short Season. Further breaking down the level into subgroups does not appear to impact the results substantially so we elect to pool these three sublevels into a single group.

and Toledo), one at each level. The results suggest that A and AA stadiums provide additional revenue substantially below construction costs, while at the AAA level new revenues seem to approach costs.

5.1 Model Estimation

The results of our estimations for each of the three levels shown in Table 2 strongly show that new stadiums tend to increase attendance for minor league teams just like they do at the major league level. These effects are consistent for all three levels, with larger impacts at the AAA level. Not only do these stadiums increase attendance in the first year of use, but the impacts are lasting even ten years after their construction. Our results are consistent with the two core results of Gitter and Rhoads (Forthcoming)—first, that winning increases attendance and second, that MLB may be a substitute for minor league baseball as increased ticket prices in the local area and the MLB strike led to increased minor league baseball attendance. However, it appears that the effects of a new MLB stadium built in the local area are weak, and may not even be negative at some levels.

In years in which clubs constructed a new stadium (New Stadium), attendance increased by about 1,000 fans at the A and AA level and increased by about 2,500 at the AAA level. These increases are statistically significant at the 1% level. Like major league teams the positive impact of a ten-year-old stadium steadily declines to 200, 400, and 700, increase in APG for the A to AAA levels, respectively. If the impacts are totaled over a ten-year period, we find that constructing a stadium adds over 1.2 million fans at the AAA level and 400,000 at the AA level based on the average number of games played per year.[5] At the single A level some leagues play a 76-game schedule and some play 140-game schedule (half of those games are at home). The average impacts between high and low level A are not substantially different. Over the ten year period for low level A (with the shorter schedule) new

[5] This calculation was made using the average number of games played for each team, since most of the time teams lose one or two games a year to rain outs that are not rescheduled.

stadiums increase attendance by about 200,000 fans and for the higher A level with the 140 game schedule the increase is similar to AA of just under 400,000 fans.

Our estimates show weak evidence that new stadiums constructed by MLB teams within 100 miles may take away fans from minor league teams at the AAA level and no evidence at other levels. In some sense this may be surprising because fans appear to substitute minor league baseball for MLB teams. When the nearest MLB team within 100 miles raises their ticket prices $1 this increases attendance by 42, 60, and 130 fans per game at each level, A through AAA respectively. Additionally, minor league baseball saw increased attendance during the MLB strike years of 1994 and 1995 further supporting the substitutability between major and minor leagues.

Table 2: Impacts of Stadium Construction on Average per Game Attendance by Level

	A	AA	AAA
Win %	1051.607	1089.343	383.91
	(187.855)**	(455.082)*	(781.7)
New Stadium	980.786	962.711	2581.947
	(84.734)**	(155.709)**	(252.588)**
Stadium 1 year old	853.968	902.107	2511.78
	(79.627)**	(152.743)**	(251.746)**
Stadium 2 years old	754.322	862.889	2327.12
	(80.087)**	(153.639)**	(249.024)**
Stadium 3-4 Years old	623.492	671.533	1896.087
	(64.437)**	(123.263)**	(185.419)**
Stadium 5-6 Years Old	400.034	380.404	1229.368
	(62.934)**	(120.324)**	(187.718)**
Stadium 7-8 Years Old	343.652	191.469	991.425
	(63.829)**	(115.7)	(201.932)**
Stadium 9-10 Years Old	195.397	393.893	733.357
	(65.006)**	(122.902)**	(208.966)**
Final Year of Old Stadium	-322.09	-709.86	-836.26
	(112.192)**	(244.836)**	(297.817)**
Penultimate Year of Old Stad	-330.934	-801.435	-795.639
	(116.358)**	(235.159)**	(311.001)*
Year 1994	143.564	249.351	463.823
	(56.970)*	(118.809)*	(189.691)*
Year 1995	175.429	205.342	297.137
	(55.185)**	(114.2)	(186.2)
Trend	15.113	-1.181	21.946
	(4.274)**	(8.6)	(12.7)
New MLB stadium Local	-56.305	-39.214	-474.25
	(130.1)	(196.5)	(350.3)
1 year old MLB stadium Local	-121.03	-119.088	-374.968
	(113.03)	(206.72)	(351.16)
New MLB stadium 2-6 years old	-22.519	249.027	-381.617
	(64.87)	(122.834)*	(222.99)
Local*MLB ticket price	42.033	59.867	129.948
	(13.295)**	(23.432)*	(36.427)**
Constant	1523.588	2882.272	4682.504
	(111.940)**	(243.697)**	(418.977)**
Observations	1303	437	457
Number of Cities (Fixed Effects)	110	43	33

Standard errors in parentheses
* significant at 5% level; ** significant at 1% level

5.2 Cost Benefit Analysis

To begin our cost benefit analysis we provide a generalized comparison using our aggregate estimates of revenue increases and compare them to construction costs from a recent report by Marcheck (2004). This report provides stadium construction costs for around 90% of the minor league stadiums built between 1990 and 2004 and suggests that public funds make up about 85% of the typical financing structure of a minor league stadium development deal. Table 3 below shows the average cost to construct a new ballpark ranging from $33 million at the AAA level to $15.5 million at the low A level. We calculate the potential revenue for a minor league baseball team by using the average price of a ticket in 2006 at each level based on a limited sample of about six teams at each level conducted by Team Marketing Reports. The additional revenue from a new stadium is then estimated by multiplying the average ticket price by the increase in fans over a ten-year period taken from the results earlier in section 5.1. The revenue estimate will likely be relatively high, as it does not include a discount rate. On the other hand it does not include additional revenue streams such as parking and concessions.

Nevertheless, even with the generous (non-discounted) estimate of new stadium revenues that come from new fan spending, stadium construction costs appear to exceed marginal revenue. At the AAA level, new revenue is about one third of construction cost; it is closer to one tenth of construction cost at the AA and low A levels. The final column shows that the cost per additional fan ranges from $28 at AAA to around $50 at AA and High A, with low A coming in at nearly $78.

Of course, revenue comes from more than ticket sales. Like MLB, the revenue stream for minor league baseball also includes concessions, parking and souvenirs. Since 2005, Team Marketing Reports has collected data to construct a fan cost index (FCI) for minor league baseball, which includes a generous basket of goods and can be used to estimate minor league baseball team revenues. At the

AAA level the FCI is over $22 a fan. The FCI likely represents an overestimate of average revenue, since minor league teams often provide a large number of discounted tickets and concessions. Furthermore, it is unclear if the average fan is represented by the basket. We therefore, think of the FCI as an upper bound on new revenue. At the AAA level the calculation shows that new stadium revenue and construction cost are somewhat close as the FCI is about 80% of the cost of an additional fan. The FCI is about the same for AA and A level baseball ($22) but the construction cost for each new fan is two to three times that at the AAA level. At the AA and A level, the stadium construction cost per new fan appears to clearly exceed the additional revenue.

Table 3: Estimated Average Revenue from Additional Fans After New Stadium Construction

	Average Stadium Construction Cost in 2006 Constant Millions $s	Average 2006 Ticket Price	Estimated Fans Added from a New Stadium; Millions Over 10 years	Additional Revenue over 10 year period; Million $s	Cost Per Fan Added
AAA	$33.10	$8.58	1.2	$10.30	$27.59
AA	$20.20	$7.22	0.4	$2.89	$50.51
High A	$18.65	$6.40	0.4	$2.56	$46.62
Short Season A	$15.54	$7.60	0.2	$1.52	$77.71

Coates and Humphreys (2005) also note that revenues might increase in newer stadiums as fans may pay more for tickets in stadiums with better facilities. New concession stands may also increase non-ticket revenue. To calculate the projected marginal revenue from constructing a new stadium we divide the sample into old and new fans. We provide a simple equation below where revenue from a new stadium (NR) will be equal to the revenue from new fans and the additional revenue from fans who had previously attended games at the old stadium but now pay higher prices. The price of attending a

game at a new stadium is represented by (P_{new}), which is greater than the price to attend a game in the old stadium P_{old}. These prices represent a basket of attending a minor league baseball game that includes a ticket, concessions and souvenirs for a representative consumer. The two quantities represent the new fans, Q_{new}, who would not have attended a game at the old stadium and the old fans who would have attended a game at the old stadium, Q_{old}. We assume that new revenue must exceed the cost of the stadium for construction to be profitable. Given that this ignores the stadium's staff labor costs (ushers, ticket takers, concession stand workers), this will be a generous estimate of profitability.

$$NR = P_{new}Q_{new} + (P_{new} - P_{old})Q_{old}$$

Table 4 below calculates the increase in revenue required to pay for construction of a new stadium. We include two estimates of revenue from new fans: the average price of a minor league baseball ticket in 2006 and the FCI from 2006, which is a basket that includes a ticket, concessions, and souvenirs. We examine these figures over a ten-year period. The number of new fans over ten years is taken from our estimates in the previous section of novelty effects and the number of old fans is calculated using the 2006 average attendance for the appropriate level of minor league baseball. Below, we express the additional revenue required from each old fan for new stadium revenues and construction cost to be equal.

$$\frac{Stadium\ Cost - P_{new}Q_{new}}{Q_{old}} = P_{new} - P_{old}$$

At the AAA level, our estimates suggest that average additional revenue from an old fan must be between $1.39 and $4.94 for stadium construction costs to be covered. This amount increases as the level of minor league baseball decreases.

Table 4: Required Additional Revenue Per Fan for Stadium Cost to Equal New Revenues

	Additional Revenue over 10 Years Needed Per Fan to Pay for a stadium (P_{new} =FCI)	Additional Revenue over 10 Years Needed Per Fan to Pay for a stadium (P_{new} =Average Ticket Price)
AAA	$1.39	$4.94
AA	$3.72	$5.65
High A	$5.18	$8.45
Short Season A	$9.27	$11.66

Note that Coates and Humphreys (2005) estimated that it would take an additional $6.40 from each fan to maintain bond payments to pay for the new Oriole Park at Camden Yards in Baltimore. They additionally point out this is likely an underestimate since increasing price would decrease the number of fans, and that their estimate represents 32% of the ticket price which is not an insignificant portion of the old ticket price. Our results suggest that at AA and A the percent increase would have to be even higher than the Coates and Humphreys estimates. This seems unlikely, since prices are substantially smaller for low minor league teams, compared to MLB teams.

While we could benefit from having data on fan expenditures in old and new stadiums to compare to our estimates, we can try to put these numbers in perspective. At the A level, it seems unlikely that a new stadium would increase per fan revenue in an amount equivalent to or greater than the average ticket price. At the AAA level, the additional amount needed per fan is about the price for one item at the concession stand. So one can imagine a new stadium increasing revenue in an amount similar to cost with slight increases in ticket and concession prices; however, large profits from new stadiums seem unlikely.

We try to illustrate the relationship between new revenue and stadium construction cost by examining estimates from one team from each level of minor league baseball in Table 5 below. These teams are located in Cedar Rapids, IA, Jacksonville, FL and Toledo, OH. We chose these teams because they built stadiums about midway through our sample period and because the construction costs of each of three cities stadiums were easily available. The stadiums in Cedar Rapids and Toledo opened in 2001 and cost about $14.5 million and $34 million, while the stadium in Jacksonville opened in 2002 and cost $32.9 million. In each of the three cities we present the average attendance in the ten years prior to the stadium's construction. Attendance increased substantially in the first year in the new stadium for each team; in Cedar Rapids and Jacksonville the increases were 50%, while the increase was over 90% in Toledo. We include attendance data through 2009 for each team and use 2006 average league ticket prices to calculate revenue by year, since we do not have year by year price data for individual teams. Coates and Humphreys (2005) provide a similar analysis and show that even in the first year of the new stadium additional revenues do not cover the payments on bonds used to fund stadium construction costs for four MLB teams. Our results for Cedar Rapids and Jacksonville show additional estimated revenues from the increased attendance at the new stadiums are only 2% and 3% of the total construction cost, which is well below a likely bond payment or opportunity cost of capital. These results are consistent with our estimates based on league averages suggesting that the new revenue stream generated from A and AA level stadiums are substantially lower than the stadium's construction cost. At the AAA level revenues are over 7% of the total cost in Toledo, which is consistent with our findings that new revenues may approach construction costs for AAA teams.

Table 5: Projected New Revenues for Three Minor League Teams

	Cedar Rapids A-Level				Jacksonville AA-Level		Toledo-AAA Level		
Year	Attendance Per Year	Fans From New Stadium	New Revenue	Attendance Per Year	Fans From New Stadium	New Revenue	Attendance Per Year	Fans From New Stadium	New Revenue
Pre-Stadium Avg (1992 to 2001 or 2002)	129238			235145			295441		
2002	196066	6682	$427,702				567804	272363	$2,336,874
2003	174451	45214	$289,366	359979	124834	$901,301	517331	221890	$1,903,815
2004	177929	48692	$311,626	420495	185350	$1,338,226	544778	249337	$2,139,311
2005	184190	54953	$351,696	359957	124812	$901,142	556995	261554	$2,244,132
2006	176021	46784	$299,414	404992	169847	$1,226,295	569380	273939	$2,350,396
2007	168067	38830	$248,509	396012	160867	$1,161,459	590159	294718	$2,528,680
2008	164568	35331	$226,115	364365	129220	$932,968	584596	289155	$2,480,949
2009	169697	40460	$258,941	354443	119298	$861,331	559037	263596	$2,261,653
Average New Revenue Per Year			$301,671			$944,733			$2,280,726
Construction Cost			14,500,000			34,000,000			32,900,000
Average Revenue/Total Cost			2%			3%			7%

Coates and Humphreys (2008) point to a near consensus among economists that public subsidies of professional sports stadiums should be eliminated. While our estimates, like Coates and Humphreys (2005), are somewhat imprecise due to lack of total revenue data, two trends of note seem to emerge that are in agreement with the consensus view of economists. First, a privately financed stadium is unlikely to be profitable at the A and AA level. Second, even at the AAA level, the additional fan revenue that results from the novelty effect are not likely to be much higher than construction cost. While these trends do not appear to be inconsistent with the continued call by owners for public funding of stadium construction in the US, our results suggest that minor league stadiums are not engines of economic growth unless their impacts go beyond ball park revenue.

6. Conclusion

The novelty effect for minor league baseball stadiums is similar to that of MLB stadiums, as fans of minor league baseball appear to respond to new stadiums in much the same way as fans of MLB baseball. The major difference we identified in this paper seems to be that additional attendance at minor league stadiums resulting from the novelty effect does not fall off as quickly as it does for MLB stadiums. It is likely that fewer substitute entertainment opportunities in minor league cities exist compared to major league cities making the novelty effect wear off relatively more quickly in the major league cities. We also find weak evidence that new MLB stadiums within 100 miles of a AAA stadium can take fans away from the minor league stadium. This result adds support to Gitter and Rhoads' (Forthcoming) finding that minor and major league baseball are substitutes. All of this suggests that considerations of location and timing of new stadium construction and renovation of both minor and major league stadiums should include the possibility of interacting novelty and substitution effects.

A more precise measure of the benefits that flow from new stadium construction can be useful in the ongoing popular debate over how much the public sector should subsidize stadium construction and renovation projects for MLB teams. Those who support subsidies for new major league stadium construction typically point to public goods benefits such as the status that accompanies being a "big league city." This designation can lead to higher self-esteem for all citizens in the city (see Coates and Humphreys 2008) and has been used to partly justify subsidization of stadium construction or renovation. Because minor league baseball teams cannot provide "big league city" status, our results provide what likely amounts to a minimum level of private benefits an owner of a baseball team can expect to earn in the form of the novelty effect. Our results can thus serve to calibrate the public and private benefits that are expected to flow from MLB stadium construction or renovation. This knowledge can be especially helpful in guiding the public debate over how large to make public subsidies for MLB stadiums.

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