It's Just Not Cricket: The Uncontested Toss and the Gentleman's Game

Sarah Jewell J. James Reade Carl Singleton*

University of Reading

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Abstract

Cricket offers a wealth of opportunity and potential insights for economists and other researchers. Focusing on the oldest domestic cricket competition, the English County Championship, we discuss issues of demand, home advantage, competitive balance and the importance of winning the pre-match coin toss to determine the playing order. Despite cricket being generally regarded as a sport for traditionalists, the County Championship is remarkable in how often the rule makers have altered its format. We study one recent major change, the replacement of the mandatory pre-match coin toss with an uncontested one, whereby the away team could decide whether to bowl first or face a toss to bat instead. In theory, this ought to have reduced home advantage, made the toss matter more when it was contested, and incentivised teams to prepare better pitches leading to longer matches. We found no evidence of the first or the last of these effects, but matches did become more predictable once the toss was decided. This suggests that the rule makers were right to abandon this experimental change after only four seasons.

Keywords: Home advantage, First-mover advantage, Decision making under uncertainty, Coin toss, County Championship, First-class cricket

JEL codes: D81, L83, Z22

* Corresponding author: c.a.singleton@reading.ac.uk, Department of Economics, University of Reading, Whiteknights Campus, Reading, RG6 6UA, UK.

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1. Introduction

Cricket is a massive sport. It dominates the attention of sports fans on the Indian Subcontinent. It is a national obsession in India, Pakistan, Bangladesh, Sri Lanka, Afghanistan and Nepal, as well as among these ethnic communities found in large numbers around the world, such as in the Arabian Peninsula. It is also popular in other regions of the former British Empire, such as Southern Africa, Australia, New Zealand and the Caribbean. Cricket remains the dominant sport of the English summer, despite the encroaching influence of football. To put the scale of the demand and interest in cricket into perspective, in 2019 a match between India and Pakistan in the World Cup drew an estimated live broadcast audience of one billion.[1] In comparison, the biggest live event in the US annual sporting calendar, the National Football League Super Bowl, attracts around 100 million domestic viewers and less than that number again in the rest of the world.[2] Even the FIFA Football World Cup final in 2018 had an estimated average viewership of just over 500 million.[3] In this context, there is a surprising lack of economics literature concerning cricket, at least when compared with the team sports most focused on by economists, such as baseball, basketball, and association or American football (Gregory-Smith et al., 2019).[4] Like these other sports, cricket is a setting that allows effective economic analysis, with implications not just for this sport and others, but for our wider understanding of economic behaviour.

In this chapter, we focus on the oldest cricket league, the English County Championship (henceforth the CC). This competition can be traced back to the 1700s in some form, but it officially began in 1890. From the first match to the most recent, we have complete data not only on final outcomes but also the specifics of what happened within those matches. The CC is the premier domestic first-class cricket competition in England, with matches played over several days. Despite the increasing popularity of short-form cricket, the CC still makes up most of the professional cricket played in England each season. One reason why the CC is interesting for economists is that its rule makers have continuously tinkered with its design over the past 130 years. We will describe some of

[1] Source: Dave Richardson, International Cricket Council (ICC) Chief Executive https://www.mirror.co.uk/sport/cricket/one-billion-watch-crickets-biggest-16528033. This estimate may be on the high side, however, as the ICC reports 270 million watched India against Pakistan in the 2019 World Cup. However, similar estimates were also made that a billion people watched the 2015 World Cup match between the same two sides: https://www.telegraph.co.uk/sport/cricket/cricket-world-cup/11413995/India-beat-Pakistan-by-76-runs-as-estimated-one-billion-viewers-tune-in-to-World-Cup-clash.html.

[2] Source: Nielsen, via CNN: https://edition.cnn.com/2020/02/03/media/super-bowl-2020-ratings/index.html

[3] Source: FIFA: https://www.fifa.com/worldcup/news/more-than-half-the-world-watched-record-breaking-2018-world-cup

[4] See Gregory-Smith et al. (2019) for a more thorough summary of this cricket economics literature than the brief and more focused discussion later in Section 2 of this chapter.

the major changes alongside a timeline of how competitive the league has been over time. Generally, the tinkering appears to have worked in one respect, as in the past two decades the CC was as competitive as it has ever been. We focus on the period since the competition was split into two hierarchical divisions in 2000, documenting the extent of home advantage, i.e., teams playing at their home ground have a higher chance of winning a match.

The main attention of this chapter is on a novel rule change in the CC brought in for the 2016-2019 seasons. Before this period, each cricket match started with a mandatory coin toss, with the captain calling it correctly making the decision on whether his team should bat or field first. Given the variable conditions of a CC match over the maximum four days that it can last, the outcome of the toss can be important. It potentially favours the home side, who can prepare the playing conditions, i.e., the pitch, with the expectation that if they were to win the toss, then it would suit their relative strengths and preferences. In 2016, the mandatory coin toss was replaced with what was described as an uncontested toss.[5] Under this system, the away team had the option of whether to bowl first or instead face a toss should they prefer to bat first. The principal aim of this rule change was to counteract the incentive of the home team to prepare a 'poor' pitch, which would favour its bowling strengths and thus lead to a match that could finish well within the scheduled four days. In other words, the hope was that the uncontested toss would lead to a better balance of competition between bat and ball within a match, as well as increasing the uncertainty of the match outcome through reduced home advantage. We econometrically analyse the impact of this rule change over several relevant match outcomes. We find some statistically weak evidence that the change increased the extent to which the toss outcome could predict the final match result. This unintended negative consequence is not offset by a reduction in home advantage. There is also no convincing evidence that batting conditions persistently improved in the CC after 2016, i.e., through longer first innings, suggesting that home teams did not on average respond to the change by preparing substantially 'better' pitches. The rule makers have decided to revert to the mandatory coin toss from the 2020 season, which on balance appears to be the correct decision, not least because cricket fans, especially those who follow the CC, are well-known as traditionalists.[6]

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[5] Formally, the English Cricket Board referred to this rule change as "no mandatory toss"; https://www.espncricinfo.com/story/_/id/20430915/no-mandatory-toss-county-championship. A similar rule was introduced to domestic cricket in Pakistan for the 2019/20 season and called the "no toss" rule; https://www.pcb.com.pk/press-release-detail/pcb-announces-playing-conditions-and-code-of-conduct-for-2019-20-season.html. It is colloquially referred to as an "uncontested" toss as this is what is recorded on match scorecards.

[6] Whenever a new rule change is suggested or the game of cricket revolves, there is typically significant grumbling among what are referred to as 'traditionalists' of the game, be they fans (e.g. https://www.spectator.co.uk/article/cricket-

The remainder of the chapter proceeds as follows: Section 2 introduces the economics of cricket, including past studies, a brief description of the game and the CC, with its major rule changes over the past 130 years, as well as a description of competitive balance and home advantage in the CC; Section 3 analyses the impact of the uncontested toss on match outcomes; and Section 4 concludes.

2. The Economics of Cricket

2.1 Why should cricket interest economists?

Cricket is of potential interest to economists for several reasons. The game has a long history. It has gone through several rule changes, as well as the development of different forms of the game, and across its history has experienced numerous innovations, such as the use of technology to aid decision making. The game also involves a series of decisions by teams, players and officials, often made under pressure, which can be easily observed, aided by the discrete nature of the game, i.e., a match comprises a series of innings, played over sessions, which in turn consist of a set of overs and balls. It is easy to collect definitive individual-level performance data, in the form of batting, bowling and fielding statistics. There is a greater scope to explore home advantage, compared with other sports, since match conditions systematically vary across venues, and not only are teams more familiar with some conditions but they can also affect them. Cricket is subject to some clear exogenous factors, such as a coin toss and weather. The longer form of the game especially offers scope to explore a wide set of decisions and outcomes.

2.2 What are cricket and the County Championship?

2.2.1 First-class cricket – a brief description

Cricket is a game involving bat and ball between two teams of 11 players. It takes place on a field, which has somewhere toward the centre a pitch (22 yards in length) with a wicket at both ends. The game is overseen by two on-field umpires (referees), with some matches (typically at international level) having a third umpire (television match official) and a match referee. In each innings one team bats and one team bowls (fields). In first-class cricket (matches taking place over at least 3 days), each

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s-traditionalists-should-embrace-the-day-night-test) or past and present players (https://www.telegraph.co.uk/cricket/2017/10/10/players-union-warns-cricketers-traditionalists-unlikely-support/).

team has up to two innings, which alternate. Typically, there is a minimum number of overs expected to be bowled in a day, with a set time limit for play. An over consists of 6 balls bowled to the batting team. In a four-day first-class match that went to the very end of the fourth day, with no interruptions, 350-380 overs could be expected. In other words, such a match can consist of over 2,000 individual events (balls bowled). A team's aim over the course of a match is to score more batting runs than their opposition before either teams' resources have run out, which are the time remaining in the game and the number of wickets to have fallen (outs). An innings ends when ten wickets have fallen, and the roles are then reversed in the next innings. An innings may also end if the batting team decides to declare early, usually to try and force a result before the match time runs out, or if a team runs out of batsmen due to injury.

In first-class cricket, there are effectively five possible match outcomes for a team: win, loss, draw, tie or no result. A team wins (loses) if they score more (less) runs than the other team over their two completed innings. A draw takes place when a game does not reach the conclusion of the fourth innings, i.e., time runs out before ten wickets have fallen. A tied match occurs when the final wicket falls in the fourth innings and the cumulative numbers of runs scored by both teams are the same. This is very rare. A no result outcome is normally declared when weather or other circumstances prevent the first innings from beginning. Weather is often a factor in determining a drawn match, due to time lost because of rain or bad light.

If a captain wins the coin toss, then his or her decision to bat or bowl first will be determined by factors including the interaction of the pitch (both the initial condition and how it is expected to change), expected weather conditions, and each team's relative strengths, especially among the bowlers. The pitch is prepared by the home team. Whilst they have no control over the weather or the natural conditions, they have an incentive to produce a pitch that plays to their strengths or suits their purposes. For example, a home team that is ahead in an international series of matches may produce a pitch that is likely to lead to a draw. A team with strong spin bowlers can produce a pitch that is expected to 'take turn' as the match progresses, such that they have a strong advantage in the final innings. Teams may have a financial incentive when preparing a pitch, to attempt to ensure the match lasts the full number of days to maximise revenue, rather than favouring the bowlers too much and producing an early outcome. However, home teams still face an element of risk when producing pitches, as the coin toss still determines who decides on batting first or second.

In games played over four innings, the general wisdom, at least at the test match level, is that teams should opt to bat first, owing to the fact it generally becomes more difficult to bat as the pitch

gets older (though not always, e.g., in New Zealand). However, teams may opt to field first if they believe their bowlers can exploit early conditions that favour bowling. It is often argued that a pitch allowing a good battle between bat and ball creates a better spectacle, leading to greater interest and demand for the game.[7] The mark of a 'good' pitch is one which results in a win for one of the teams well into the final day of scheduled play, so long as the opposing teams are not completely mismatched in their strengths or play is not significantly interrupted by the weather.

2.2.2 The County Championship

The County Championship is a first-class cricket competition in England and Wales, officially running since 1890, though it has been running unofficially since the 1700s. There have been many changes to the CC across its history: the number of teams competing, the structure of the league (a single division versus two), the length of matches in terms of days, the number of matches played by teams each season, and how points are awarded. There have also been changes in terms of penalties and other inventions, such as permitting games to be decided on a single innings and allowing day/night matches.

In 1890, there were only eight county teams (Gloucestershire, Kent, Lancashire, Middlesex, Nottinghamshire, Surrey, Sussex, Yorkshire). Currently, there are eighteen teams. The CC expanded to nine teams in 1891 (Somerset), to fourteen in 1895 (Derbyshire, Essex, Hampshire, Leicestershire, and Warwickshire), to fifteen in 1899 (Worcestershire), to sixteen in 1905 (Northamptonshire), to seventeen in 1925 (Glamorgan) and to eighteen in 1992 (Durham). The competition was a single league until 2000, after which it was divided into two hierarchical leagues of nine teams each, with promotion and relegation at the end of each season (year). The rationale for introducing two divisions was twofold (Forrest and Dorsey, 2008): to reduce the number of "meaningless" matches, with the aim of increasing stadium attendances and revenues; and to improve the quality of domestic (home-grown) players, by concentrating talent in a top division, thus giving teams greater incentives to invest in talent to achieve promotion or avoid relegation, which should then in turn improve the strength of the England test match team. From 2000 to 2005, three teams were promoted to and relegated from Division One each season, which decreased to two teams from 2006 to 2015 and 2017 to 2018. In 2016, two teams were relegated but only one promoted, as Division One decreased to eight teams. In 2019, only one team was relegated from Division One and three teams were promoted to Division One, increasing the number of teams in Division One to ten. The latter increase in the size of Division

[7] See ESPN Cricinfo 2017 for a discussion of the balance between bat and ball in ODIs; https://www.espncricinfo.com/story/_/id/27093872/why-bat-ball-balance-now-probably-best-in-odi-history.

One was to reduce incentives toward short-termism for management and coaches in the top division, who would fear the sack if they were relegated.[8]

Since 1993, matches have exclusively taken place over four days, but this has varied in the past. Prior to 1988, all matches were three days, with an experiment of two days in 1919, and between 1988 and 1992 teams predominately played three-day games with some four-day games mixed in. The minimum number of overs expected to be bowled in a day, weather permitting, has varied over time. It is currently 96, with the possibility of adding a further eight overs per day if time was lost to bad weather on previous days. On the final day of a match, captains can agree to finish when sixteen overs are remaining and call it a draw if they wish, which means a minimum of eighty overs bowled.

Throughout the history of the CC, there have been continual tweaks to the number of games played, points systems, and, therefore, how final league positions and champions were determined. From 1963, all teams consistently played the same number of games in a season, though that number has varied over time, tending to decrease as the limited overs form of the game became more financially lucrative. Before 1963, there were seasons where teams played a varying amount of games and, to determine final league positions, the points earned from each match were adjusted by the number of games or possible points. From 1993 to 1999, teams played seventeen matches, i.e., each other team once and some teams had one fewer home match than the others. From 2000, when the CC was split into two divisions, teams played sixteen matches, i.e., each other team in the division home and away. This was reduced to fourteen matches in 2017, when the number of teams in each division also changed.

The first CC in 1890 had a system of one point for a win, minus one for a loss and zero for a draw. Since the matches have been played over four days, there have been several changes to the weighting of points, particularly for wins and draws. Points for a draw (three points) were first introduced in 1996. Win points were reduced from sixteen to twelve in 1999, but then increased to fourteen in 2003 and back to sixteen in 2010. Points for a draw were increased to four in 1999, then reduced back to three in 2010 and increased to five in 2014. Bonus points were first used in the CC in 1957, based on comparative runs scored in the first innings and run rates, until 1962, and then re-introduced in 1968 for both batting and bowling performances in the first innings over a set number of overs. The idea of

[8] See English Cricket Board: https://www.ecb.co.uk/news/894379/counties-agree-to-men-s-domestic-structure-changes-from-2020

bonus points is to encourage and reward teams for more attractive play, to increase fan interest.[9] Bonus points have been used consistently since 1968, although the points system has varied, i.e., the maximum number of batting or bowling points and the time in a match when they are awarded. For example, the number of overs during which bonus points could be accumulated was reduced from 130 to 120 in 2009 and to 110 in 2010, to incentivise faster scoring, more attacking cricket and preparation of good pitches. The current system has been used since 2010:

Batting Points (first innings runs scored):
200- 249: 1
250-299: 2
300-349: 3
350-399: 4
400+: 5

Bowling Points (first innings wickets taken):
3 to 5: 1
6 to 8: 2
9 to 10: 3

Currently, if a lot of wickets fall in a day's play, then the pitch will be inspected, and umpires can report a 'poor' pitch. The penalty for a poor pitch was originally twenty-five points, one more than the maximum number for a win with full bonus points; Essex were the first team to receive such a penalty in 1989. The exact penalty has varied over time but has generally been reduced. The most recent example was Somerset in 2019, who were deducted twenty-four points, although twelve of these were suspended for two years and the other twelve are to be applied in the 2020 season.

2.3 Does competitive balance matter in cricket?

The uncertainty of outcome hypothesis was introduced by Rottenberg (1956) and states that the interest of sports fans, and thus the demand for sport, will be greater when contests are more competitive. Uncertainty of outcome can be separated into three levels (Cairns et al, 1986): match, season (e.g., one completed league championship), and long-run dominance, which Szymanski (2003) termed championship uncertainty. Season-level and long-run dominance can be important for demand; if

[9] Whilst there are no studies that have looked at the impact of bonus points in cricket, Lenten and Winchester (2015) focused on their introduction in rugby union, finding that teams scored more tries, but only toward the end of a match when a win was already likely.

many teams are in contention to win a championship and in the running for promotion or relegation, or if a variety of teams win a championship and get promoted/relegated over the longer term, then this may maintain interest and demand. In general, there is mixed evidence on whether there is a positive relationship between the uncertainty of outcome and the demand for sport (Borland and Macdonald, 2003; Szymanski, 2003). Studies often do not distinguish between match-level, season-level or long-run dominance (Szymanski, 2003).

In studies relating to cricket, several have focused on the link between the uncertainty of outcome and spectator demand. Studies have examined attendances at test match cricket (e.g., Bhattacharya and Smyth, 2003; Blackham and Chapman, 2004; Hynds and Smith, 1994; Sacheti et al., 2014), one day internationals (ODIs) (e.g., Sacheti et al., 2016a) and domestic matches (e.g., Morley and Thomas, 2007; Paton and Cooke, 2005; Schofield, 1983). These studies have tended to find that match-specific factors are more important than economic ones. Some examined the impact on attendance of match uncertainty (e.g., whether the result was a foregone conclusion, subjectively determined, going into the final day), series uncertainty for international fixtures (e.g., whether the result of a series of matches was known before the final match), and match and season uncertainty for domestic competitions. They found stronger evidence that series uncertainty had more significant negative impacts (Bhattacharya and Smyth, 2003; Blackham and Chapman, 2004; Hynds and Smith, 1994). In contrast, Sacheti et al. (2014) found the reverse, with little evidence for any significant impact of series uncertainty, which may relate to tickets for test matches typically being sold in advance, and some evidence for impacts of match uncertainty, i.e., a certain result on the final scheduled day had a negative impact on demand; tickets for day five are often only sold on the day. The differences between these sets of results may relate to Sacheti et al. (2014) making use of panel data methods. At the domestic level, there is the possibility of a wider set of match and season-level uncertainty measures, and the evidence suggests that the latter are important for demand. Morley and Thomas (2007) captured season-level uncertainty using a measure of whether a team was still in contention for the championship, whilst Paton and Cooke (2005) found that matches which were not important in terms of promotion/relegation had reduced attendances. Paton and Cooke (2005) also found that match uncertainty had no significant demand effects in the 2000-2002 English seasons.

A couple of studies have focused on long-term patterns. Sacheti et al. (2014) examined the impact of different measures of uncertainty of outcome on attendance in test match cricket in England, NZ and Australia between 1980 and 2011, using differences in official team rankings. Their findings suggested that long-term uncertainty had a limited influence on test match cricket attendances, but the

strength of the home and away team in each match did. However, there is some evidence that long-term uncertainty is important for ODI attendance in England but not in Australia (Sacheti et al, 2016a). To the best of our knowledge, no studies have examined the effects of long-term measures of uncertainty of outcome on domestic cricket.

2.3.1 Competitive balance in the County Championship

Irrespective of the apparently dubious empirical evidence regarding competitive balance, the history of rule changes in the CC is indicative of governing bodies who were convinced that competitive balance was essential to generate fan interest. Over almost the whole post-war era, attendances at CC matches have been falling, prompting different tweaks to the longer-form game, as well as creating entirely new shorter formats.

Using the final points totals of teams at the end of each season, constructed using the entire history of the CC from CricketArchive.com (see Section 3.1 for more details on this data source), we consider two measures of competitive balance over time. The first is the commonly used Gini coefficient:

$$GiniCC_{ds} = \frac{2\sum_{i=1}^{n_{ds}} ip_{ids}}{n_{ds}\sum_{i=1}^{n_{ds}} p_{ids}} - \frac{n_{ds}+1}{n_{ds}}, \quad with \quad p_{ids} \leq p_{i+1ds}\ , \tag{1}$$

where p_{ids} is the number of points achieved by team i in division d and season s, and n_{ds} is the number of teams in the division that season. To construct this measure for each season and, after 1999, each division, we use whatever points system was being applied at the time. That is, we track over time the amount of end-of-season competitive inequality, with a larger Gini coefficient implying that the CC was less competitive. Figure 1 plots these measures for each season since 1890. It shows that the early years of the CC were relatively unequal and that the level of inequality varied dramatically from season to season. This is not a pattern unique to cricket; association football, whose formal leagues developed in England at around the same time, also displayed high inequality in its early years (Reade, 2020).

After the early years, the distinguishing features of competitive inequality in the CC are a permanent shift down to a new and quite consistent level, after Glamorgan was admitted in 1921. A further level shift down occurs in the mid-1960s, shortly before the introduction of the one-day game. This also coincided with an equal number of games being played by all teams in a season, thus plausibly removing any advantages or disadvantages to some that an uneven fixture list had previously created. The introduction of bonus points in 1968 also appears to have happened alongside the CC

becoming more competitive, with teams thereafter earning rewards even if they lost a match. What is distinct about the CC is that a relatively high level of competitive balance has been maintained over such a long period.

Again, making a comparison with English football, competitive balance in that sport deteriorated consistently over the half century after it reached its high point in the 1950s (Reade, 2020). But this has not happened in English cricket. This is despite a myriad of changes being made to the game in the pursuit of improving demand. Whereas the post-war decline in football attendance numbers reversed in the 1980s (Reade, 2020), the same has not happened in cricket, despite relatively high levels of competitive balance.

Figure 2, which focuses in on the more recent years of the data, since the split into two divisions in 2000, suggests a slight upward trend in competitive inequality over the past two decades. There is no suggestion that this was reduced by the introduction of the uncontested toss. If anything, the 2016-2019 seasons were on average marginally less competitive than the decade which came before.

A second measure of competitive balance attempts to evaluate the extent to which final championship outcomes change between seasons, i.e., competitive mobility, and can be written as:

$$C_s = \frac{\sum_{i=1}^{n_s} |r_{is} - r_{is-1}|}{n_s}, \quad (2)$$

where r_{is} is the rank of team i in season s, and n is the number of teams. A higher value would generally be regarded as better, and up to the point where the CC split into two divisions, this measure was as high as it had been in the entire history of the competition, as Figure 3 shows. The highest period of competitive mobility appears to have been between the mid-1960s and 2000, coinciding with the era of bonus points, balanced fixtures and a single division. After the split in 2000, this measure of balance in the CC has fallen mechanically because of limited promotion and relegation. The average season-to-season change in a team's rank has been between 1 and 3.5 positions over the past two decades, whereas it reached as high as 7 in 1998. There is no suggestion that competitive mobility was any higher or lower in the 2016-2019 period with the uncontested toss than in the previous fifteen seasons.

2.4 Is there home advantage in cricket?

There is plenty of evidence in the sports economics literature that suggests officials tend to favour home teams, whether consciously or unconsciously (for reviews see Dohmen and Sauermann, 2016; Reade, 2019). Cricket involves umpires who make quick and often subjective judgements, especially in relation to LBW (Leg Before Wicket) decisions. Several studies have looked at LBWs and found that away team batsmen received more decisions (outs) than those on the home team (Crowe and Middeldorp, 1996; Ringrose, 2006; Sacheti et al., 2015), although it is difficult to separate out umpire bias from the pressure of the home crowd. Sacheti et al. (2015) used the switch to neutral umpires to disentangle these two factors, with the evidence pointing more toward umpires favouring their home team. Cricket has used technology for a relatively long time (since approximately 1992), to aid the decisions of officials, when compared with other sports, such as football. More recently the game has introduced a Decision Review System (DRS), first used in 2008 (Gregory-Smith et al., 2019), where players can refer decisions to a third off-field umpire. A small number of papers have looked at the impact of DRS on decision making and umpiring (e.g., Borooah, 2016; Gregory-Smith et al., 2019; Shivakumar, 2018). Gregory-Smith et al. (2019) showed that DRS can reduce the potential bias of decisions in favour of the home team.

Allsopp and Clarke (2004) identified home advantage in cricket by the number of runs scored in ODIs, with an average of 14 runs more scored by the home team. De Silva and Swartz (1998) also found evidence of home advantage in ODIs. Dawson et al. (2009), in their exploration of day/night ODIs (one team bats in daylight and the other bats under artificial light), found significant home advantage, i.e., if a team was playing at home, then this increased its odds of winning by 69%. In the context of test matches, Allsopp and Clarke (2004) found a home advantage in terms of runs scored in the first innings. They also found that a significant first innings lead was a good predictor of a winning outcome, and this relationship was stronger for the home team than the away team. Morley and Thomas (2005) examined domestic one-day matches and, consistent with the evidence at the international level, found that home teams won 57% of the time and the advantage of winning the toss was greater for home teams. To the best of our knowledge, there are no studies that have examined the home advantage in CC matches. In none of these studies was home advantage explicitly linked to the issue of how pitches were prepared. Allsopp and Clarke (2004) considered that conditions may vary across countries, but the inclusion of parameters for individual countries or similar conditions, such as in the Indian Subcontinent, did not improve their common home advantage model.

2.4.1 Home advantage in the County Championship

Home advantage is a concept common across many forms of sport. At first glance it appears quite slight in the CC. From Figure 4, the percentage of matches that finished as wins for the home team in a season has only been marginally higher than the percentage that finished as away wins. The home advantage is substantially smaller than is commonly found in football matches (see e.g., Singleton et al. 2019; Reade et al., 2019; Peeters and van Ours, 2020).

To some extent, the draw disguises the extent of home advantage, and so we also plot over time in Figure 4 the percentage of matches that ended in a home win excluding drawn games. After the uncontested toss rule was introduced in 2016, there is evidence that this slightly mitigated home advantage, since the percentage of non-drawn matches that were won by the home team was falling year-on-year, reaching precisely 50% in 2019.

2.3 First-mover advantage and the toss of a coin

The decision on which team bats first in a cricket match is generally decided by the toss of a coin. The winning captain decides whether their team will bat or field first. Therefore, which team gets to make this decision is randomly determined. Several studies have found limited evidence for an advantage of winning the toss in one day cricket (Allsopp and Clarke, 2004; Clarke and Allsopp, 2001; Silva and Swartz, 1998) and test match cricket (Allsopp and Clarke, 2004). Bhaskar (2009) found in daytime ODIs that winning the toss and batting first decreased the chances of winning. There is a general wisdom that teams winning the toss, particularly in the longer form, should opt to bat first, and this preference for batting first may lead to teams making sub-optimal decisions (Bhaskar, 2009). Allsopp and Clarke (2004) argued that teams' typical preferences for batting first may explain why there is no advantage from winning the toss in test match cricket. Some studies have specifically examined the toss in day/night matches, where an advantage from the conditions is clearer (Bhaskar, 2009; Dawson, 2009). It is typically harder to bat under lights in the second innings, so it is usually more advantageous to bat first. In this context, Dawson (2009) found that, in a contest between two evenly matched teams, winning the toss and batting first led to a 57% probability of winning. If the home team won the toss and chose to bat first, then its win probability increased to 69%.

In domestic cricket, there is more evidence that the toss matters. Morley and Thomas (2005) found that winning the toss in domestic one day matches could be an advantage, but other factors such as weather, home advantage, team strength and the importance of the match for the league standing of

a team were more important in determining the result. Forrest and Dorsey (2008) showed that the toss was influential in the CC between 1993 and 2006 in matches where there was a winner (i.e., excluding draws and no results): 54.2% of teams winning the toss went on to win, and this was statistically significantly different from 50%. They found no evidence that if the home team won the toss, then they subsequently had a greater chance of winning than if the away team did likewise, i.e., the importance of winning the toss was the same for both the home and the away team. Forrest and Dorsey (2008) discussed several reasons why the toss may be more important in the CC compared to in ODIs or in test matches. They argued that, compared to limited overs cricket, there are fewer restrictions in the CC, which may allow teams to better exploit favourable conditions and effective bowlers, in addition to the fact that the pitch will deteriorate more in a four-day match, given the longer period of play. However, in test matches, they argued that there are typically greater resources available and financial incentives to produce a better pitch, which then has a better chance of holding up, allowing more even conditions and negating the toss advantage.

Figure 5 shows that winning the toss in the CC before 2016 was on average a greater advantage to the home team than the away team. Since 2016, the evidence here also suggests that the toss became a more important factor in determining the outcome of a match.

3. The Impact of the Uncontested Toss

In 2016, the County Championship introduced the uncontested toss. Rather than a completely random coin toss to determine who would decide to bat or bowl first, the away team instead had the first option of putting the home team in to bat or opting for there to be a toss. The mandatory toss was removed over concerns about the state of the pitches being prepared in the CC, especially in Division Two, and the impact that this may have had on the competitiveness of the England test match team, in terms of batting skills, such as patience, 'hanging around at the crease', shot selection, playing spin bowling etc., and the development of quality spin bowling, fast bowling or the ability to reverse swing the ball.[10] The pitches being prepared in the CC suited English weather conditions, incentivising teams to pick and develop players suited to these, who were likely to be unsuited to the conditions faced in test

[10]See ESPNcricinfo, among various other media or official sources: https://www.espncricinfo.com/story/_/id/20430915/no-mandatory-toss-county-championship. See also the ECB in 2017 discussing the reasons why they decided to keep the rule change in place after the first season: https://www.ecb.co.uk/news/123373/toss-changes-retained-after-positive-spin.

match cricket overseas, such as in the Indian Subcontinent or Australia (the England test match team has only won one of the last eight test match series in Australia, and one of the last seven in India, but has a consistently strong record at home). Unlike in other sports, the primacy of the international game, and the role of the domestic setup to support it, is generally accepted in English cricket, not least because the domestic teams receive a large proportion of their revenues through the TV deals for international cricket.

Probably reflecting the changing nature of pitch preparation and player skills in the CC, as well as the increasing scheduling of matches in the peripheries of the domestic season in spring and early autumn, if we look at the decision of the team winning the toss since 2000, we can see a marked increase in opting to field first. In 2015, the year before the uncontested toss was introduced, 55% of teams opted to field first (51% in Division One and 58% in Division Two) compared with 28% in 2000 (33% in Division One and 24% in Division Two). Crudely speaking, this would suggest that pitches may have become more friendly to medium-paced bowlers over time, who can extract the most advantage out of a pitch when it is still green and relatively new.

In the 2016 season, the first year of the uncontested toss, 39% of away teams opted to field first rather than face a toss, suggesting that batting first was generally preferred, in contrast to the previous few seasons. However, by the 2018 and 2019 seasons, over half of the away teams opted to field first. This suggests that despite the rule change initially having the intended effects of favouring batting and longer matches, teams reverted quickly toward preparing pitches that favoured domestic bowling skills and shorter matches.

Despite these patterns and the intentions of the ECB when introducing the uncontested toss, it is not a priori obvious what to expect for the response by teams and match outcomes. Home teams should have had a decreased incentive to prepare pitches which suited their strengths, conditional on a 50:50 chance of winning the toss. This should have reduced the home advantage in match outcomes overall. In matches where the toss was uncontested, we should expect a clear reduced home advantage, as, without having to win a toss, an away team had a chance to exploit conditions that favoured bowling first over batting. But, if a toss was contested, then we should expect that its outcome mattered more. A contested toss would generally imply that match conditions did not suit the away team bowling first, suggesting that the home team had a clear advantage if they could make them do this. In other words, when a toss happened, we should expect its outcome to have had a greater impact on determining the match outcome in the 2016-2019 seasons than before. This should have increased the incentive for a

home team to prepare matches which favoured batting first. Therefore, we should expect to see longer first innings in 2016-19 than before.

The rationale of the uncontested toss was that giving the away team the option of putting the home team in to bat first would encourage counties to produce better pitches, that would last longer and encourage more spin and reverse swing bowling, as well as giving batsmen more practice at batting longer and playing such bowling. However, the uncontested toss was scrapped from 2020 after just four years, due to the English Cricket Board (ECB) believing that tougher scrutiny and penalties for a poor pitch would lead to improvements, and that a change in the seam of the Dukes cricket ball used in CC would improve the balance between bat and ball.[11]

3.1 Data

As above, the data used to analyse the impact of the uncontested toss rule change were extracted from CricketArchive.com, from the scorecards of every CC match between 1890 and 2019. However, we focus on the twenty seasons in 2000-2019, after the CC split into two divisions, with promotion and relegation. The dataset covers 22,237 matches in total since 1890; we ignore 161 matches which had no result, typically because the match was abandoned before any play due to weather or pitch conditions, leaving 2,809 matches to focus on since the beginning of the 2000 season. We focus on five different outcome variables of cricket matches:

1. Whether the home team won, conditional on the match not ending in a draw;
2. Whether the home team avoided defeat, i.e., they won or drew the match;
3. Whether the away team avoided defeat;
4. The combined total number of runs scored in both the home and away teams' first innings, conditional on both teams having completed their first innings.
5. The combined total number of overs bowled in both the home and away teams' first innings, conditional on both teams having completed their first innings.

We study outcomes 1-3 to assess whether the uncontested toss rule change affected the ultimate outcomes of cricket matches, on average. We consider these three binary outcomes to simplify the model estimation and interpretation of the results. We study outcomes 4 & 5 to assess whether the

[11] See Wisden in 2019 summarising the ECB's decision: https://www.wisden.com/stories/county-cricket/uncontested-toss-scrapped-for-2020-county-championship.

nature of matches was affected by the uncontested toss, i.e., whether the length of the first innings increased, implying that pitches were prepared that were more friendly to batting earlier in the match.

Scorecards tell us the outcome of the toss in each match, as well as whether it was contested or not from 2016 onwards. We also construct time-varying measures of the teams' relative strengths. To do this, we use the entire history of CC results. We generate dynamic Elo (1978) ratings, which are updated using a recursive algorithm after every match result. The original application of this rating system was applied to Chess players and leagues, but it has since been used widely in the sports economics literature as a way to capture the relative abilities of teams throughout a season, depending on the relative strengths of the opponents they have played up to that point in time (e.g., Hvattum and Arntzen, 2010).[12] Figure 6 plots these ratings for the eighteen CC teams since 1890. Like the Gini coefficient in Figure 1, the pattern of Elo ratings over time represents reduced competitive inequality, through reduced variance, especially in the past two decades, implying that teams' relative strengths have narrowed.

3.2 Estimation

To assess the impact of the uncontested toss on the outcomes of CC matches, we estimate the following (logistic) regression model using data from all matches since the beginning of the 2000 season:

$$y^*_{ms} = \alpha_m + \lambda_1 HToss_{ms} + \lambda_2 HToss16'19_{ms} + \lambda_3 Uncon_{ms} + \boldsymbol{x'_{ms}}\beta + \varepsilon_{ms}\ , \qquad (3)$$

$$\varepsilon_{ms} \sim \text{Logistic}(0,1) \quad ,$$

$$y_{ms} = \begin{cases} 1; & y^*_{ms} > 0 \\ 0; & otherwise \end{cases} \quad ,$$

where m refers to the distinct matchup between a home and an away team, e.g., Surrey playing at home against Yorkshire, and s is the season. In our preferred specifications, we include fixed effects in the model, α_m, such that we identify the impacts of the rule change from variation over the seasons in outcomes within matchups. The outcome variables, y^*_{ms}/y_{ms}, are the five listed above. $HToss_{ms}$, $HToss16'19$ and $Uncon_{ms}$ are dummy variables, taking a value of one if the home team won the toss, if the home team won the toss in the period 2016-2019, and if the toss was uncontested, respectively. Therefore, λ_1 estimates the effect of the home team winning the toss, λ_2 estimates the added effect of

[12] To apply the rating system to cricket, we score a win as 1, a draw as 0.5 and a loss as 0. We choose an updating factor of 40.

the home team winning the toss in 2016-2019 and λ_3 measures the impact of the away team choosing not to contest the toss in 2016-2019. The combination of these three effects maps to all possible outcomes of the toss in 2000-2019, allowing an assessment of whether this on average matters for each outcome. We also include control variables in $\boldsymbol{x_{ms}}$, with corresponding coefficient vector β. This includes the ELO ratings of both the home and away teams before each match, as described above and in Figure 6, to capture their time-varying relative strengths in the CC, as well as fixed effects for the season and the month in which the matchup took place. ε_{ms} gives the (latent) model error term, representing all other unspecified heterogeneity in match outcomes.

For outcomes 1-3, the match results, we use conditional likelihood estimation when admitting the matchup fixed effects, as it is well-known that the standard logistic regression model estimates of such models are inconsistent (Chamberlain, 1980). For outcomes 4 & 5, we estimate the equivalent model as stated above by ordinary least squares. In the versions of these models without the matchup fixed effects, we estimate standard errors robust to home-team-season clusters, to account for heteroskedasticity across the different teams and how they performed or prepared their pitches within seasons. When including the matchup fixed effects, we estimate standard errors robust to these matchup clusters. We exclude from the analysis all matches which had no result.

3.3 Results

Table 1 presents the results of estimating Equation (3) for the first three outcomes that we focus on, using all CC matches since the beginning of the 2000 season. Columns (I) and (II) consider only those matches that did not end in a draw and whether the home team won. Columns (III) and (IV) consider the effect of the toss outcome on whether the home team avoided losing the match. Similarly, columns (V) and (VI) look at whether the away team avoided defeat. Columns (I), (III) and (V) omit the matchup fixed effects from the regression model, whereas the other columns include them and are our preferred specifications, since they address any bias form not accounting for the fixed unobserved heterogeneity of CC matches. For example, Somerset may have had a particularly strong home advantage when winning the toss, since they generally prepared pitches which favoured their spin bowling strengths, which some of their opponents have been generally weaker against than others. The estimated models in Table 1 all exclude season and month fixed effects, as these were found to be generally statistically insignificant. In other words, conditional on the other factors controlled for, the general extent of home advantage in the CC has remained unchanged since 2000. The ELO rating regressors for both home and away teams are generally significant predictors of match results, and

have the expected signs, though these effects are weaker when the matchup fixed effects are included in the models.

In all six regressions summarised in Table 1, the effect of winning a toss improves a team's likelihood of achieving a positive result. However, these effects are not statistically significant at standard levels, unlike the results for the CC in Forrest and Dorsey (2008), who did not control for relative team strengths nor fixture heterogeneity, and who estimated less conservative standard errors. In the 2016-2019 seasons, an away team choosing not to contest a toss and to bowl first is associated with a decreased likelihood of home success, but not significantly so. If a toss did take place in this period, then the importance of winning it with regards the final match result increases, as hypothesised. But this effect is also not statistically significant for whether a home team wins or avoids defeat. If an away team loses a toss, having chosen to contest it, then their likelihood of avoiding defeat is 69% of what it was if they had lost a toss before 2016 in the same fixture. This effect is marginally statistically significant (p-value<0.1). In general, these results are consistent with the expected effects of the uncontested toss rule change: an away team gains an advantage when it chooses not to contest a toss and a toss matters more when it is contested. In other words, the outcome of what happened before the first ball was bowled in a match had a bigger impact on the eventual result than it did before the uncontested toss was introduced. However, the general uncertainty of cricket match outcomes means that these model estimates are imprecise, and the conclusions are not statistically convincing.

Table 2 summarises the ordinary least squares estimates of Equation (3) for two more cricket match outcomes: the total collective number of runs scored (columns I & II) and overs bowled (columns III & IV) in both teams' first innings. As before, the preferred model specification admits matchup fixed effects (columns II & IV). Across all these estimates, there is no evidence that whichever team wins the toss significantly affects these outcomes, neither over the whole period or after the uncontested toss rule change. However, a bowling team deciding to not contest a toss and to bowl first in the 2016-2019 seasons is associated with 42 fewer runs scored (p-value<0.1) and 13 fewer overs bowled (p-value<0.05) in the first two completed innings of a match. These effects are reduced compared with model estimates which omit the matchup fixed effects, highlighting the importance of controlling for fixture heterogeneity. The results should not be a surprise, since an away team deciding to bowl first would typically imply that conditions favoured their bowlers early in a match, with the consequence of lower scores and more frequent wickets falling.

The regression models summarised in Table 2 included season fixed effects, which estimates are displayed with confidence intervals in Figure 7 for runs scored and Figure 8 for overs bowled. These

provide for each season the conditional estimates of the mean number of total runs scored or overs bowled in the first two completed innings of matches. There is suggestive evidence that in the first season where the uncontested toss was applied, in 2016, the length of the first two innings on average did increase relative to just before, though they were no longer than in the early 2000s, nor did this initial effect persist over the following three seasons. Therefore, there is no clear evidence that the uncontested toss led to 'better' pitches that favoured determined batting and longer matches.

4. Conclusion

The County Championship is one of the longest running annual leagues in professional sport. Over the past 130 years, there have been many changes to how this competition was administered, with the rule makers consistently tinkering with the format to achieve their objectives, be that competitive balance, increasing demand and revenues, fostering sought after talents and skills, or accommodating the wider cricketing schedule. In this chapter, we focused on the recent introduction of a novel rule in cricket, whereby the away team could choose whether to bowl first or face a coin toss, to instead possibly have the option of batting. Previously, whoever got the decision on whether to bowl or bat first was just determined by a mandatory coin toss. We found some statistically weak evidence that this increased the impact on the result of matches from whichever team made the decision to bat or bowl first. This is potentially to the detriment of the demand and revenues for CC cricket, given there is evidence from previous studies that aspects of the uncertainty of match outcomes negatively affect attendances (e.g., Sacheti et al., 2014). We found no evidence that the uncontested toss change consistently increased the length of the first two completed innings in a match, which was the primary objective of the rule makers. Taken together, this suggests that the right decision has probably been made by English cricket's administrators to abandon this toss experiment from the beginning of the 2020 CC season (if that ever takes place).

The game of cricket offers substantial opportunities for further economic research. The use of technology continues to creep into the game, either in terms of assisting or evaluating both umpire and player decision making. While there have been some studies on the impacts of this already (e.g., Borooah, 2016), there are opportunities to look closer at the effects that decision review systems have, and whether their use should be extended, given both the fixed setup costs and the incremental costs of their use, in terms of playing time lost and fan patience tried. Although there have been a few widely publicised and studied corruption and match-fixing scandals in cricket, the proliferation of new

T20 leagues around the world, and the betting markets which follow, deserve far greater attention (see Jewell and Reade, 2014, for further discussion of this issue). A casual look at the world's largest betting exchange, Betfair Exchange, will show that cricket matches attract significant amounts of gambling interest. For instance, recent matches in the T20 Indian Premier League have more bet on their result outcome markets than contemporary English Premier League association football games. Yet, there have been next to no studies of whether these cricket prediction markets are efficient, and the discrete nature of a cricket match lends itself well to the detection of unusual betting patterns and corruption. The nature of play within a cricket match also affords interesting research opportunities. For example, Papps and Bryson (2019) recently used Major League Baseball to detect and investigate the mechanisms driving peer effects and spillovers in production. The structure of cricket suggests that such an analysis could also be valuable in this sport, given the extended and variable amount of time that two batsmen spend together on the pitch. Despite cricket being a game where each event within a match involves one batsman facing one bowler, even the most casual follower will recognise the adages spoken frequently by commentators about a team's need to "build (break) a partnership" or to "bowl in tandem". Whether partnerships do matter in cricket and, if so, why do they matter, are questions that deserve the attention of economists.

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Tables

TABLE 1: Logistic regression estimates for English County Championship match result outcomes, effects of winning the toss, 2000-2019 (odds ratios)

	Home win, excl. draw		Home avoid loss		Away avoid loss	
	(I)	(II)	(III)	(IV)	(V)	(VI)
Home toss ($\hat{\lambda}_1$)	1.163	1.199	1.162	1.178	0.923	0.926
	(0.137)	(0.152)	(0.114)	(0.118)	(0.086)	(0.089)
Home toss, 16-19 ($\hat{\lambda}_2$)	1.352	1.203	1.021	1.058	0.644**	0.687*
	(0.342)	(0.339)	(0.234)	(0.266)	(0.125)	(0.139)
Uncontested ($\hat{\lambda}_3$)	0.898	0.899	0.803	0.825	0.939	0.995
	(0.160)	(0.190)	(0.115)	(0.135)	0.149)	(0.169)
Home Elo rating (100s)	1.346***	1.207***	1.249***	1.094	0.811***	0.898*
	(0.090)	(0.086)	(0.070)	(0.064)	(0.045)	(0.050)
Away Elo rating (100s)	0.766***	0.906	0.862***	0.963	1.269***	1.115**
	(0.047)	(0.053)	(0.041)	(0.055)	(0.062)	(0.057)
Constant	0.816		1.246		1.713	
	(0.556)		(0.684)		(0.943)	
Match-up fixed effects	No	Yes	No	Yes	No	Yes
Log-likelihood	-1,121	-642	-1,622	-1,104	-1,742	-1,204
N	1,654	1,480	2,809	2561	2,809	2,708

Notes: ***, **, * indicate significance from one at 1%, 5% and 10% levels, respectively, two-sided tests. Cluster robust standard errors are displayed in parentheses. Columns (I) & (II): whether the home side wins or loses the match (drawn matches and non-results excluded from sample). Columns (III) & (IV): whether the home team avoids defeat (i.e., home wins or draws, non-results excluded). Columns (V) & (VI): whether the away team avoids defeat (i.e., away wins or draws, non-results excluded). Columns (I), (III) & (V): 360 season-home-team clusters. Columns (II), (IV) & (VI): fixed effects (conditional) logit (e.g., Chamberlain, 1980), with 247, 265, and 286 match-up clusters, respectively (some of the total 306 matchups were dropped due to no outcome variation within them).

Source: author calculations using CricketArchive.com

TABLE 2: Linear regression estimates for English County Championship first innings (home and away) outcomes, effects of winning the toss, 2000-2019

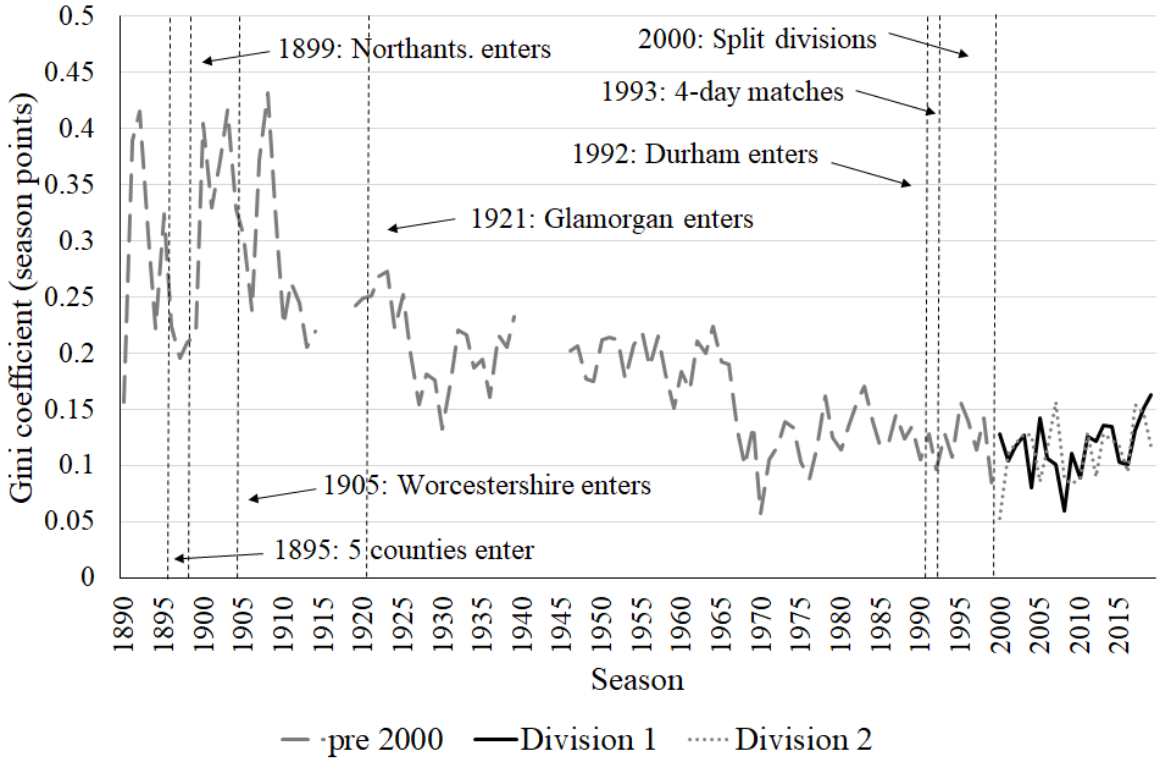
	Runs scored		Overs bowled	
	(I)	(II)	(III)	(IV)
Home toss ($\hat{\lambda}_1$)	-2.96	-8.37	-0.11	-1.40
	(8.12)	(8.94)	(2.05)	(2.25)
Home toss & 2016-19 ($\hat{\lambda}_2$)	-3.38	1.14	-1.95	3.31
	(24.18)	(28.27)	(6.26)	(7.31)
Uncontested ($\hat{\lambda}_3$)	-50.99**	-41.94*	-15.93***	-13.08**
	(20.02)	(22.45)	(5.06)	(5.64)
Home Elo rating (100s)	1.15	-4.95	0.38	-1.53
	(4.82)	(4.73)	(1.15)	(1.18)
Away Elo rating (100s)	7.49*	11.68**	2.04*	2.36*
	(4.31)	(4.62)	(1.12)	(1.22)
Month fixed effects	Yes	Yes	Yes	Yes
Season fixed effects	Yes	Yes	Yes	Yes
Match-up fixed effects	No	Yes	No	Yes
R^2 (within match-up)	0.069	0.075	0.062	0.068
N	2,604	2,604	2,604	2,604

Notes: ***, **, * indicate significance from one at 1%, 5% and 10% levels, respectively, two-sided tests. Cluster robust standard errors are displayed in parentheses. Excludes matches where two innings were not completed. Columns (I) & (II): total runs scored in the first completed innings of both the home and away teams. Columns (III) & (IV): total overs bowled in the first completed innings of both the home and away teams. Columns (I) & (III): 360 season-home-team clusters. Columns (II) & (IV): 306 match-up clusters.

Source: author calculations using CricketArchive.com

Figures

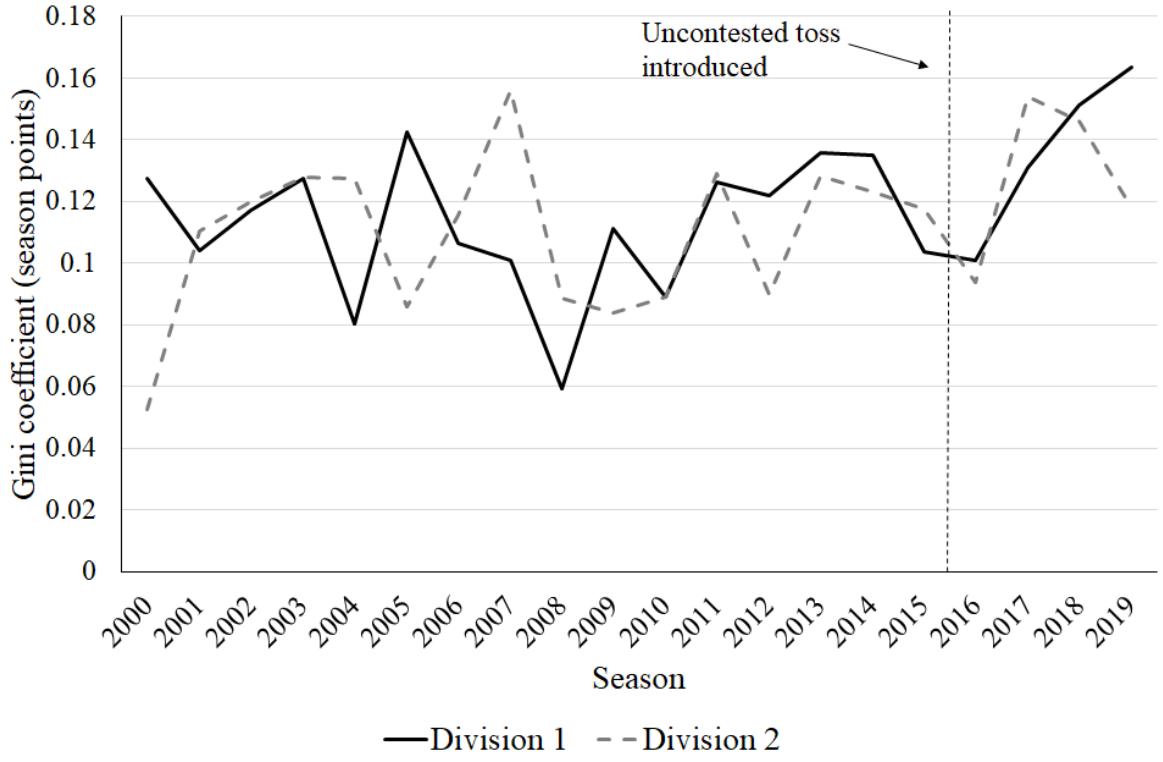
FIGURE 1: Competitive inequality within seasons of the English County Championship, 1890-2019



Notes: Gini coefficient computed over all teams in English County Championship using the division final points tables, after removing any penalties which had been applied. From 2000, results show coefficients in each of the CC divisions.

Source: author calculations using CricketArchive.com

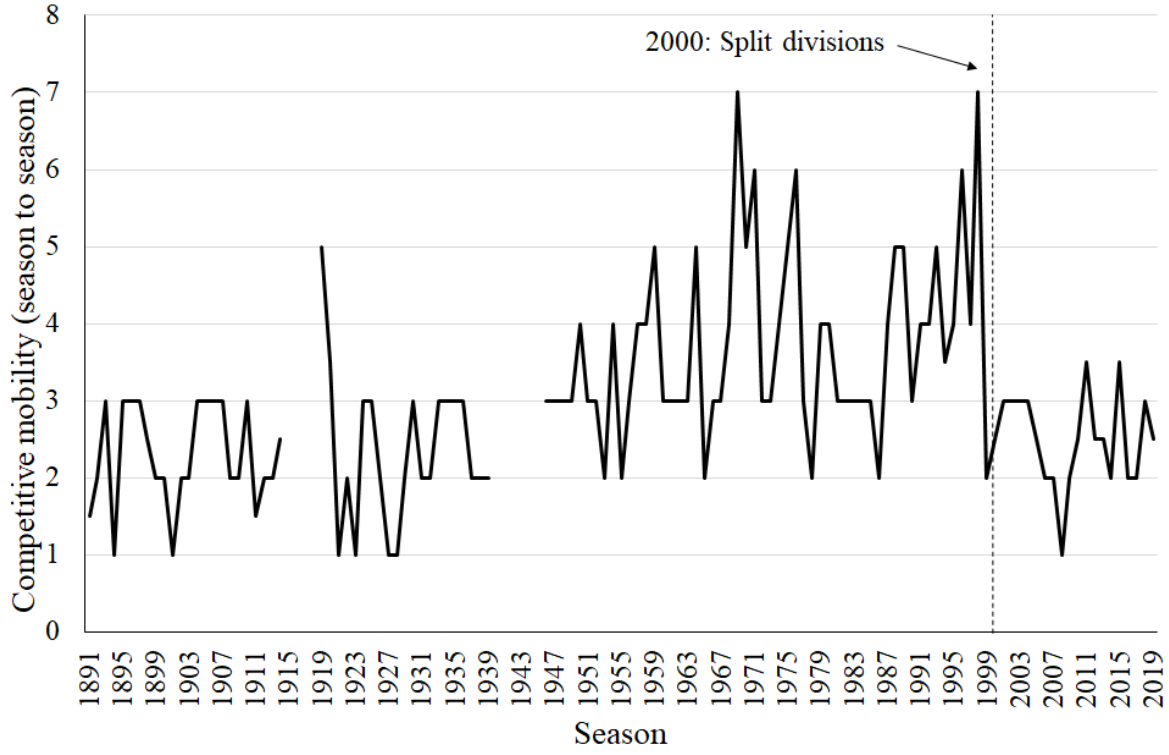
FIGURE 2: Competitive inequality within seasons of the English County Championship Divisions One and Two, 2000-2019



Notes: Gini coefficient computed over all teams in English County Championship using the division final points tables, after removing any penalties which had been applied.

Source: author calculations using CricketArchive.com

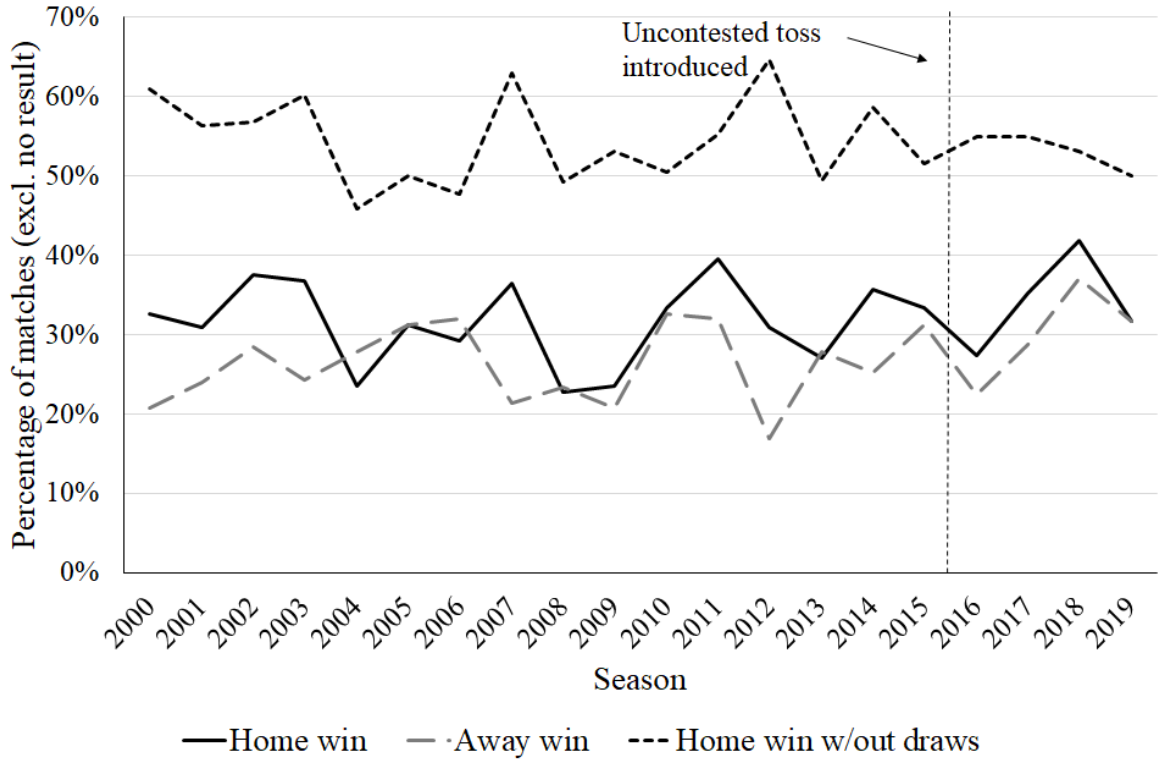
FIGURE 3: Competitive mobility between seasons of the English County Championship, 1890-2019



Notes: Shows the mean absolute change in rank between consecutive seasons for all teams in the CC. Teams are consistently ranked over the competition hierarchy before and after the division split in 2000.

Source: author calculations using CricketArchive.com

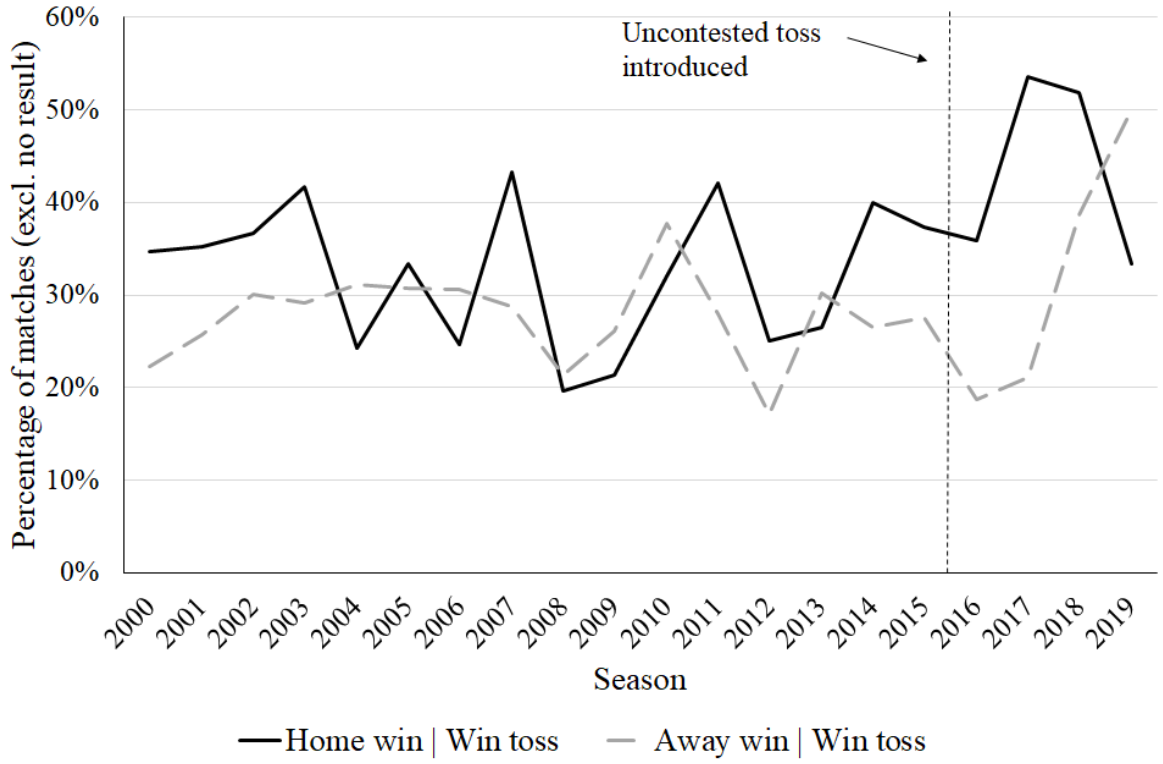
FIGURE 4: Home advantage in the English County Championship, 2000-2019



Notes: Shows the percentage of all matches in each season which ended in a result where either the home of the away side won, with the residual being drawn matches. Also shows the percentage of these matches won by the home team when excluding drawn matches.

Source: author calculations using CricketArchive.com

FIGURE 5: Advantage of winning the toss in the English County Championship, 2000-2019

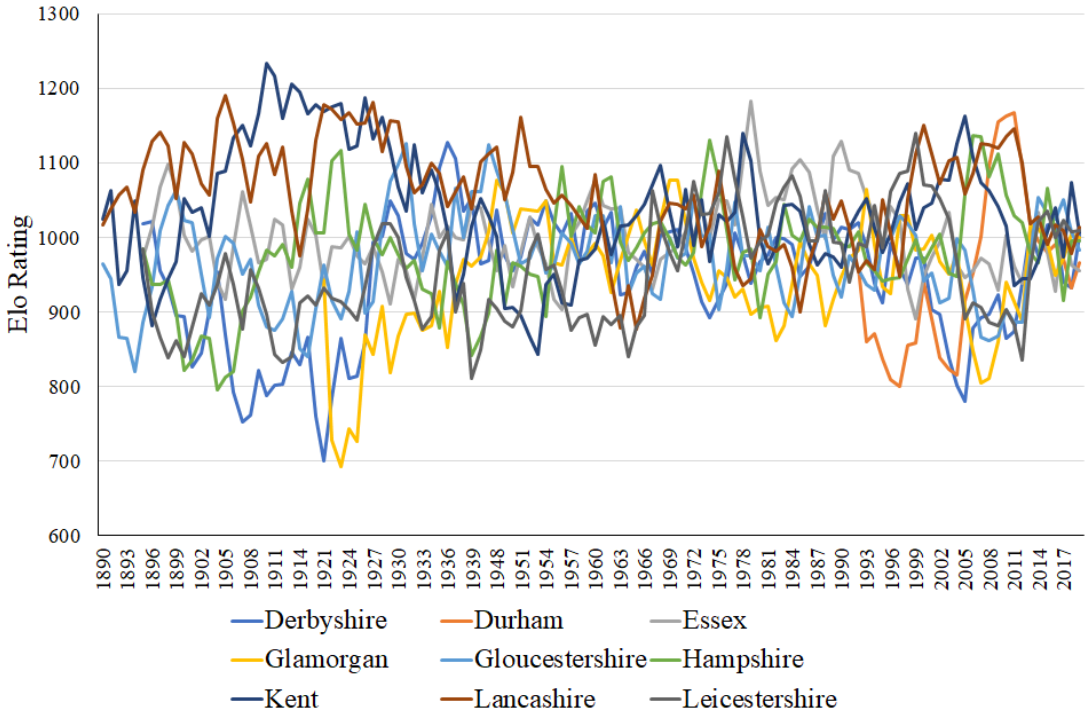


Notes: Shows the percentage of all matches in each season where the home or away side went on to win the match after having won the toss.

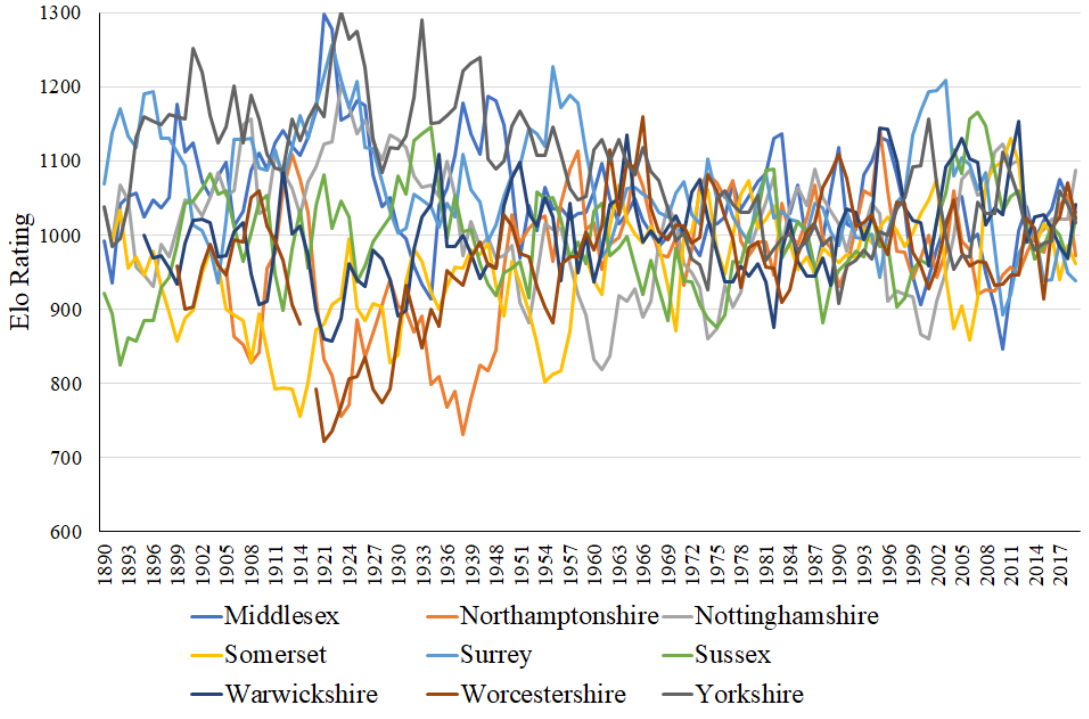
Source: author calculations using CricketArchive.com

FIGURE 6: Elo Ratings of County Championship teams, 1890-2019

(A)



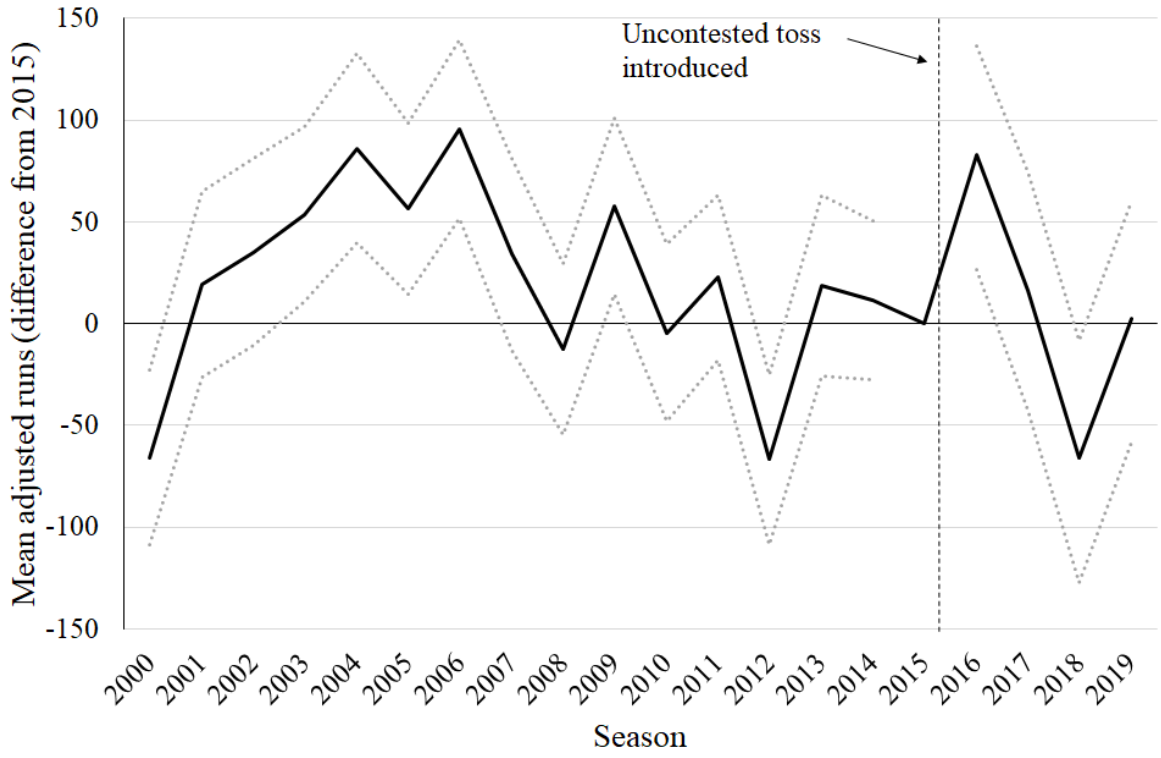
(B)



Notes: Shows derived Elo ratings of teams throughout the history of the CC. Two sub-figures are used to make the patterns easier to observe, with alphabetical order defining which team appears where. Values shown are season averages over matches played for each team.

Source: author calculations using CricketArchive.com

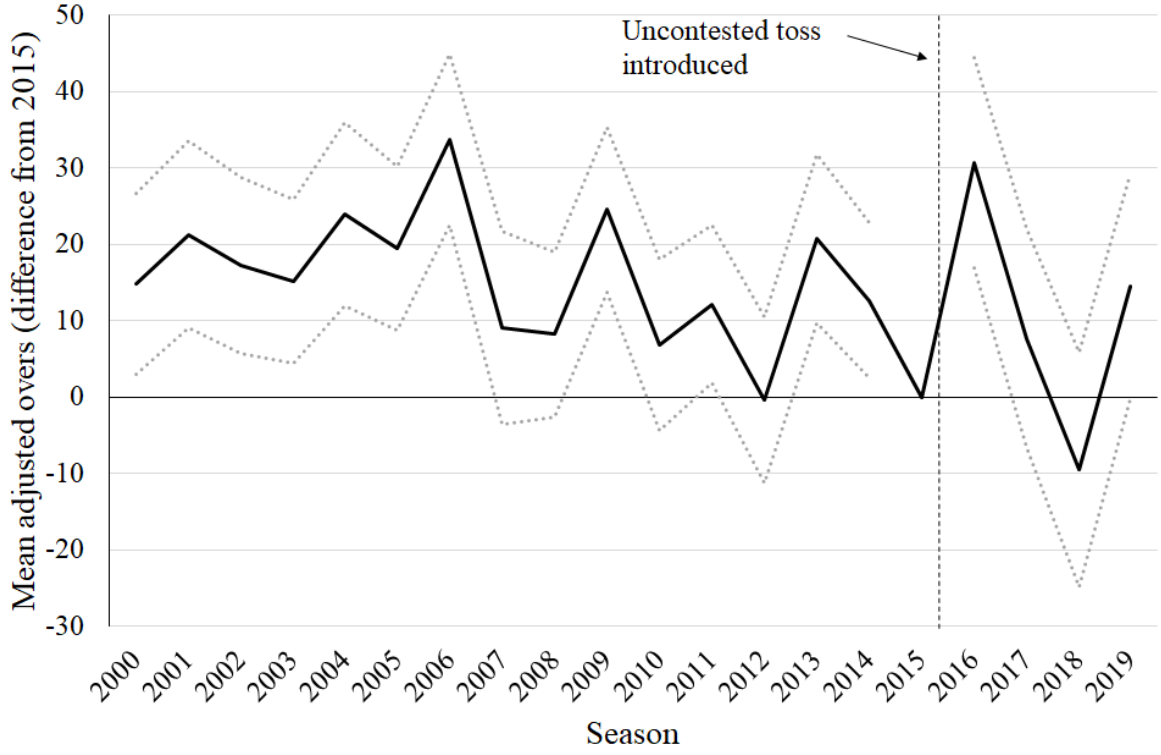
FIGURE 7: Mean sum of home and away first innings runs scored, regression adjusted, relative to 2015



Notes: Shows estimates of the season fixed effects from Table 2, column (II), i.e., adjusted mean total runs scored by the home and away team in the first innings of matches, with 2015 as the excluded season.

Source: author calculations using CricketArchive.com

FIGURE 8: Mean sum of home and away first innings overs bowled, regression adjusted, relative to 2015



Notes: Shows estimates of the season fixed effects from Table 2, column (IV), i.e., adjusted mean total overs bowled by the home and away team in the first innings of matches, with 2015 as the excluded season.

Source: author calculations using CricketArchive.com