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Managerial Decision Making under Uncertainty: the case of Twenty20 cricket

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Managerial Decision Making under Uncertainty: the case of Twenty20 cricket

Abstract

We consider managerial decision making by examining the impact of decisions taken by cricket captains on Twenty20 International (T20I) match outcomes. In particular, we examine whether pressure from external commentators is associated with sub-optimal decision making by captains. Using data from over 300 T20I matches, we find little evidence that either winning the toss or choosing to bat first improves the likelihood of winning. Despite this, we find that captains in T20I cricket are significantly more likely to choose to bat rather than bowl after winning the toss, a finding that is consistent with social pressure constraining captains' decision making.

Keywords: cricket, decision making, uncertainty, conditional logit.

JEL codes: L83, D8, D83.

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Introduction

We examine choice under uncertainty by considering the batting order choices of international cricket captains (the sequence in which the two teams "bat" and "bowl") upon winning the random pre-match coin toss in light of concern about a widely held, though possibly incorrect belief regarding the optimal choice of batting order. The choice of batting order is a non-trivial decision because of the potential effects of the playing surface and weather conditions on cricket match outcomes.

The use of professional sport as a testing ground for economic behaviour has a rich heritage. Bhaskar (2009) looks at decisions taken upon winning the toss in professional cricket matches by likening them to randomized trials. Walker and Wooders (2001) consider serving behaviour in professional tennis matches to investigate mixed strategy equilibria. Duggan and Levitt (2002) use sumo wrestling in Japan to examine corruption whilst Berri and Simmons (2009) consider discrimination using data from the National Football League (NFL).

Whilst experimental economists often use moderate financial incentives to try to induce rational behaviour amongst subjects in a laboratory setting (Camerer and Lowenstein, 2004), professional sportspersons tend to face very strong performance incentives because of the nature of their jobs, with considerable opportunities to learn over time. Further, data on professional sport often have the advantage of being detailed, comprehensive and accessible. The competitive nature of professional sport also means that decisions taken in these environments are particularly likely to help in furthering the understanding of decision making in other competitive environments.

Our study of choice under uncertainty builds on a recent literature that has examined decision making under a type of uncertainty in which the decision maker is influenced by a lesser informed judge. Brandenburger and Polak (1996) show how managers may withhold private information from the market because of a short term concern over their company's share price, while Cummins and Nyman (2005) demonstrate how inefficiencies can be endogenously created by very competitive environments in which one party is better informed than the other. For example, firms are often better informed than their consumers but must satisfy their consumers' preferences.

Boyle and Haynes (2009) and Whannel (2006) have commented on the increasing prominence of major professional sports in the mass media, which has consequently heightened the scrutiny on major sportspersons. Due to the heavy influence of the media on professional sport, media opinions serve as external judgement on the decisions of international captains. Similar to the influence of the view of the external market on managers in the corporate world (Hirshleifer, 1993; Brandenburger and Polak, 1996), cricket captains are strongly aware of the critical opinions of the media.

Indeed, there exist further similarities between captains and corporate managers. Captains have a number of responsibilities with the ultimate goal of winning matches for their teams, just as managers of firms have the responsibility of managing their employees with the ultimate aim of maximizing profits for their companies. Also, captains are typically appointed for relatively short tenures. Whilst they are most likely to extend their tenures if they are successful in winning matches, captains may take decisions that benefit them rather than their teams given their short tenures. Narayanan

(1985) demonstrates that managers who are appointed for longer tenures are less likely to take decisions that prioritize short term gains ahead of longer term profit maximization. Similarly, Hirshleifer (1993) suggests that managers can make investment choices that are bad for shareholders but make the manager look better in the short run.

We present and test a model of captains' decision making in which a captain's decision making is constrained by social pressure. This social pressure is caused by a received wisdom, prevalent amongst the cricket media, that batting first is superior over the alternative of bowling first. This received wisdom in the cricket media has also been noted by Bhaskar (2009). It has its origins in the early history of Test cricket, the oldest form of international cricket, where batting first was considered advantageous. Recent statistical analysis (Allsopp and Clarke, 2004) has offered little supporting evidence for this belief, yet this received wisdom has persisted over time: captains who choose to bowl and lose in important Test and One Day International (ODI)[1] matches are subject to widespread criticism.

In contrast to previous work on this topic, we examine a relatively new format of the game called Twenty20 International (T20I) cricket, a second version of limited overs cricket. This allows us to observe captains' decision making from the very inception of this format of the game and to test whether their decision making improves or worsens over time, given the considerable opportunities to learn. We thus add to the literature on economic decision making by examining data on how successfully T20I captains perform in making one important decision repeatedly.

[1] ODI cricket is the first version of limited overs international cricket, played since 1971. It has been played at 40, 45, 50, 55 or 60 overs a side, but has remained at 50 overs a side for the last two decades.

Background and literature review

Choice under uncertainty

Baird (1989) suggests that "the best way to judge the competence of any executive…is by the quality of decisions made in complex situations when faced with uncertainty" (p.5). When making these decisions, managers may face uncertainty from various sources, such as the changing nature of demand for their goods, supply side changes, invention and innovation (Jones, 2004).

As mentioned, of primary interest to this study are decisions in which individuals are influenced by others' judgment of their actions. Brandenburger and Polak (1996) showed that managers withhold private information to keep share prices in line with market expectations instead of maximizing profits, whilst Narayanan (1985) demonstrates that managers may use private information to make decisions that result in short term gains at the expense of shareholders. However, the likelihood of these decisions is inversely related to experience and length of contract. Baker and Nyman (2009) suggest that job market interviewees may not necessarily disclose whether they are suited to the job to their potential employers. Cummins and Nyman (2007) discuss incentives created by rank order promotion tournaments within companies in which employees may be forced to agree with their superiors' incorrect pre-conceived notions about investment decisions in order to gain promotion. In each of these uncertain situations, individuals face incentives that leave them unwilling to make efficient use of the information available, as their choices are evaluated by those with inferior information. Indeed, as Cummins and Nyman (2005) suggest, it is the very competitiveness of these environments that drives such behaviour.

Roles of cricket captains

In professional cricket, the captain plays a key role in the running of his team. He bears several responsibilities, including formulating plans and strategies within matches and series; having a say in team and squad selections; acting as a team spokesperson during interactions with the media and maintaining team morale in a squad of up to sixteen other players.

In international cricket teams, the selection committee is akin to a principal and the captain to an agent. The selectors choose squads and appoint captains with the aim of winning matches and series, so cricket captains are accountable to their selectors (and in some countries, the administrators of their national governing body). Whilst the selectors can observe decisions taken by the captain, they are not privy to the captain's motivations. Given the level of competition; pressure faced from selectors and the fact that T20I cricket usually has only two outcomes, one might expect captains to care only about winning matches. However, there is a major source of external pressure on captains from the cricket media. Cricket captains face intense scrutiny of their decisions. If these decisions are reported as contributing to the team's failure, there are severe consequences for the captain's career.

Previous studies on social pressure have noted such external influence on behaviour. For example, Bernheim (1994) constructed a model of social interaction in which an individual's utility function includes a need for social approval in addition to standard consumption utility. In this model, the social status of an individual is assumed to depend in part on the public perception of him or her.

The batting order decision

Batting order decision making provides a useful natural experiment of choice under uncertainty. The captain chooses between two alternatives not knowing what the outcome will be, just as, for example, a manager might choose between two employees not knowing whether they will be productive for the company or a prospective university student may decide between two courses not knowing which course will maximize career earnings. While this decision is sometimes made in consultation with the team coach and other players, the captain bears responsibility for it. Further, data on the batting order decision and the final match outcome are available and unambiguous.

Several international captains have faced extreme criticism after choosing to bowl first and losing in important matches. After bowling first and losing the second Test of the 2005 Ashes series, a series Australia subsequently lost, the former Australian captain Ricky Ponting never chose to bowl first in a Test match again. The former English captain Mike Denness was sacked after losing the first Test match of the 1975 Ashes series against Australia, partly because of his decision to bowl first. Another former English captain, Nasser Hussain, commented on the long standing criticism of his decision to bowl in the opening Test match of the 2002-03 Ashes, which England subsequently lost, saying "...it has...been labelled the biggest mistake I made as England captain" (John, 2006). In ODIs, Indian captain Sourav Ganguly received considerable criticism after choosing to bowl first in the 2003 World Cup final against Australia, which India subsequently lost.

We look at captains' decision making in the relatively new T20I format (first played in February 2005), enabling us to examine the evolution of captains' decisions since the very inception of this format of the game. This novelty of T20I cricket can

potentially provide insights into learning over time. Specifically, in the early days of T20I cricket, matches were treated less seriously by the media. As interest in the format has grown, decision making by captains has come under a similar level of scrutiny to other forms of cricket.

The frequent discussion of the effect of the toss and batting order choice on professional cricket match outcomes has made it a subject of some interest in the literature, including, amongst others, de Silva and Swartz (1997), who found that winning the toss offers no competitive advantage in ODI matches. The toss seemingly does not provide a real advantage in Test cricket or ODI cricket played in the day.[2] Despite this, batting first continues to be considered a superior choice by the cricket media.

T20I matches typically last only three hours and tend to attract large crowds.[3] Due to the shorter length of matches compared with other formats (for example, ODI matches are typically played for seven hours, whilst Test matches can be played for up to six hours a day for five consecutive days), the impact of changes in weather and pitch conditions is likely to be smaller in T20I cricket than ODI and Test cricket, making it an interesting format in which to assess the effect of the toss.

An economic model of the batting choice decision

On winning the toss, a captain is faced with the choice of batting or bowling first. Excluding ties and abandoned matches, there are only two possible results in T20I cricket: a win or a loss. This gives four possible decision and outcome combinations.

[2] One exception is Dawson et al. (2009), who investigated day/night ODI matches and found that winning the toss and batting first increased the chance of winning

[3] Based on data available to the authors (for 82 T20I matches in the sample), average crowd attendance for T20Is was 21,315 spectators per match.

One might expect captains to make the choice of batting order in a T20I match with the sole aim of winning. Winning is more pleasurable than losing and successive losses may cause the captain to lose their job. However, we propose that the pressure exerted by scrutiny from the media is also likely to influence their behaviour, in particular through the incorrect but entrenched received wisdom that batting first increases the chance of a team winning as compared to bowling first.

We present a model of captains' decision making in T20I cricket. We propose that social pressure operates as a constraint on captains' decision making. That is, captains seek to maximise their expected return subject to satisfying this social constraint. This modelling strategy is akin to a manager who seeks to maximise profits subject to operational constraints or a consumer who maximises utility subject to a budget constraint. In this case, as the social pressure constraint tightens over time, captains are predicted to take increasingly sub-optimal decisions. We first show a captain's expected utility function:

$$EU = pU_W + (1-p)U_L$$

$$EU = U_L + p(U_W - U_L) \quad \textbf{[1]}$$

where:

p = *probability of team winning*

U_W = *utility gained from winning match*

U_L = *utility gained from losing match*

Let $p=t+e$, where t is the increase or decrease in probability of winning from batting first, whilst e is everything else that determines the probability of winning.

$$EU = U_L + [E(t)(Bat)+e](U_W - U_L), \text{ where}$$

$$-1 \leq t \leq 1 \text{ and } 0 \leq t+e \leq 1$$

The captain maximises EU *subject to* $S + E(t) \geq 0$, *where:*

S = *social pressure*

$E(t)$ = *expected impact of batting first on the probability of winning*

Without social pressure, to maximize *EU* a captain will choose to bat *(Bat=1)* if $E(t)>0$, meaning the expected impact of batting first on the chance of winning is positive. He will choose to bowl *(Bat=0)* if $E(t)<0$, as the expected impact of batting first on winning is negative. However, in this case, with $E(t)<0$ and bowling first being the correct choice, social pressure has the potential to change the decision. To illustrate this, let the constraint to bat first be binding if $S + E(t)>0$, meaning that social pressure to bat first is greater than the expected beneficial impact of bowling first on winning. Figure 1 shows how the social pressure constraint affects expected utility by plotting expected utility against the marginal change in the probability of winning from winning the toss. With no social pressure, as *t* approaches -1 (meaning the probability of losing after batting first approaches certainty), *EU* increases with bowling first because it makes winning more likely. However, if constrained by social pressure, captains will take sub-optimal decisions, choosing to bat even though it lowers expected utility.

As mentioned, interest in the T20I format has grown over time, so it is likely social pressure on T20I captains has also risen. Increasing social pressure on captains is likely to conflict with the effect of increasing knowledge of T20I cricket: with increasing experience of T20I cricket, captains would be expected to make better decisions at the toss, based on knowledge of which choice is likely to be more successful. However, as our model suggests, increasing social pressure is likely to constrain captains' decisions, in which case the effect of the toss would be expected to

decrease over time. Based on this, we propose a series of hypotheses. If greater knowledge of T20I cricket leads to better decision making, the toss will be expected to have an increasing positive effect on winning over time; however, if social pressure increases over time, the effect of the toss will be expected to decrease over time.

The effect of social pressure on T20I captains is also likely to differ in home and away matches. One would expect that captains playing at home would take better decisions at the toss based on knowledge of local conditions and which choice is more successful in their own countries: given this, the toss would be expected to have a stronger effect at home. However, there is more scrutiny of home captains by fans and particularly the media, which is likely to increase social pressure on T20I captains at home and due to which the effect of the toss will be expected to be lower in home games.

As Narayanan (1985) suggests, in the corporate world, experienced managers are less likely to be affected by social pressure to prove their ability and consequently put short term share prices ahead of longer term profit maximization for their firms. Similarly, more experienced T20I captains are less likely to be affected by social pressure from the media and so take better decisions. Given this, if social pressure on longer term captains is lower, the effect of the toss will be expected to increase with captaincy experience.

In our empirical analysis, we test for the effect of the toss and batting order choice on match outcome over time considering the potentially conflicting effects of social pressure and home advantage.

Econometric model and data

Conditional logit model

Our core empirical approach is to estimate conditional logit models of the probability of winning. The data are organized with two observations for every match, representing the winning and losing team respectively. Due to the inherent dependence between teams in each match, some previous studies such as Duggan and Levitt (2002) clustered the standard errors for each match. Simply clustering the standard errors, however, does not control for the fact that the two observations for each match are correlated with each other by construction. For this reason, we follow Dawson et al. (2009) and use the conditional (fixed effects) logit model. Koop (2008) explains that conditional logit analysis can be employed when multiple alternatives exist with variance across alternatives for any individual. For comparison, we also report OLS estimates in which the dependent variable is the margin of victory (or loss) for each team.

We follow the notation of Dawson et al. (2009) in constructing a conditional logit model:

$$y^*_{mt} = x_{mt}\beta + \alpha_m + \varepsilon_{mt} \qquad \textbf{[2]}$$

where y^*_{mt} (m refers to match and t to team) is an unobserved variable measuring team performance; x_{mt} is a vector of explanatory variables; β is a vector of unknown parameters; α_m is an idiosyncratic fixed effect associated with match i and ε_{mt} is a random error term accounting for discrepancies between observed responses and predicted outcomes.

y_{mt} can also be written as the binary response variable that measures the performance of the team:

$$y_{mt} = \begin{cases} 1 \text{ if the team wins} \\ 0 \text{ otherwise} \end{cases}$$

The probability of the team winning is given in Equation 3:

$$\Pr(Y_t = 1 | x_{mt}, \alpha_m) = \frac{\exp(\alpha_m + \beta x_{mt})}{1 + \exp(\alpha_m + \beta x_{mt})} \quad \textbf{[3]}$$

For comparison, we follow Allsopp and Clarke (2004) in reporting OLS estimates in which the dependent variable is the margin of victory (or loss) for each team with similar explanatory variables. One advantage of the OLS model in this context is that the margin of victory provides additional variation in the dependent variable, which increases the precision of the inference from the analysis. However, captains are likely to gain utility primarily from the match result as opposed to the margin of victory or defeat. As such, we regard the OLS estimates as a robustness check for our preferred conditional logit estimates. For consistency, we continue to exclude tied matches in the OLS models.

Variables

The discussion above suggests a number of variables expected to influence T20I match outcome. This list of variables and their description is provided in Table 1. Data on the variables are available for every match in the sample. *Win* and *Margin* are used as the dependent variables when estimating the probability of winning and the margin of winning respectively. *Toss* is a binary variable which assumes the value 1 if the team wins the toss or 0 if it loses. The expected sign on *Toss* is positive, though previous studies have found mixed results on its effect on Test and ODI match outcomes.

We include *TossDecisionBat* and *TossDecisionBowl* as variables that assume the value 1 if the team wins the toss and chooses to bat and the team wins the toss and

chooses to bowl respectively, 0 otherwise. These terms are included to assess the effect of the batting order choice upon winning the toss on match outcome. *Home* is a binary variable which assumes the value 1 if the team is playing at home, 0 otherwise. This variable is included because of the widely observed home field advantage in professional team sports (Nevill and Holder, 1999). Due to this, teams playing at home are expected to better exploit knowledge of pitch (the playing surface area) and weather conditions and to benefit from crowd support. *Home* is thus expected to have a positive coefficient. We include a *Toss*Home* interaction term to examine the effect of winning the toss at home. *TeamStrengths* controls for the relative strengths of the two teams, defined as the difference in pre match T20I ratings between the team and its opponent. This variable is expected to have a positive coefficient, with the higher pre match rated team expected to win. *DayNight* is a binary variable indicating whether the match was played under floodlights. *Time* is the number of the T20I that the team is playing, so that, for example, the fourth T20I that Australia played has a *Time* value of 4, the fifth a *Time* value of 5 and so on for all seventeen teams in the sample. *Time* will be interacted with *Toss* to ascertain the effect of the toss over time. Finally, *Experience* shows the number of T20Is the captain of the team had led in prior to the game. *Toss* will be interacted with *Experience* to test the effect of experience on captains' decision making.

Data

The data comprise all 301 T20I matches played by the seventeen T20I teams[4] between February 2005 and May 2013, not including seven matches that were abandoned due to

[4] These are, in order of playing T20Is: New Zealand, Australia, England, South Africa, West Indies, Sri Lanka, Pakistan, Bangladesh, Zimbabwe, India, Kenya, Scotland, Netherlands, Ireland, Canada, Bermuda and Afghanistan.

poor weather conditions and eight others that were tied. The data were obtained from the ESPNcricinfo website. For each match our dataset includes the date; venue; competing teams; batting order; which team's captain won the toss; batting order decision taken by the captain who won the toss; match result; whether the game was played under floodlights; whether one team was playing at home; number of T20Is each team had played and the number of T20Is each team's captain had led in prior to the match.

To measure relative team strengths and in the absence of pre-match betting odds, we construct a rating system for T20I matches partly based on the ICC's T20I cricket rating system.[5] Also, the result margin in runs for matches in which the team batting second won (where the result was achieved in terms of wickets and overs remaining, rather than runs) was obtained by converting the wickets and overs remaining into a runs value using the T20 scaled Duckworth-Lewis table for rain affected matches (Duckworth and Lewis, 1998).

Results

Descriptive statistics

In Table 2, we report summary statistics for each variable and also the mean win percentages in particular circumstances. The raw data suggest little benefit from winning the toss, with the team that wins the toss winning about 51.5% of matches. Despite the side batting first winning marginally less than half of matches, captains chose to bat over 57% of the time. Running a single sample t-test suggests this

[5] There are two differences from the way the ICC rating system is calculated. Firstly, the ODI rating of the team at the time of its first T20I match was used as its initial T20I rating, with each team given, for points calculation purposes, a base number of ten matches. Secondly, our T20I ratings system does not restrict the sample of matches used to those played in the previous two years only, as the ICC system does, because the volume of T20Is is small.

proportion of captains batting first is significantly different to 50% (p-value 0.013). In other words, the descriptive statistics suggest that captains choose to bat significantly more often than they choose to bowl in T20I cricket.

Teams choosing to bowl emerged victorious in slightly more than 51% of cases, compared to just under 52% for teams choosing to bat. In day/night games, the winning percentage for teams winning the toss is only 44%, suggesting an apparent disadvantage from winning the toss in such matches. The team batting first in day/night games won almost 57% of the time. Teams playing at home win almost 53% of the time and, further, teams winning the toss at home win nearly 55% of the time, suggesting an advantage from playing at home in T20I cricket.

Next, we split the sample into three chronological periods to investigate changes over time. In particular, we examine whether captains are adapting their decisions in light of previous T20I matches because early on, captains were unaware of optimal batting order choices, but one would expect them to have learned these choices over time. We report the percentage of matches in which the captain chose to bat; the percentage of teams that won after choosing to bat and finally the percentage of teams that won after batting first regardless of which team won the toss. We then look at how these proportions change over time.

The first two splits are of 100 matches each, whilst the third split comprises 101 matches. The results are reported in Table 3. The split sample percentages show that in the first third of T20Is, captains chose to bat 49% of the time, but in the second and final third of T20Is, captains choose to bat in over 60% of matches.

Although the percentage of matches won by teams choosing to bat first rose in the second third of T20Is, it dropped sharply in the final third of matches. Further,

while the percentage of teams winning batting first (regardless of the toss) rose in the second third of T20Is there was a decline in the final third, in contrast to the continuingly high proportion of captains batting first.

Referring back to our theoretical model, it is possible captains are responding to a conventional wisdom that constrains decisions, which is consistent with the effect of external judgment by those with inferior information. International captains are better informed about team strengths, strategies and pitch conditions than the media, but may similarly take decisions in line with media opinions because of the potential criticism from bowling and losing. By doing so, captains can partially control for adverse consequences from the outcomes of their decisions. Similar to the old management adage that "no one ever got fired for buying IBM" (p.21, Bhaskar 2009), by choosing to bat first captains can reduce criticism of their decision making.

To further examine decision making by captains in T20Is, we consider decisions made by individual captains. At the time of writing, in June 2013, there had been 72 captains of the seventeen T20I teams. Of these 72 captains, only 23 led their teams in more than ten T20Is. In Table 4, we report the proportion of decisions to bat by captains based on the experience of captains. Interestingly, captains who led in more than ten games batted first more often than those who led in fewer than ten matches. However, these statistics, being cumulative, do not show how individual captains' decision making evolved over time. As mentioned, Narayanan (1985) demonstrated that managers with more experience were less likely to be influenced by market opinion and put short term benefits first. It is interesting to consider if captains' batting order choices evolve similarly.

The descriptive statistics make clear that any influence of the toss on win probabilities is moderated by other factors. For this reason, we now move on to a multivariate regression analysis.

Econometric estimates

Conditional logit estimation

We report the conditional logit estimates in Table 5. Using this method, we estimate two observations per match but incorporate match fixed effects.

We include *Toss, TeamStrengths* and *Home* as explanatory variables in the first regression. *Toss* and *Home* both have positive coefficients as expected, but are statistically insignificant. However, *TeamStrengths* is very significant, at the 1% level of confidence. The coefficient on *Toss* was positive and statistically significant prior to the inclusion of *TeamStrengths*. However, once *TeamStrengths* was included, the coefficient was no longer significant, suggesting the effect of the toss recedes once the relative strength of the team to its opponent is controlled for. To interpret the coefficient on *TeamStrengths*, we convert the coefficient into its marginal effect, showing the partial derivative of the probability of winning with respect to *TeamStrengths*. The marginal effect is 0.003, implying that a 1% increase in the pre-match ratings point difference is likely to raise the probability of winning a T20I by 0.3%.

In the second regression, we separate the batting order choice taken upon winning the toss by considering *TossDecisionBat* and *TossDecisionBowl* separately. The marginal effect of winning the toss and batting on winning the match is greater than

that of winning the toss and bowling. However, the two interaction terms are statistically insignificant, as is *Home*.

In the third regression, we examine the effect of winning the toss over time by interacting *Toss* with *Time*. The interaction term is statistically insignificant, suggesting the effect of the toss is not significant over time. In the fourth regression, we consider the effect of playing at home and winning the toss at home to assess the importance of home advantage in T20Is. The sum of the coefficients on *Toss* and *Toss*Home* is around 0.123, but both variables are insignificant.

In the fifth regression, we consider the effect of captaincy experience and also interact captaincy experience with winning the toss to see how this evolves with time. *Experience* is not significant, though *Toss*Experience* is only slightly insignificant at the 10% level. The sum of the coefficients on *Toss* and *Toss*Experience* is positive. In the final regression, we consider the effect of winning the toss in day/night games. The interaction term has a negative coefficient, implying that winning the toss in a day/night game reduces a team's chances of winning, though it is insignificant. *Toss* is slightly significant, though the sum of the coefficients on *Toss* and the *Toss*DayNight* interaction term is negative.[6] In contrast to ODI matches, which are played partially during the day time and partially during the evening, day/night T20I matches are typically played entirely during the night. Given this, conditions would be expected to change less markedly in day/night T20I matches compared to day/night ODI matches.

Clearly, the conditional logit estimates suggest relative team strength is the only statistically significant explanation of T20I match outcome, robust to a number of

[6] *TeamStrengths* was interacted with *Time* but was very insignificant. This is not reported.

specifications. Notably, the effect of the toss over time is statistically insignificant, as is the effect of winning the toss at home.

OLS estimation

As a comparison, we report the OLS estimates in Table 6, using margin in runs as the dependent variable. Winning the toss has no significant impact on match outcome, similar to the conditional logit estimates. All other things being equal, playing at home raises the margin of victory by more than 7 runs, on average. The *Toss*Time* interaction term has an insignificant coefficient. The coefficients on *TossDecisionBat* and *TossDecisionBowl* are again statistically insignificant, suggesting the choice of batting order is not significant in raising the margin of victory. *Experience* and *Toss*Experience* are both significant, with a positive sum of coefficients between *Toss* and *Toss*Experience*, suggesting that with increasing experience, captains are likely to win by higher margins upon winning the toss, on average. This provides support for experience lowering the effect of social pressure on captains, though increasing captaincy experience is in itself reflective of some intrinsic captaincy skill. Nonetheless, this finding is similar to Narayanan's (1985) suggestion that more experienced managers face fewer incentives to prioritize short term gains at the expense of shareholders, as in both cases social pressure lessens with experience.

Evidently, similar to the conditional logit estimates, the OLS results show a very significant effect of relative team strengths on the margins of victories in T20Is, with the larger the difference, the more likely the higher rated team is to win by a big margin. Strikingly, playing at home is statistically significant in influencing the margin of victory, in contrast to the conditional logit estimates. However, the effect of the toss on

match outcomes is insignificant. As shown in the descriptive statistics, there is evidence that captains are leaning towards batting first. Given that the multivariate regression results suggest that the toss has no significant effect on match outcome, the preference for batting first is surprising and is consistent with irrational decision making by T20I captains.

So how do our results compare with previous literature? Earlier studies have looked at the effect of the toss on Test and ODI matches rather than T20Is, so the comparison with our results has to be considered firstly in light of the differences in formats and secondly the time needed for captains and players to adapt to a new version of the game, though our results partially control for time and experience. The high significance of relative team strengths is similar to Allsopp and Clarke's (2004) finding that higher rated teams were more successful in Test and ODI matches. The lack of significance for the toss is similar to both de Silva and Swartz's (1997) result for ODI cricket and Allsopp and Clarke's (2004) result for Test and ODI cricket. However, the insignificance of playing at home is in contrast to the results obtained by Morley and Thomas (2005) and Allsopp and Clarke (2004), who considered home field advantage in English domestic and international one day cricket respectively. The insignificance of batting order choice contrasts with Dawson et al. (2009), who found a very significant and positive effect of batting first in day/night ODI matches. The shorter length of T20I matches means that conditions do not change as markedly between innings as they do in day/night ODIs, though the toss was nonetheless significant in day/night T20Is.

Discussion and Conclusion

We examine choice under uncertainty by presenting and testing a model to illustrate how cricket captains may make decisions subject to a social pressure. Our model builds on the literature on uncertainty in which the decision maker is evaluated by a lesser informed judge. As the decision maker responds to what the less informed judge expects, sub-optimality results. One example is found in Brandenburger and Polak (1996), who suggest corporate managers "…often complain that they feel pressured to make the decisions the stock market thinks is correct rather than the decisions they believe to be in the best interests of their firms" (p.524). Similarly, our model proposes that external pressure can lead to sub-optimal decisions that do not maximize the team's probability of winning.

Using the entire population of T20Is till May 2013, this paper tests some implications of this model. Our findings suggest that, controlling for relative team strengths and home advantage, winning the toss does not have a meaningful impact on the outcome of the match, irrespective of the choice to bat or to bowl first. Furthermore, the impact of the toss on winning does not become significant over time. Despite this, we find evidence that captains are choosing to bat first significantly more often than to bowl first in T20I cricket. This irrational behaviour of captains may be because captains are making batting order choices that shield them from media criticism.

Previous literature has noted the theoretical effect of external pressure on corporate managers, who may face incentives to prove themselves as good managers or to avoid short term criticism of their decision making. We show how cricket captains making one important decision repeatedly (giving them opportunities to learn over time)

still tend towards making choices that are likely to reduce short term criticism by shifting towards batting first more often, despite a lack of evidence to suggest that this choice is more successful.

Our research adds to the literature by identifying that socially influenced decision making can occur even in a highly competitive environment. Indeed, the captain's batting order choice is intensely scrutinized by third parties because international cricket is highly competitive. This situation is not unlike that found in Cummins and Nyman (2005), whereby competition itself contributes to inefficient behaviour. If international cricket was less competitive, there would be less third party commentary for captains to be concerned about.

The findings here may be of interest to the ICC in terms of the debate over the fairness of day night matches in major tournaments, as discussed by Dawson et al. (2009). Although Test matches and ODIs played in the day do not apparently provide the team winning the toss with a major advantage, day/night ODIs do give the team batting first after winning the toss an advantage, raising issues about their presence in major ODI tournaments. Contrary to the perception that the shorter duration of T20I matches makes them more chance than skill driven as compared to ODI cricket and especially Test cricket, our results suggest that T20I cricket matches, like Test and ODI matches, are generally won by the stronger team and the toss does not play a major role.

The T20I format, however, is still in a relatively early period of development. As more matches are played, future research might usefully explore further the evolution of learning and adjustment to decision-making trends. Comparisons with domestic Twenty20 competitions, and in particular the Indian Premier League, are also likely to be instructive.

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Table 1: Variables and definitions

Variable	Definition
Win	1 if the team won the match, 0 if it lost
Margin	Margin of the result for the team, in runs
Toss	1 if the team won the toss, 0 if it lost
Bat	1 if team batted first; 0 otherwise
Bowl	1 if the team bowled first, 0 otherwise
TossDecisionBat	1 if the team won the toss and chose to bat first, 0 if not
TossDecisionBowl	1 if the team won the toss and chose to bowl first, 0 if not
Home	1 if the team played at home, 0 if not
*Toss*Home*	1 if the team played at home and won the toss, 0 if not
TeamStrengths	Difference in pre match T20I rating between team and opposition
DayNight	1 if the match was played under lights, 0 if not
Time	The number of T20Is the team had played
Experience	The number of T20Is the captain had led prior to the match

Table 2: Summary statistics

Variable	Mean
Margin	**31.8 (2.00)**
TeamStrengths	**26.0 (1.71)**
Bat | *Toss* = 1	**57.1 (2.90)**
Bowl | *Toss* = 1	**42.9 (2.90)**
Win % if:	
Toss = 1	**51.5 (2.65)**
Bat = 1	**49.8 (2.88)**
TossDecisionBat = 1	**51.7 (3.81)**
TossDecisionBowl = 1	**51.2 (4.40)**
Home = 1	**52.5 (3.92)**
*Toss*Home* = 1	**54.9 (5.50)**
*Toss*DayNight* = 1	**44.1 (4.26)**
*Bat*DayNight* = 1	**56.6 (4.25)**
N	**301**

Notes:
(i) Standard errors in brackets.
(ii) A single sample t-test was run to test whether the proportion of captains batting first (Bat | Toss=1) was significantly different from 50%. Batting first was found to be significantly different from 50% at the 5% level of confidence (p-value 0.013) with a standard error of the test of 0.029.

Table 3: Decision making and win percentages over time

	Split 1	N	Split 2	N	Split 3	N
Choosing to bat after winning the toss	**49.00 (5.00)**	**49/100**	**62.00 (4.85)**	**62/100**	**60.39 (4.87)**	**61/101**
Teams winning after choosing to bat	**53.06 (7.13)**	**26/49**	**58.06 (6.27)**	**36/62**	**44.26 (7.05)**	**27/61**
Teams winning after batting first	**43.00 (4.95)**	**43/100**	**55.00 (4.97)**	**55/100**	**51.49 (4.97)**	**52/101**

Notes:
(i) *Split 1* refers to the first 100 T20Is; *Split 2* to the next 100 T20Is and *Split 3* to the most recent 101 T20Is.
(ii) Standard errors in brackets.

Table 4: Decision making by individual captains

Number of matches	Tosses won	Bat first percentage
More than 10	**219**	**56.16 (3.35)**
10 or less	**82**	**54.88 (5.50)**

Note:
Standard errors in brackets.

Table 5: Conditional logit (fixed effects) estimates

Dependent Variable	*Win*					
Variable	1	2	3	4	5	6
Toss	0.052 (0.12)		0.355 (0.22)	0.020 (0.20)	0.530 (0.22)**	0.313 (0.17)*
TeamStrengths	0.011 (0.002)***	0.011 (0.002)***	0.011 (0.002)***	0.011 (0.002)***	0.011 (0.002)***	0.011 (0.002)***
Home	0.115 (0.16)	0.112 (0.16)		0.062 (0.31)		
*Toss*DayNight*						-0.544** (0.25)
*Toss*Home*				0.103 (0.51)		
TossDecisionBat		0.129 (0.18)				
TossDecisionBowl		0.079 (0.20)				
*Toss*Time*			-0.013 (0.008)			
Experience					0.027 (0.015)	
*Toss*Experience*					-0.056 (0.022)	
Pseudo R squared	0.09	0.09	0.10	0.09	0.10	0.10
Log likelihood	-189.367	-189.114	-188.314	-189.347	-186.012	-187.210
N=602						

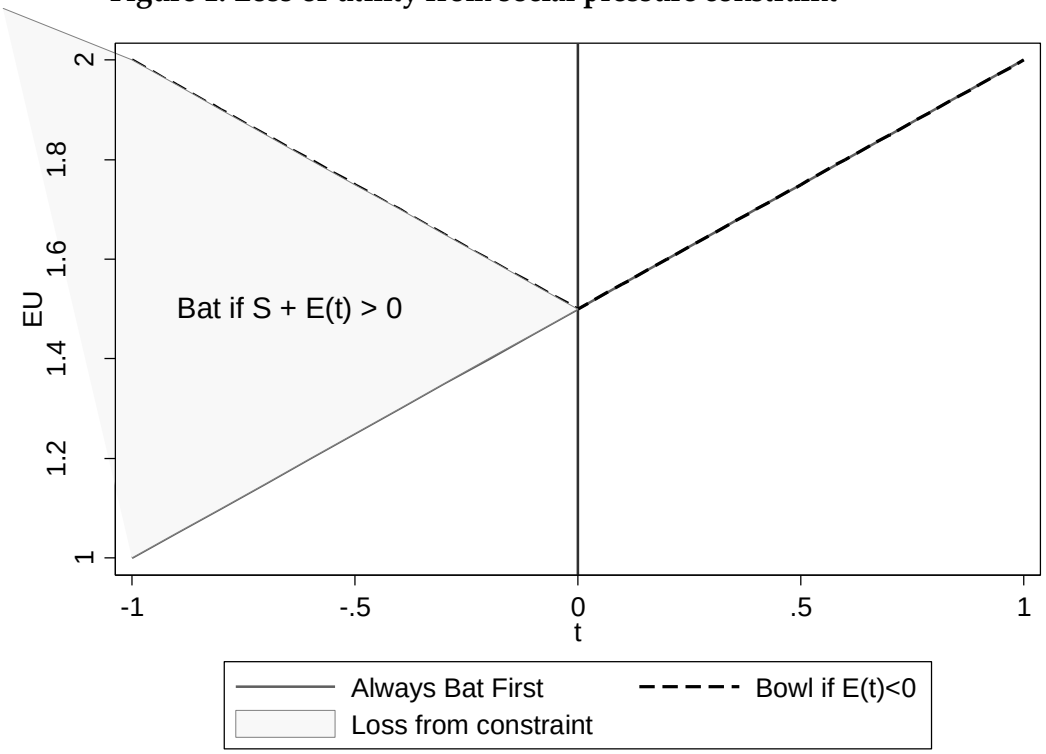
Notes:
(i) Robust standard errors used.
(ii) *Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

Table 6: OLS estimates

Dependent Variable: *Margin*						
Variable	1	2	3	4	5	6
Toss	3.705 (3.33)		7.449 (5.00)	2.674 (4.00)	13.761 (4.79)***	7.464 (3.93)*
TeamStrengths	0.523 (0.05)***	0.522 (0.05)***	0.520 (0.05)***	0.524 (0.05)***	0.509 (0.05)***	0.513 (0.05)***
Home	7.184 (3.62)**	7.171 (3.63)**		5.483 (5.41)		
*Toss*DayNight*						-7.655 (4.70)
*Toss*Home*				3.302 (7.24)		
TossDecisionBat		5.874 (3.85)				
TossDecisionBowl		2.741 (4.24)				
*Toss*Time*			-0.151 (0.16)			
Experience					0.825 (0.28)***	
*Toss*Experience*					-1.18 (0.40)***	
R squared	0.202	0.203	0.198	0.201	0.209	0.200
N=602						

Notes:
(i) Robust standard errors used, clustered by match.
(ii) * Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level.

Figure 1: Loss of utility from social pressure constraint



Note:
Figure 1 shows the utility loss arising from the social pressure constraint, with values of *EU* = 2 for a win and *EU*= 1 for a loss. *t* represents the impact of the toss on the probability of winning. When *t*=0, the toss has no impact on the probability of winning, *p*=0.5 and *EU*=1.5. When *t* is negative, bowling first is preferable and so if the captain is forced to bat first due to social pressure, the loss in utility is illustrated by the shaded area. As *t* approaches – 1, the loss in EU increases, but the level of social pressure required overturn the decision to bowl also increases.