Article

Journal of Sports Economics
2017, Vol. 18(8) 787-802

DOI: 10.1177/1527002515609664
journals.sagepub.com/home/jse
SAGE

Cream Puffs: Why Do Elite College Football Programs Schedule Games Against Vastly Inferior Opponents?

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Abstract

This article provides a novel answer to the question of why elite college football programs schedule so-called "cream puff" games against vastly inferior out-of-conference opponents. Using data on college football games from 2002 to 2010, I find that a team's chances of winning are 5.3–15.6% greater in the game following their victory over a cream puff. In my preferred estimation, this "cream puff effect" is roughly half as large as the estimated home field advantage. I also show that the U.S. Today/Sagarin rating system, which I use to control for team abilities, penalizes teams for playing vastly inferior opponents. I devise two empirical strategies that deal with this potential problem and show that the cream puff effect is not simply an artifact of the rating system. These results contribute to the literature on dynamic contests by showing that not only does the timing of one's efforts within a contest matter but so does the schedule of one's opponents.

Keywords

optimal scheduling, mismatch, college football, incentives, self-deception

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Introduction

On Saturday, September 4, the top ranked Crimson Tide of the University of Alabama opened their 2010 season by playing the unranked Spartans of San Jose State University at Bryant–Denny Stadium in Tuscaloosa. Alabama, a 39.5 point favorite, won the game by a score of 48 to 3. On the same day, the 11th ranked University of Oregon Ducks, a 36.5 point favorite, beat the Lobos of the University of New Mexico by a score of 72 to 0 in Eugene. In a game in which Las Vegas didn't even set a gambling line, the Seminoles of Florida State University beat the Bulldogs of Samford University (Birmingham, AL) by 53 points in Talahassee. Such lopsided games are not unusual in National Collegiate Athletic Association football.

Why do elite college football programs schedule so-called "cream puff" games against vastly inferior opponents? To be certain, money plays a role. Most cream puff games are played at the dominant team's home field, and sellouts are the norm. The dominant team can demand a relatively large fraction of the surplus generated, while the cream puff benefits by receiving a relatively small slice of a much larger pie than it is used to.[1] Moreover, even a single loss can derail a team's chances of playing in an influential and lucrative postseason bowl game. Scheduling a nonconference game against a vastly inferior opponent minimizes this risk.

In addition to these financial incentives, however, this article establishes the existence of a "cream puff effect." I find that playing a cream puff in one game increases a team's chances of winning the following game by 5.3–15.6%. To put this into perspective, my estimations of the home field advantage range from 16% to 18%, so the cream puff effect is strategically significant.

Using data on college football games from the 2002-2010 seasons, I classify games as cream puffs when the Las Vegas gambling line is sufficiently large, or, when the Las Vegas line is not defined, the difference in the U.S. Today/Sagarin ratings is sufficiently large. I focus on college football because, in contrast to the National Football League (NFL), teams have some discretion in scheduling. In the NFL, schedules are set by league officials. In college football, in a typical 13-game regular season, a team may play 12 games, only 8 of which are against opponents from the team's conference.[2] This means the team has some leeway in scheduling its remaining four games. Should they seek out tough competitors in order to test and/or prove themselves, or should they find soft opponents they can easily beat? This article's main result is that there are benefits to playing cream puffs beyond the (essentially) guaranteed win.

The analysis is complicated by an unusual feature of the Sagarin ratings, which I use to control for team abilities. In particular, I show that the Sagarin ratings penalize teams for playing vastly inferior opponents. Although the dominant team won every cream puff game in my sample, their rating, on average, decreased. This is a potential concern because if a team is underrated after playing a cream puff, they are more likely to win subsequent games than their rating would suggest.

To show that the cream puff effect is not simply a by-product of this feature of the Sagarin ratings, I adapt the empirical analysis in two ways. First, I modify the Sagarin ratings by simply ignoring changes to a team's rating after playing a cream puff, thereby removing the ratings penalty to playing inferior teams. Second, I restrict analysis to games later in the season, when the Sagarin ratings are most likely to be good predictors of performance. The results from these analyses show that the cream puff effect indeed exits, although slightly decreased.

One possible explanation for this cream puff effect is that definitively defeating an opponent is good for the dominant team's morale and confidence, and this benefit carries over to the next game. A second explanation for the cream puff effect is that games against vastly inferior opponents have benefits similar to weeks off but without any of the perceived drawbacks. Cream puff games allow the dominant team to sit their starters for much of the game, thereby resting them and lowering the chances of injury.[3] But, in contrast to the cream puff effect, I find that weeks off do not actually increase a team's chances of winning their next game, possibly because they disrupt the players' routines and concentration.

This article contributes to the literature on the optimal design of contests and, in particular, dynamic contests, such as a tug-of-war or a race with a predetermined finish line (Harris & Vickers, 1987; Moscarini & Smith, 2011).[4] Results in these articles show that competitors try harder when leading and exert greater effort the better is the competition.

My article contributes to this literature in two ways. First, I study a situation in which the agents choose not only their strategy in response to their current opponent but also which opponents to play and in which order. This optimal scheduling problem has not, to my knowledge, been studied in the literature. And second, while I do not solve the optimal scheduling problem, I present evidence that heretofore was not known to impact the solution to this problem. In particular, teams play better after soundly defeating markedly inferior opponents. This could be put to use, for example, by scheduling a cream puff game immediately prior to taking on one's arch rival.

The cream puff effect could also have implications for the sports betting market.[5] Whether the cream puff effect can be used as part of a profit-making gambling strategy remains an open question.

The rest of this article proceeds as follows. The second section describes the data and the classification of cream puff games. The third section provides intuitive evidence of the cream puff effect, using both sample means and regression analysis. The fourth section shows that the Sagarin ratings penalize teams for playing vastly inferior opponents. I then show, by modifying the empirical analysis, that the cream puff effect exists despite this potential problem. The fifth section probes more deeply into the origins of the cream puff effect by making comparisons to the effects of score differentials in the last game and rest days. The sixth section concludes.

Data

I combine data from three sources. The first reports the outcomes of all games involving at least one Division IA, or Football Bowl Subdivision, team from the 2002-2010 regular seasons.[6] The second contains the gambling lines from Las Vegas.[7,8] Finally, I have Jeff Sagarin's ratings, originally published in *USA Today*, for both teams of each game.[9]

I classify a game as a cream puff game if it is a nonconference game, and the teams' estimated abilities are sufficiently far apart. My preferred measure of relative abilities comes from the data on Las Vegas gambling lines or spreads. Las Vegas does not, however, set a line on all games. Presumably, this occurs when it is especially difficult to predict the score differential either because not much is known about one team or because the teams are so unevenly matched. When the Las Vegas line does not exist, I use the difference in the Sagarin ratings, which exist for both teams in all games, to measure relative abilities.

I designate a game as a cream puff if it is a nonconference game and the Las Vegas line, if defined, is strictly greater than 31 points. If the Las Vegas line is not defined, a game is designated a cream puff game if the difference in the teams' ratings is strictly greater than 31.[10] I chose the cutoff of 31 for two reasons. First, this cutoff results in 272 games classified as cream puffs or 4.2% of the sample. I think of cream puff games as relatively rare occurrences, in that only the top tier of teams is relevant and even those teams rarely play more than one per season. Second, there seems to be a "break" in the frequency of spreads at 31. Panel (a) of Figure 1 shows the full histogram of the spreads in my sample, while panel (b) focuses on spreads in the range of 26–40. The main results of this article are robust to different cutoffs and classifications.

The unit of observation is a game, with the competitors labeled either *Team* or *Opponent*. If neither competitor played a cream puff last game, assignment as Team or Opponent is random. If just one competitor played a cream puff last game, they are the Team and the other competitor is the Opponent. I lose eight games in which both competitors played a cream puff last game.

Preliminary Analysis

My hypothesis is that playing a cream puff increases a competitor's performance in the following match. As a first step toward establishing the cream puff effect, Table 1 reports winning percentages of teams for each quarter of the season by whether or not the last game was a cream puff. This table shows that winning percentages in games after cream puffs are higher than in games after more worthy foes in each quarter of the season. Almost by definition, teams that play cream puffs are strong teams. Thus, the sample in Table 1 is restricted to games in which the Team played a cream puff game at some point in the season, a somewhat crude method of controlling for team ability.

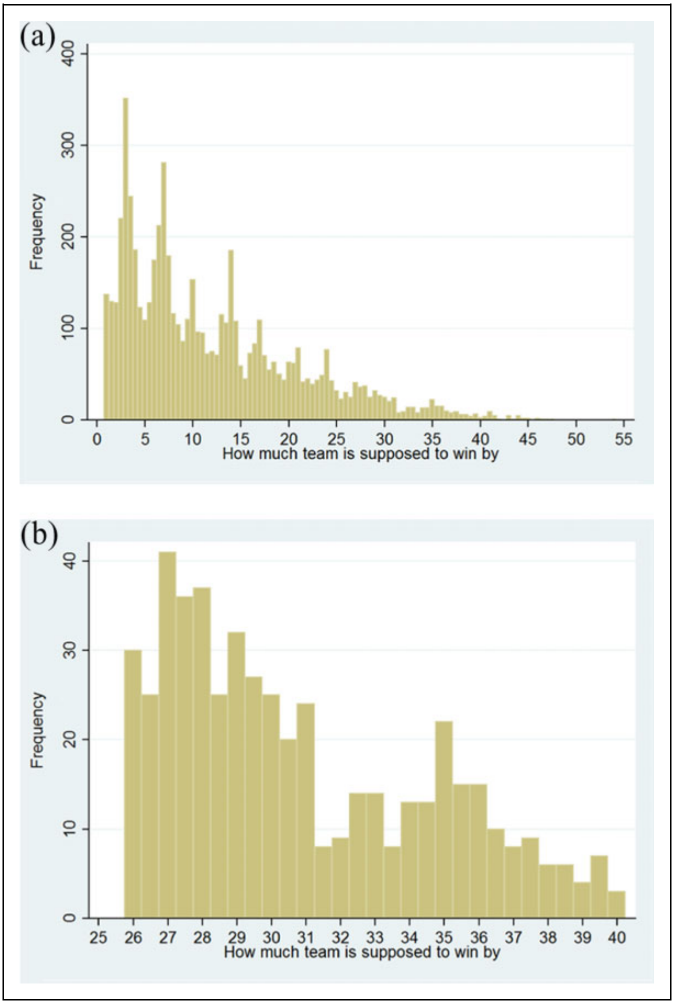

Figure 1. Histogram of spreads. Panel (a) depicts the histogram of spreads for the full sample and panel (b) depicts the histogram for spreads between 28 and 40.

I next use regression analysis in order to better control for competitors' abilities and to derive more precise estimates of the effect of playing cream puffs on the probability of winning subsequent games. I estimate a Probit model because the dependent variable, whether the Team wins or not, is binary.[11] The following results report not the coefficient from the Probit regression but rather the marginal effect (or, in the case of dummy explanatory variables, the effect of switching from 0 to 1) of a variable evaluated at the means of the other explanatory variables.

Table 1. Winning Percentages by Cream Puff Status and Quarter of Season.

Quarter of Season	Game After Cream Puff	Game After Worthy Foe
1	76.5% (132)	73.5% (208)
2	71.4% (70)	65.4% (321)
3	75.0% (32)	64.1% (343)
4	81.8% (11)	68.3% (142)
Season total	75.1% (245)	67.1% (1,014)

Note. Each cell reports winning percentages by season quarter and whether or not the last game was a cream puff. Frequencies are reported in parentheses. Cream puff games are not included. The sample is further restricted to teams which play a cream puff game at some point in the season.

Table 2 presents the results from baseline regressions. The dependent variable is an indicator for whether the Team wins or not (win_T). The explanatory variables include an indicator for whether the Team played a cream puff last game Game After a Cream Puff for the Team ($GACP_T$) and various control variables. In column (1), I use the Sagarin ratings (R_T and R_O) and an indicator for whether the Team is playing at home (Home_T) to control for the competitors' abilities. In column (2), $GACP_T$ and the Las Vegas line (Line_T) are included as regressors.[12]

The first cell in column (1) shows the effect of switching the $GACP_T$ variable from 0 to 1 on the team's probability of winning—the estimated cream puff effect is a 15.6% increased chance of winning in the game after playing a cream puff. The effect is statistically significant at all standard levels as are all regressors. In order to evaluate the strategic significance, compare the cream puff effect to the home field advantage. Home teams have an 18% greater chance of winning in column (1), which means the magnitude of the estimated cream puff effect is approximately 87% as large as the magnitude of the home field advantage.

Column (2) shows results from a regression in which the Las Vegas line is used to control for the teams' relative abilities.[13] When the spread is included, the cream puff effect is smaller in magnitude and significant only at the 15% level. This indicates that the Las Vegas line incorporates some, but not all, of the cream puff effect. In what follows, I will focus on results using the Sagarin ratings to control for relative abilities.

Overall, the results in this section suggest that there are dynamic benefits to playing weak teams. Playing a cream puff increases a team's chances of winning in the next game by 5.3–15.6%. To put this into context, the magnitude of the estimated cream puff effects range from 30% to 87% of the magnitude of the home field advantage.

The Sagarin Ratings' Cream Puff Penalty

The dominant team won every cream puff game in my sample. Nevertheless, on average, their Sagarin rating decreased after this victory. This is because the

Table 2. Marginal Effects From Baseline Regressions.

Independent variable	(1)	(2)
$GACP_T$	.156*** (.036)	.053 (.040)
$Home_T$	.179*** (.014)	
R_T	.025*** (.0008)	
R_O	−.026*** (.0008)	
$Line_T$		.028*** (.0007)
N	6,531	5,919
Pseudo R^2	.29	.29

Note. The dependent variable is a dummy variable for whether the *Team* wins or not. Each cell contains the marginal effect of a continuous variable (R_T, R_O, and $Line_T$) or a discrete change of a dummy variable from 0 to 1 ($GACP_T$ and $Home_T$). Standard errors are in parentheses. The difference in sample sizes occurs because Las Vegas does not set a line on all games. Statistical significances at 10%, 5%, and 1% levels are indicated using *, **, and ***.

Sagarin ratings implicitly penalize teams for playing vastly inferior opponents. In addition, it is difficult for the dominant team to overcome this penalty by "running up" the score because, while winning by a larger margin does lead to a greater rating increase, the effect exhibits diminishing returns.[14] Table 3 illustrates how teams' Sagarin ratings change after playing cream puffs in my sample. The Sagarin ratings penalize teams for playing cream puffs most severely in the first part of the season.

This is a potential problem because the estimated cream puff effect is obtained by controlling for teams' abilities using the Sagarin ratings. If teams are systematically "underrated" after playing a cream puff, then they are more likely to win subsequent games than their Sagarin ratings suggest.

In the remainder of this section, I modify the analysis in two ways to show that the cream puff effect does not derive from the Sagarin rating penalty to playing cream puffs—it exists despite this issue. First, I modify the Sagarin ratings by ignoring changes to a team's rating after playing a cream puff. Second, I restrict the sample to games variously classified as "late" in the season, when the Sagarin ratings are most likely to be good predictors of performance. The results in this section show that the estimated cream puff effect is not simply an artifact of the Sagarin ratings. The cream puff effect still exists, albeit slightly diminished in magnitude relative to earlier results.

In the first approach, I simply ignore the most recent change to a team's rating in the game following a cream puff. That is, I use the rating from before the cream puff game to proxy for the team's ability in the game after the cream puff. This only affects the team's rating in the game after a cream puff—subsequent games revert to using the Sagarin rating.[15] One could justify this modification since cream puff games reveal little to no information—we learn very little when Alabama beats San

Table 3. Average Rating Change After Playing a Cream Puff, by Week.

Week	Average Rating Change	Standard Deviation of Rating Changes	Frequency
2	−4.36	3.15	54
3	−3.89	3.66	57
4	−2.25	3.50	44
5	−2.42	3.68	25
6	−1.50	2.58	28
7	−0.65	2.04	10
8	0.01	1.71	8
9	−2.63	2.03	3
10	−0.07	0.83	13
11	−0.47	0.58	8
12	0.29	0.78	8
13	0.13	0.82	7
14	−1.15	0.52	3
15	0.11	0	1
Overall	−2.52	3.37	269

Note. The rating change is calculated as rating after playing the cream puff less rating prior to playing the cream puff. The value reported is the mean across all teams playing games after cream puffs in the designated week.

Jose State by 45 points and thus should not adjust their rating. In any event, if the cream puff effect observed in column 1 of Table 2 is purely a consequence of the Sagarin ratings underrating teams after cream puffs, this simple method should then eliminate the observed cream puff effect.

In fact, Table 4 shows that the cream puff effect remains significant in both a strategic and statistical sense. The estimated cream puff effect with the modified ratings is a 9.4% increased chance of winning in the game after playing a cream puff. The effect is statistically significant at the 2% level. The magnitude of the cream puff effect, corrected for the Sagarin ratings penalty of playing a vastly inferior opponent, is approximately half as large as the magnitude of the home field advantage. This is smaller than the cream puff effect estimated with the unadulterated Sagarin ratings but is preferable because it removes any influence of the Sagarin rating penalty to playing cream puffs.

The second method I use to eliminate potential bias from the Sagarin ratings is to focus only on games variously classified as late in the season, at which time the rating system has observed enough outcomes and acquired enough information to generate relatively accurate ratings. Indeed, as Table 3 shows, the Sagarin rating penalty for playing cream puffs seems to disappear after the 6th week of the season. Columns 1 through 5 of Table 5 report results from regressions in which the sample is restricted to games occurring after different cutoff points (i.e., games in the first few weeks are excluded).

Table 4. Marginal Effects From Regressions Using Modified Ratings.

Independent variable	(1)
$GACP_T$	.094** (.039)
Home_T	.179*** (.014)
$\tilde{R}_T$	.026*** (.0008)
R_O	−.026*** (.0008)
N	6,531
Pseudo R^2	.29

Note. The dependent variable is a dummy variable for whether the Team wins or not. Each cell contains the marginal effect of a continuous variable ($\tilde{R}_T$ and R_O) or a discrete change of a dummy variable from 0 to 1 ($GACP_T$ and Home_T). Standard errors are in parentheses. The modified ratings $\tilde{R}_T$ are equal to the Sagarin ratings R_T except in games after cream puff games, at which point the modified rating is set equal to the team's Sagarin rating before playing the cream puff game.
Statistical significances at 10%, 5%, and 1% levels are indicated using *, **, and ***.

The coefficients on $GACP_T$ do not change much as one moves across from the first column (games in Week 6 and up) to the fifth column (games in Week 10 and up). The standard errors, however, do increase as the cutoff week increases. This is likely due to the sample getting smaller, and the number of games after cream puff games also falling. The results from using later cutoffs are not reported because the estimated cream puff effects are approximately zero and are in all cases smaller than their standard errors.

Another way to define late in the season derives from a change in the way Sagarin's ratings are constructed over time. At the start of a season, the Sagarin ratings are constructed in a Bayesian fashion and are thus influenced by a necessarily somewhat arbitrary initial weight. As the season progresses and the teams become "connected" (meaning any team can be linked to any other team through a chain of previous games), the initial weights are removed and, Sagarin claims, the ratings are from that point on unbiased. It typically takes 6–10 weeks for teams to become connected.[16] Column 6 of Table 5 reports the results of the baseline regression estimated on the sample of games in which the teams were connected. The estimate of the cream puff effect is roughly the same size as in the other samples. Again, the number of games after cream puffs in this sample is quite small, which could explain the large standard error and lack of statistical significance at standard levels.

The results in this subsection show that the estimated cream puff effect is not simply a result of a Sagarin rating penalty for playing vastly inferior opponents nor inaccuracies in the ratings at the beginning of the season. The cream puff effect exists and is large in magnitude even after eliminating potential concerns deriving from the Sagarin ratings. While some of the estimates are not significant at standard levels, the magnitude of the cream puff effect is relatively constant.

Table 5. Marginal Effects From Baseline Regressions on Restricted Samples.

Independent variable	(1)	(2)	(3)	(4)	(5)	(6)
$GACP_T$	.138** (.062)	.084 (.077)	.113 (.085)	.116 (.091)	.136 (.095)	.103 (.096)
$Home_T$	.166*** (.017)	.171*** (.018)	.179*** (.020)	.186*** (.021)	.183*** (.024)	.162*** (.022)
R_T	.025*** (.001)	.026*** (.001)	.026*** (.001)	.025*** (.001)	.025*** (.001)	.025*** (.001)
R_O	−.026*** (.001)	−.026*** (.001)	−.027*** (.001)	−.026*** (.001)	−.025*** (.001)	−.025*** (.001)
Sample restriction	Weeks 6 and up	Weeks 7 and up	Weeks 8 and up	Weeks 9 and up	Weeks 10 and up	Connected
Games after cream puffs	89	61	51	43	40	42
N	4,024	3,547	3,072	2,599	2,132	2,461
Pseudo R^2	.23	.24	.25	.24	.24	.24

Note. The dependent variable is a dummy variable for whether the *Team* wins or not. Each cell contains the marginal effect of a continuous variable (R_T, R_O, and $Line_T$) or a discrete change of a dummy variable from 0 to 1 ($GACP_T$ and $Home_T$). Standard errors are in parentheses. The samples in columns (1) through (5) are restricted as detailed in the row titled "Sample restriction." The sample in column (6) is restricted to games in which the teams are "connected" in the Sagarin ratings. The number of games after cream puffs included in each sample is listed in the row titled "Games after cream puffs." Statistical significances at 10%, 5%, and 1% levels are indicated using *, **, and ***.

Robustness Checks

In this section, I put the cream puff effect into context by exploring its relationship with score differentials and weeks off.

Score Differentials

Cream puff games often result in lopsided results, and the median score differential for a cream puff game has the favored team winning by 39 points, while the median value for more evenly matched competitors is 1 point. Figure 2 shows the histograms of score differentials for cream puff games (shaded) and noncream puff games ("clear").

Part of the explanation given in the introduction for the existence of the cream puff effect was that lopsided victories raise team spirits. If this is true, one would also expect the score differential from a team's last game to affect their performance in the current game. In order to test this conjecture, I included in the regression the score differentials from the Team's and Opponent's last game as well as an interaction with the game after a cream puff indicator for the Team. Figure 3 illustrates the effects of last game's score differential on the Team's probability of winning from this regression.[17]

Each panel of the figure shows the effect of last game's score differential on the Team's probability of winning the current game for three different samples: the Team in the game after playing a cream puff (a), the Team in the game after playing a more worthy foe (b), and the Opponent (c). The solid line indicates the estimated probability the team wins for the relevant last game score differential, with all other explanatory variables evaluated at their means. The shaded region indicates the 95% confidence interval, and when this region includes the line at 0.5 on the vertical axis, we cannot conclude that the last game score differential's effect is not 0 at the 5% statistical significance level.

Panels (b) and (c) are essentially mirror images of one another. In games not after cream puff games, a greater score differential in the previous game increases a competitor's chances, but the effect is not very large in magnitude. In panel (a), the cream puff effect is large and statistically significant, but the effect of last game's score differential is opposite that shown in panels (b) and (c). In particular, a larger score differential in the previous cream puff game decreases the Team's chances of winning the current game.[18]

Overall, the cream puff effect and the effect of last game's score differential work in similar ways. When two teams are evenly matched, beating one's opponent by a greater margin increases the chances one wins their next game. When two teams are so unevenly matched that one is classified as a cream puff, the dominant team's chances of winning the next game increase. The interaction effect depicted in panel (a) of Figure 3, however, shows that greater score differentials in cream puff games hurt the dominant team in their next game.

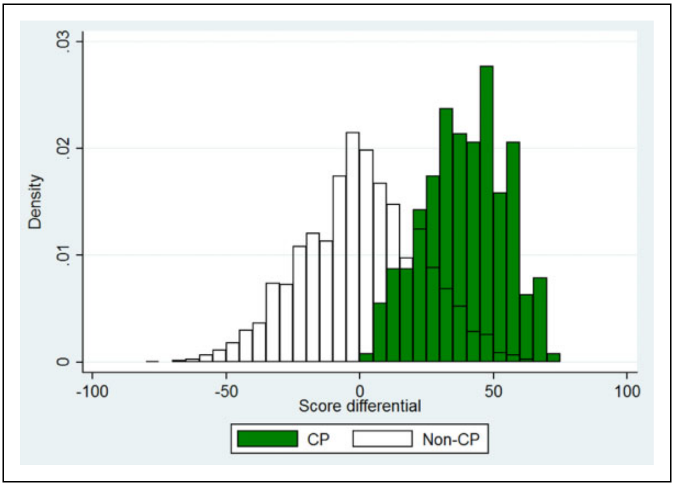

Figure 2. Histogram of score differentials by cream puff status.

One possible explanation for this pattern is that, in order to beat a cream puff by a large margin, the dominant team must leave its starters in the game for longer. This increases the chance of injury, meaning that important players are less likely to participate in subsequent games. Also, the starters may simply be more tired in subsequent games, having foregone a rest in order to drive up the score.

Weeks Off

The benefit of a cream puff game may not actually be an increase in team morale and spirits but rather that it is essentially an opportunity for the team to rest (at least) its starting players. Since college football teams routinely have one or more weeks without a game within a season, it is possible to check if the cream puff effect is similar to a week-off effect. When dummy variables for games after weeks off were added to the baseline regression, the estimated week-off effect was actually *negative* but not statistically significant at standard levels. The estimated cream puff effect was not significantly changed from the previous results.[19]

One possible explanation for the difference in these effects is that weeks off are disruptive in that football teams are creatures of habit and routine. A cream puff not only allows a program to keep to its routine but also allows some players to rest and heal. If coaches and athletic directors want to increase team performance, they should consider replacing weeks off with cream puff games.

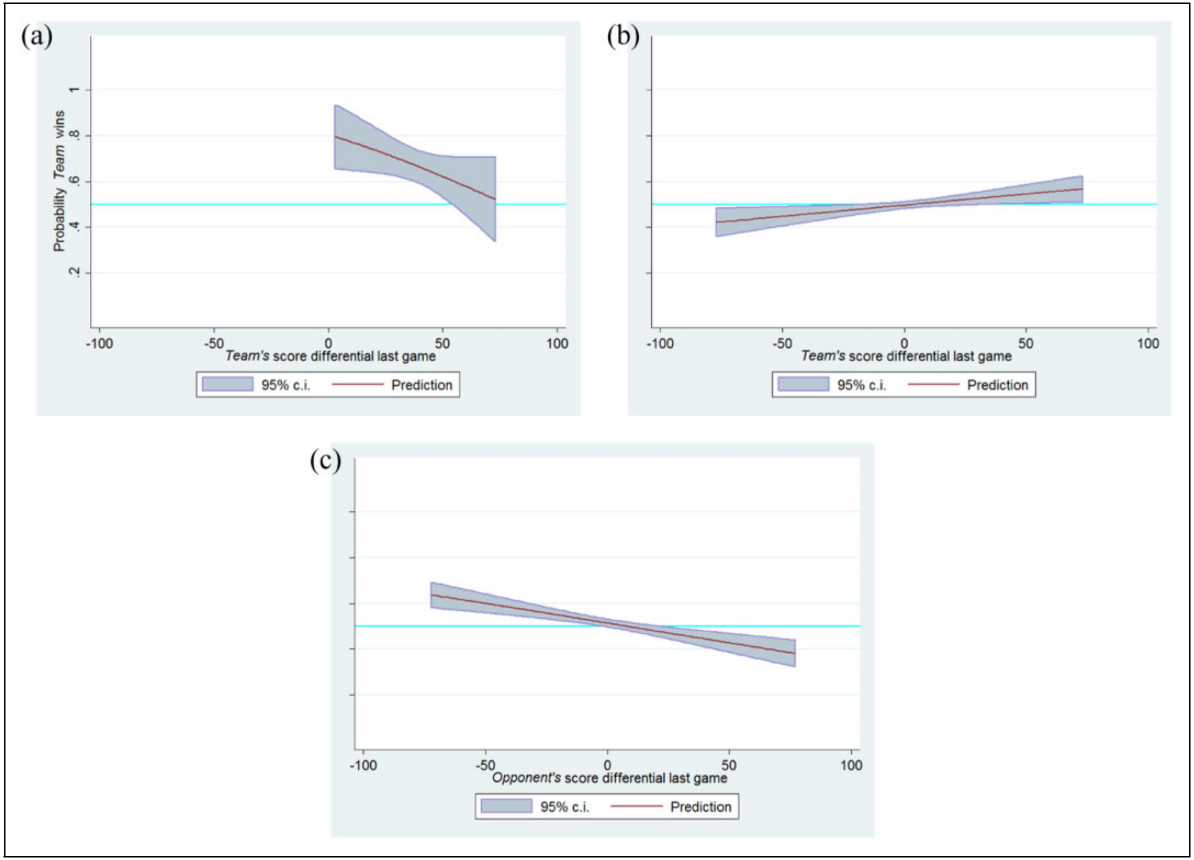

Figure 3. Effects of score differentials on probability *Team* wins. Each panel shows the effect of a competitor's score differential in the most recent game on the Team's probability of winning, with all other variables evaluated at their means. Panel (a) depicts the effect of the Team's last game score differential on the probability the Team wins in the game after a cream puff. Panel (b) depicts the effect of the Team's last game score differential on the probability the Team wins in a game after a more worthy foe. Panel (c) depicts the effect of the *Opponent's* last game score differential on the probability the Team wins.

Conclusion

This article has established the existence of the cream puff effect—namely, high-quality teams are more likely to win in the game after they play a markedly inferior opponent. In my preferred estimation, the cream puff effect is 9.4%, approximately half as large as the estimated home field advantage. This effect is robust to different econometric specifications, sample selections, and to the inclusion of standard control variables.

The results in this article can profitably inform future study of the "optimal scheduling game," wherein teams simultaneously set their schedules to maximize some objective. The objective function of college athletic programs is not obvious. Are they trying to maximize the number of wins, revenues, their chances of making the national title game, or their exposure on nationally syndicated television networks? Nevertheless, an interesting question for future research is to study the optimal scheduling game for one or more of these objectives. The cream puff effect will be important to consider in solving for the equilibrium of the optimal scheduling game because it is an additional tool that athletic directors can use to achieve their goals, whatever they may be.

The existence of the cream puff effect in college football might also have implications in other economic arenas, such as the the labor and marriage markets. For instance, managers might increase their workers' chances of success by scheduling easy, confidence boosting tasks prior to those more difficult and important. Similarly, singles and job seekers might schedule dates and interviews with less discerning and desirable potential partners before meeting their most desired match.

Acknowledgment

I am grateful to Editor Leo Kahane and two anonymous referees for helpful comments and suggestions. I also thank Michael Davis and participants at the Virginia Tech brown bag seminar series and the North American Association of Sports Economists sessions at the Missouri Valley Economic Association conference.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Notes

1. While comprehensive data on revenue sharing arrangements are scarce, anecdotal evidence does exist. For instance, Temple (2012) reports that Appalachian State University was paid US$400,000 by the University of Michigan to play in Ann Arbor at the

beginning of the 2007 season. If tickets were on average US$50 for that game, ticket revenue from the 109,218 fans was US$5,460,000, giving Appalachian State University (ASU) just over 7% of ticket revenue.

2. Very few teams, known as "independents," do not belong to a conference. In my sample, the independent teams are Army (2005-2010), Connecticut (2002-2003), Navy (2002-2010), Temple (2005-2006), Troy (2002-2003), and Western Kentucky (2008).
3. According to Meyers (2010), there are on average 4.85 injuries per team in each game.
4. See Szymanski (2003) for a review of the literature on optimal contest design.
5. There is a body of literature testing the efficiency of sports betting markets. Vergin and Sosik (1999) show that betting on the home team in NFL games with a "national focus" (i.e., Monday night and play-off games) can constitute a profitable betting strategy. Borghesi (2007) shows that game day temperature affects home and visitor performance in the NFL differently and that this information is not efficiently incorporated into the gambling line.
6. Source: http://homepages.cae.wisc.edu/~dwilson/rsfc/history/howell
7. Source: http://www.repole.com/sun4cast/data.html
8. I believe this is the "starting" gambling line from Las Vegas, but, according to Levitt (2004), bookmakers rarely adjust the gambling line and so the final line is usually the same as the initial line.
9. I am grateful to Kenneth Massey for providing this data set.
10. The complete list of cream puff games is available upon request.
11. The estimated cream puff effect from a linear probability model is not significantly different from that of Probit model.
12. I performed likelihood-ratio tests (Harvey's, 1976, multiplicative heteroskedastic Probit model against the standard Probit model) for heteroskedasticity for all regressions in this article. None were significant at the standard levels.
13. I do not report the results of a regression including both teams' ratings and the Las Vegas line as control variables because they are highly collinear.
14. To give a sense of how strong this effect is, consider two teams separated by 31 rating points at some point in the first half of the season. In order for their rating to not go down, the dominant team must beat such an opponent by 70–80 points. The median score differential in a cream puff game in my sample is 39 points and was only once greater than 70.
15. I have also used slightly different modified ratings in which the rating is changed in the game after a cream puff in the same way but only if the rating fell after the cream puff game. This different modification does not significantly affect the results.
16. The week at which the teams became connected for the years in my data set are 2002—Week 13, 2003—Week 11, 2004—Week 10, 2005—Week 6, 2006—Week 6, 2007—Week 8, 2008—Week 8, 2009—Week 7, and 2010—Week 6.
17. Results from this regression are available upon request.
18. This same general pattern is also observed when using either the Las Vegas line or the modified ratings $\widetilde{R}_T$ to control for the competitors' relative abilities.
19. Results from this regression are available upon request.

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