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The Evolution of Competitive Balance in Men's International Cricket

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The evolution of competitive balance in men's international cricket

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ABSTRACT

Rationale: This study analyses competitive balance (CB) in all formats of men's international cricket longitudinally between 1877 and 2019 with the results broken down into segregated time periods to account for changes in the format of the sport over the course of its history.

Methodology: Using recognised measures of league concentration, the results display a mixed picture in respect of competitive balance across the various formats of cricket. Men's international cricket has seen growth in the last five years after all Twenty20 (T20) matches between International Cricket Council (ICC) member nations have been awarded international status and competitive balance in all formats of the game has remained relatively stable.

Findings: No significant changes have been observed in CB scores in test and One Day Internationals (ODI) while improvement in CB scores have been observed for T20I. We did not find any impact of the introduction of T20I on competitive balance in ODI cricket.

Practical implications: In a broader governance context, questions remain over the potential for further growth of the international cricket market given the dominant market position of the full members of ICC, in particular India, Australia and England, who have access to majority of the central revenue funding from the governing body.

1. Introduction

The uncertainty of the sport industry is the important ingredient in its recipe for success. Boorah and Managan (2012) argue that the long-term sustainability, in terms of retaining the interest from fans and generating income from the games, and the competitive balance of a sporting league are co-related to each other. The variable quality of sport might have implications on its competitive balance or anti-competitive behaviour (Smith & Stewart, 2010). Smith and Stewart (2010) further argue that the complexity of managing sport is

related to the idiosyncratic product it delivers to its participants and fans.

The starting point of the economic analysis of professional team sports has been the proposition that sports leagues are in a unique position because of the existence of specific demand-side externalities (Cairns et al., 1986). The importance of "closeness of competition" is identified by Rottenberg (1956, p. 242), who suggests that "competitors must be of approximate equal size if any are to be successful" considering the nature of the industry. Vrooman (2013, p. 3) suggests that while "the perfect game is a symbiotic contest between equal opponents", professional

sports leagues are "imperfectly competitive natural cartels where games are played between teams with asymmetric market power".

It can further be stated that professional team sports and leagues contribute to the broader literature of coopetition (Brandenburger & Nalebuff, 1996), which is defined as competition on the field with simultaneous cooperation off the field (Scelles et al., 2018). Coopetition is important for league organisers, which operate as governing bodies to maintain a successful league. The concept of coopetition in sport is relevant because if opponents are competitors on the field, they need each other to produce the competition on the field (Scelles et al., 2018) and are therefore economic partners (Nalebuff & Brandenburger, 1997). The debate around coopetition (Feuillet et al., 2020) is important for framing this study focused on competitive balance (CB), which is one of the key facets of professional team sports economics. Groot (2008) identifies that every competitor has an inherent interest to maintain the health of their rivals in order to have a successful sports league as an excessively imbalanced competition might have a negative effect on fan interest and, hence on demand (Késenne, 2006; Zimbalist, 2003).

The primary aim of this paper is to identify and examine the competitive balance in all formats of international cricket between March 15, 1877 and December 31, 2020. In doing this, we also provide an historical aspect of the evolution of cricket from a competition perspective.

The professional game of cricket has been integrated into commercial ways of marketing and playing sport over the last two decades. As corporate sponsorship and changing communications technologies ushered cricket into economic globalisation, leading cricketers have now become global celebrities alongside footballers and other sporting idols, with their lives outside the game attracting equal attention as their playing career from the global media (Rumford & Wagg, 2010). With 105 nations (12 nations as permanent members who have full voting rights and take part in all

formats of cricket, 8 nations as associate members with rights to play One Day Internationals (ODI) and T20 Internationals (T20I), and 84 nations as associate members with rights to only take part in T20 Internationals) as members of the International Cricket Council (ICC), cricket is argued to be one of the world's most popular sports by media, but its globalisation has been questioned by Siddiqui and Humphrey (2016). The governance situation poses some potential problems for the sport in respect of CB. Only 10 percent of members have decision making rights in international cricket. This creates an imbalance at governance level and provides the bigger members and associations with more (economic) power. Agur (2013) identifies that the financial hub for cricket has relocated to India in the past decade, with the ICC full member being an agenda-setter in the management of all forms of the game, largely due to the cash-rich Indian Premier League. As changes have been made to the traditional format of the game to provide great entertainment and an exciting result in three hours of cricket (Mondal & Rampersad, 2020), the worth of cricket industry in India was valued at $5.3 bn, which is more than North American leagues such as Major League Baseball (Geeter, 2018).

While a considerable amount of research has been done around the financial health of county cricket in England (Plumley et al., 2019; Shibli & Wilkinson-Riddle, 1997, 1998), the integrity of cricket (Philpott, 2018) and the demand of cricket around the world (Bhattacharya & Smyth, 2003; Fujak et al., 2020; Hynds & Smith, 1994; Kitchin, 2008; Lenten, 2008), a research gap exists in the analysis of competitive balance (ACB) strand of research in international and domestic cricket (Ramchandani, 2012) with no research conducted till date. To the author's knowledge, there has been no research to measure competitive balance in the multi-billion dollar industry of cricket. As the ICC formulates policies on making cricket a global game by agreeing to

include the shortest format of the game in the Commonwealth Games, and the game evolves itself by venturing into new formats such as T10 and The Hundred, it is important to identify if the shorter formats have detrimental effects on its counterparts such as One Day Cricket and Test Cricket. This study will also contribute to the strand of ACB research in professional team sports by analysing the international sports industry, where empirical research in the past has been negligible.

This study will proceed as follows: Section 2 explains the literature relating CB to sports economics, the theoretical framework of the study, previous research conducted in the scope of this study and identifying the research gap. Section 3 details the methodology. Section 4 outlines the results, followed by discussions and conclusions in section 5 and section 6 respectively.

2. Literature review

The theme of competitive balance (CB) emerged in US team sports in the late 1950s and the hypothesis of uncertain outcomes being proportional to crowd attendance (Rottenberg, 1956), formed the foundation of Uncertainty of Outcome hypotheses (UoH). Following the emergence of CB and sports economics in the late 1950s, Neale (1964), Jones (1969), El-Hodiri and Quirk (1971), and Noll (1974) discussed the theoretical research questions surrounding sports economics in North American leagues in the initial years, and subsequent theoretical and practical developments in both North America and Europe have been undertaken in 1989 by Scully, and in 2011 by Dobson and Goddard.

Two possible behavioural assumptions have been suggested about professional teams: clubs are supposed to maximise either their profits, which is in line with the reality of US professional leagues (Andreff, 2011) or the number of wins in a season, mirroring the situation of European team sports (Fort & Quirk, 1995; Sloane, 1969, 1971; Szymanski, 2003).

Subsequently, the differing practices between US team sports and European team sports in respect of league structure and organisation has played a major role in shaping the modern-day literature around sports economics. It is very difficult to categorise international cricket in a theoretical context against these models as there is no specific league format and revenues are pre-decided at the start of an eight-year cycle and not distributed on the basis of performances (ESPNcricinfo, 2017). Based on the differences in international cricket than the traditional models of sport, it can be argued that teams on the lower end of the performance spectrum, such as Bangladesh (until the mid-2000s), Zimbabwe, West Indies, Afghanistan or Ireland are generally concerned with maximising the probability of avoiding severe defeats in test cricket rather than maximising wins and this has been linked to behavioural economics by Bhaskar (2009).

Zimbalist (2002) compares competitive balance to wealth and argues that while everyone agrees it is a good thing, governing bodies and leagues have not been able to identify how much is needed to maintain the optimum balance. Ramchandani et al. (2018) argue that the origins of CB literature lie in North American professional team sports and revenue sharing, draft systems, salary caps and closed leagues are some of the common mechanisms to try and maintain the competitive balance in those leagues. Plumley et al. (2018) heavily link professional team sports to the concepts of uncertainty of outcome, competitive balance and profit and utility maximisation, justifying the argument with examples from Buraimo et al. (2015), Fort (2015), Késenne (2015), Leach and Szymanski (2015), Sloane (2015), and Vrooman (2015). However, Szymanski and Késenne (2004) argue through their research that revenue sharing is inversely proportional to investment in talent and ultimately work in reducing competitive balance.

The principal difference between North American and European team sports is the existence of promotion and relegation in the latter, which are typically organised in an ascending order of hierarchy. Another widely held belief in Europe is that North American clubs focus on maximising profits, while European clubs focus on win-maximation (Buzzacchi et al., 2003).

Notwithstanding these issues around the structure of the sport from an economic perspective, the concept of CB is still important, particularly at the pinnacle of the game, test cricket. From an academic perspective, the proliferation of CB literature has led to two distinct strands of competitive balance research that define the theoretical framework for this study (Fort & Maxcy, 2003):

(1) Analysis of Competitive Balance (ACB) literature focusing on what has happened to competitive balance over time or as a result of changes in the business practices of professional sports.
(2) Literature on competitive balance addressing the effect of competitive balance on fans and testing the uncertainty of outcome hypothesis (UOH).

There has been extensive research conducted on the UOH strand of research, which shows that uncertain outcomes are likely to effect the demand for sport as discussed in Bhattacharya and Smyth (2003), Borland and MacDonald (2003), Budzinski and Pawlowski (2017), Hynds and Smith (1994), Lenten (2008), and Pawlowski et al. (2018). However there has also been extensive research contrasting the positive correlation between UOH and CB, specifically when UOH is measured against CB as opposed to competitive intensity (Andreff & Scelles, 2015; Valenti et al., 2020). As the scope of this study paper focuses more on the organisational structure of international cricket, more focus has been placed on the ACB strand of research in the literature review.

The ACB literature can be distinguished into two major aspects, (a) the level of concentration, measuring the extent of closeness between teams in the league in a season; and, (b) the level of dominance, measuring the extent to which the same teams persist in winning the league over a number of season. The identity of a team does not matter in the measures of concentration but is crucial for the measures of dominance (Evans, 2014).

2.1. Previous research on ACB

As the origins of the concept of competitive balance are based on North American baseball (Rottenberg, 1956), substantial research focusing on the CB has been done on sports leagues in North America (Lenton, 2015; Maxcy & Mondello, 2006; Mills & Fort, 2014; Price & Sen, 2003; Salaga & Fort, 2017; Zimbalist, 2002). Following the proliferation of the researchers analysing sports economics since 1950, CB has been analysed in professional football leagues in Europe (Curran et al., 2009; Pawlowski et al., 2010; Ramchandani et al., 2018), a few papers on sport leagues in Asia (Lee et al., 2016; Tainsky et al., 2017), in other sports such as the rugby union (Williams, 2012), Formula One (Judde et al., 2013; Mastromarco & Runkel, 2009; Schreyer & Torgler, 2018), and cricket (Bhattacharya & Smyth, 2003; Hynds & Smith, 1994; Lenten, 2008). However, most of the research on the ACB strand of research has been conducted with the "big 5" European football leagues (England, Germany, Spain, Italy and France) as their subject and Ramchandani (2012) identifies a lack of literature on ACB in other sports. A list of papers discussing CB in the context of football leagues across the world, for which there is a wider body of research, has been shown in Table 1.

There are a few direct comparisons analysing both US and European models of professional team sports. One of them is Buzzacchi et al. (2003), who analyse the number of teams with

Table 1: Previous research on CB in football.

Author(s)	Leagues examined	Timeframe	Findings of CB
Feddersen and Maennig (2005)	German first division (men)	1969–2004	No changes in CB
Goossens (2006)	Top 5 European leagues (men)	1964–2005	Decline in English and Italian first divisions
Groot (2008)	Top 5 European leagues (men)	1946–2006	Decline in English, German, Italian and Dutch first divisions
Kringstad (2018)	Top divisions of Sweden, Denmark and Norway (men and women)	1995–2015	Significant difference between men's and women's football
Michie and Oughton (2004)	Top 5 European leagues (men)	1948–2004	Decline in English, German, Italian and Spanish first divisions
Mondal (2021)	Top 5 European leagues (women)	1996–2019	Improvement in England, Sweden and Norway
Plumley et al. (2018)	English Premier Division (men)	1992–2016	Decline in English Premier Division
Plumley et al. (2020)	Top 5 Asian leagues (men)	1996–2017	Decline in Iranian top division
Ramchandani et al. (2018)	Top 5 European leagues (men)	1995–2018	Decline in top 5 European leagues
Szymanski (2001)	English first division (men)	1978–1998	No changes in CB
Vales-Vazquez et al. (2017)	Top divisions of Spain (men and women)	2015	Significant difference between men's and women's football

the highest win percentage in regular season of MLB, NFL and NHL, and the number of league football champions in England, Italy and Belgium between 1950 and 1999. The paper argues that open leagues are less balanced in general than closed leagues on the basis of the analysis (Buzzacchi et al., 2003) which brings the discussion to an interesting standpoint as international cricket involves promotion and relegation among the lower divisions, while the top tier of teams participating in test cricket is a closed league.

Some studies have examined the relationship of different wider economic variables such as the GDP of the country and attendance in sport leagues against competitive balance scores for UEFA nations and FIFA rankings for CONCACAF nations (Rocke, 2019; Scelles et al., 2020). However, these methods cannot be replicated in this study due to the lack of availability of attendance data, GDP and ticket prices for all cricket playing nations examined in this paper for the duration of the study.

While Sloane (2015) identifies the non-explanation of the origins of such differences in the two continents, Szymanski and Zimbalist (2005) contrast the development of football and baseball, with the former spreading throughout the world. Football was influenced by British expatriates and local elites, whilst baseball was much more inward looking and concerned with commercial development. A direct comparison can be drawn between football and cricket, as much like the former, the latter was taken across the world by the British empire and colonies were dependent upon local elites embracing the game, its promotion by cultural entrepreneurs and the role of the educational system (Mustafa, 2013; Patterson & Kaufmann, 2005), with the objective to "civilise" the colonies with the ethos of the Anglo-Saxon values and ethics (Mondal & Rampersad, 2020).

2.2. The development of cricket

The popularity of cricket is limited to the residents of the nation-states of the former British Empire, unlike football and rugby (Malcolm et al., 2010). A range of different strategic and economic factors in the British Empire colonies impacted how the game is played in colonies and its promotion was dependent upon local elites embracing the game (Mustafa, 2013). With the evolution of the sport, a game of cricket between the colony and the British Empire started reflecting agitation of nationhood and nationalism as defeating the British

Empire was seen as an important factor to weaken imperialism on the society (Cashman, 1998).

In the early and mid-twentieth century, cricket was limited to the multi-day format, but a committee was instituted by the Marylebone Cricket Club (MCC) to address the dwindling attendances in county matches in 1950 and a new tournament called the Gillette Cup, comprising of 60 overs per side[1] with matches finishing in a day was introduced (Bal, 2010). The first international one day cricket match was organised in 1971 during the Ashes series in Australia, when the first two days of the third test was washed out and the Australian Cricket Board were forecasted to lose over £80,000 in revenues if a game of cricket was not played (Williamson, 2010). Although the Wisden Almanack did not publish any report on the match (Bull, 2011), over 46,000 people came to watch the game (4000 more than the entire 5 days of the first test held in Brisbane) with gate receipts totalling £30,000 (approximately). The format was popular with both teams and instead of a sixth test, three limited overs fixtures were scheduled for Australia's next tour of England in 1972–1973. Much like the first test cricket match played in Melbourne in 1877, the crowd and the players were a part of history being made, which they realised later (Williamson, 2010) and the match was retrospectively awarded the first ODI status.

A more pragmatic and business approach was taken to structure and organise the game by private promoters in the late 1970s through Kerry Packer's market-driven World Series Cricket involving day-night limited over fixtures, coloured clothing and broadcast on Channel 9 (Cashman, 1998). However, the property was not recognised by the ICC and players taking part in the tournament were not allowed to take part in ICC-recognised events. However, ICC soon followed path two decades later by introducing coloured clothing in the Cricket World Cup 1992, held in Australia and New Zealand.

A new format of cricket (called Cricket Max) was developed by former Blackcaps opener, Martin Crowe in 1996, which comprised 20 overs per side with an amalgamation of both test (10 overs per innings) and one day cricket (ESPNcricinfo, 1996). Although the rationale was to provide great entertainment and an exciting result by combining the old traditions of the game in 3 h, the propaganda was short-lived with the last game taking place on December 4, 2002 in Christchurch. This started a revolution in the West with the ECB commissioning a new 20-over championship (later known as T20) in 2002 to address falling domestic attendances and decline in participation figures (Williamson, 2012).

The crowd took liking to the newest format of the game and the first World T20 was played in 2007 in South Africa. India won the inaugural World T20, defeating arch-rivals Pakistan in the finals and the success paved way for the launch of the Indian Premier League (IPL), which has been described as a cocktail of mega-entertainment by journalists (Kimber et al., 2015). This made the game profitable in India and the IPL made $1 bn in sponsorship in 2017 (Geeter, 2018). Other countries followed suit, with Australia revamping the Big Bash League (BBL), West Indies introducing the Caribbean Premier League (CPL) and England redoing the T20 Blast. The domestic T20 franchisee competitions such as the IPL, BBL, CPL employ elements of North American model of professional team sports such as salary caps and draft systems with the aim of these functions being to generate better competitive balance. With the IPL attracting players from all over the world, many players from West Indies and New Zealand have refused to sign central contracts with their national boards to participate in the tournament. This has led to more lop-sided matches, mostly in favour of

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[1]An over comprises of six legal deliveries in cricket in the modern day.

the home side (e.g. New Zealand tour of England in 2008, West Indies tour of England in 2009) in overall international cricket as more often than not, some countries field potentially second-string sides in the international matches which take place alongside the IPL season. The ICC tried addressing some of the issues by including IPL in the list of future tours and programmes, effectively bringing a halt to all international cricket in April and May (Gollapudi, 2017). This highlights a shift in the economic and political power of cricket away from England to India.

In the year 2014, the ICC went through a comprehensive structural overhaul, that saw the Board of Control for Cricket in India (BCCI), Cricket Australia (CA) and England & Wales Cricket Board (ECB) forming a new executive committee (ExCo) and overriding all other ICC committees with ICC effectively ceding all decision making rights. The new overhaul proposed promotion and relegation in test cricket and provided immunity to the three permanent member nations of the ExCo, with the rationale that these three nations generate the highest amount of revenue for international cricket. A documentary titled *Death of a Gentleman* explaining the power sabotage was released in 2015 (Kimber et al., 2015).

Under the new model, it was recommended that every permanent member of the ICC is allocated a "fair" contribution cost as a recognition for their role in generating the revenues required to sustain the game by ICC in other developing countries (Ugra, 2014). A new benchmark called "marked scoreboard method" was developed to identify the major parameters for the percentage distribution and as per the new model, BCCI were set to get a share of $766 million in revenues provided by the rise of ICC revenues to $3.5 billion and no contribution cost was allocated to Bangladesh Cricket Board (BCB) due to uneconomical tours or no Test cricket being played.

While the wider goal was to reward the international bodies contributing the highest revenue to the global body, various member nations questioned the agenda of the Big Three. The Big Three were criticised for autocracy and denting the already deteriorating perception that the ICC serves less of the global development and stall the growth of associate nations (Sekhri, 2016). Following the appointment of Shashank Manohar as the ICC boss, the international body has passed the new revenue distribution model that allocates equal revenues to seven full member organisations including CA, while BCCI takes a hit of approximately $180 million (ESPNcricinfo, 2017). Although the financial throughput by the ICC has decreased for the Big Three, BCCI still remains a dominant power, both economically and politically in the cricket industry (Mondal & Rampersad, 2020).

As the ethos of capitalism dictates the global market trend in the twenty-first century, Mondal and Rampersad (2020) identify the growth of T20 leagues across the world as a contributing factor to the disruption of the status of test cricket. With the national boards unable to retain their best players throughout the year, it is important to measure how competitive balance has changed in international cricket since its introduction in 1877. Based on the distinctions drawn in the ACB literature, this study will focus on analysing the level of concentration within and between the various formats of international cricket and measure the impact of T20I cricket on test cricket and ODI cricket and on ODI cricket on test cricket.

3. Methodology

The measurement of competitive balance has been challenged thoroughly in the sport economics literature, as doubts emerged regarding the accuracy of empirical evidence due to a long history of different measures used to measure competitive balance (Martinez & Willner, 2017; Mills & Fort, 2014; Owen & King, 2015; Pawlowski, 2013). An extensive list of variables has been used to analyse competitive

balance and their strengths and weaknesses have been identified by Evans (2014) and Goossens (2006). Ramchandani et al. (2018) identify that scholars focusing their papers more on European sports use Herfindahl Index of Competitive Balance (HICB), which is a normalised version of HHI and other measures of dominance such as number of different teams to win the title and number of different top k finishes (k is the position in the league table) to measure competitive balance. A number of these measures are used by York and Miree (2018) to measure competitive balance in the National Hockey League (NHL) and are also used by a majority of papers covered in the literature review above. However, there have been disagreements between scholars around variable selections to measure competitive balance and those arguments centre around the structure of the leagues. The standard deviation of win percentages has been identified by Fort et al. (2016) to measure competitive balance in North American sports given the rarity of drawn games, but the same cannot be argued about application in a European team sport context due to high frequency of tied matches, which makes the former method a biased indicator (Pawlowski et al., 2010).

The dataset used in this study covers the time period from the first-class match played on March 15, 1877 (which was retrospectively given the official test status) to December 31, 2020, providing 144 years' worth of data for the three formats of international cricket (Tests, ODIs and T20Is) divided into 14 decades. Although the ICC have recognised matches involving Asia XI, Africa XI and ICC World XI to have international status, this study excludes these teams in calculation. Furthermore, if a team has featured in less than 3 Tests or 5 ODIs or 5 T20s in a selected period, we did not consider their results as this is likely to skew the results in favour of teams, that have consistently played against opposition below them in ICC Rankings.

We have calculated the level of concentration using the adapted version of NHICB measure, which was first used by Ramchandani et al. (2019) and is a variation and a standardised version of HICB. HICB is calculated using the formula below:

$$HICB = \frac{HHI}{1/N} \times 100$$

HHI can be calculated as the sum of the squared ratios of points for all the teams in the league and N is the number of teams in the league in any given season. NHICB is calculated using the following formula:

$$NHICB(n) = \frac{HICB}{HICBmax} \times HICBmax(n)$$

The NHICB method presented by Ramchandani et al. (2019) has some limitations as values can go below 100 if there are less than 10 teams. Therefore, the adapted version of the NHICB measure caps the lower value of the measure to 100 and the upper value depending on the value of n. Although the HICB value incorporates the different number of teams in a league, it fails to account for the actual level of concentration. Therefore, the formula used to calculate NHICB in this study is:

$$NHICB(n) = 100 + \left\{ \frac{HICB - 100}{HICBmax - 100} \right.$$

$$\left. \times [HICB(n)\,max - 100] \right\}.$$

The value of n is set as the median value for the number of teams in a format across the chosen time periods.

Another limitation with the dataset was the fact that international cricket teams played unequal number of matches in a decade. As discussed previously, some international teams play more cricket matches between each other as compared to other member nations. To address this situation, the points per game (both home and away) for each international team was calculated and the points table has

been generated using the assumption that each nation plays any other nation twice in a format in a chosen time period. However, these assumptions still fail to negate all the limitations as some nations have not played against other in bilateral series for long periods of time (e.g. India against Pakistan).

This study has performed two types of statistical operations on the data. The variance of NHICB scores over time were analysed in each format using Pearson correlation coefficient and the effects of ODI cricket on test cricket, and T20I cricket on test cricket and ODI cricket were analysed using fixed and panel effects. Mondal and Rampersad (2020) identified that the shorter formats have an impact on the longer format of the game. Whether they referred to a decrease in fan attendances in the longer format as youths are more attracted to the shorter formats of the game or a decrease in competitive balance scores linked to reduction in player quality has not been mentioned explicitly by the authors. As a result, this paper presents the opportunity to measure the impact of the shortest format on the shorter and longer formats of the game.

The impact of one format on the other is measured through multiple linear regression using the formula mentioned above. The NHICB score is treated as the dependent variable with N being the number of teams in a given time period and T_i capturing the fixed effects for time. International cricket was halted during the Second World War between 1939 and 1945 and therefore, there are no records for the period. The total number of observations across all formats are 66.

$$\text{NHICB} = \beta_0 + \beta_1 N + T_i + €$$

The evolution of competitive balance in international cricket has been captured through multiple linear regression. O represents the maximum number of overs bowled in a format (450 for test cricket, 120 for ODI cricket between 1971 and 1985, 100 for ODI cricket between 1986 and 2020, 40 for

T20I cricket). N is the number of teams for a given time period, T_i is the fixed effect for time periods and F_i is the fixed effect used to denote the formats (T20 being the reference). The significance is set at 0.10.

$$\text{NHICB} = \beta_0 + \beta_1 O + \beta_2 N + T_i + F_i + €$$

The time periods have been divided on the basis of number of games been played in different time periods. In the first three decades of test cricket only 64 international matches were played, while the number of matches has risen to as high as 109 between 2001 and 2002. Between 1877 and 1920, only 3 teams took part in test cricket, while the number was 7 between 1921 and 1970. The year 1971 saw the introduction of ODI cricket and the number of test teams fluctuated between 6 and 7 during that time period. The number of test teams have remained fairly consistent between 9 and 10 in the remainder of the years but a new format called T20I was introduced in 2005 and as such the time periods were divided from 1989 to 2004 and 2005 to 2020. The time periods have been divided into equal intervals of 10 years between 1871 and 1920, 5 years between 1921 and 1970, 3 years between 1971 and 1988, and 2 years between 1989 and 2020.

4. Results

4.1 Relationships of NHICB with time and number of teams

The time frame for test cricket has been divided into 15 periods of 10 years, ODI cricket has been divided into 10 periods of 5 years and T20I cricket has been divided into 8 periods of 2 years each. To analyse whether the distribution of NHICB scores in all formats of the game is normal, we have conducted a Shapiro–Wilk test, the results for which are shown in Table 2. The NHICB scores for test cricket and ODI cricket were not distributed normally ($p<0.05$), while the NHICB scores of T20I

Table 2. Results for test of normality (Shapiro–Wilk test).

Format	Observations	W	V	z	p
Test	15	0.856	2.801	2.037	0.021
ODI	10	0.792	3.210	2.274	0.011
T20I	8	0.936	0.893	−0.180	0.571

cricket followed normal distribution ($p>0.05$). The median NHICB scores for all the three formats of the game are displayed in Figure 1 and the mean NHICB scores for all formats between different periods are displayed in Figure 2.

The time frame has been coded for test cricket with 1 for 1870s, 2 for 1880s, and so on up to 15 for 2010s. A similar approach has been adapted for ODI cricket with 1 for 1971–1975, 2 for 1976–1980, and so on up to 10 for 2016–2020, and T20I cricket with 1 for 2005–2006, 2 for 2007–2008, and so on up to 8 for 2019–2020. Table 3 displays the results for correlation tests between time trends and NHICB.

The analysis showed a statistically insignificant time trend for NHICB for test cricket and ODI cricket [NHICB (Test): $r=−0.144$, $p=0.608$; NHICB (ODI): $r=0.103$, $p=0.777$]. However, statistically significant time trends that suggested an improvement in NHICB scores were observed for T20I cricket (NHICB: $r=−0.724$, $p=0.042$).

The number of teams in test, ODI and T20I cricket varied over time in different time periods. To identify the evolution of competitive balance across formats, we conducted Pearson's correlation tests between the NHICB scores and the number of teams in each format. The results are displayed in Table 4.

While we found no significant evolution in NHICB scores of test and ODI cricket, the NHICB scores of T20I cricket have shown statistically significant trends suggesting that T20I cricket has become more competitive with increase in number of teams (NHICB: $r=−0.812$, $p=0.014$).

4.2 Effects of ODI cricket on test cricket and t20I cricket on ODI and test cricket

The results of regression tests measuring the effects of ODI and T20I cricket on test cricket are presented in Tables 5 and 6. It has been identified through the regression model that the NHICB scores in test cricket could not be explained by the model [$F_{(5, 30)} = 0.90$, $R^2 = 0.130$, $p = 0.494$].

However, the same cannot be argued about the effects of T20I cricket on ODI cricket [F (3,
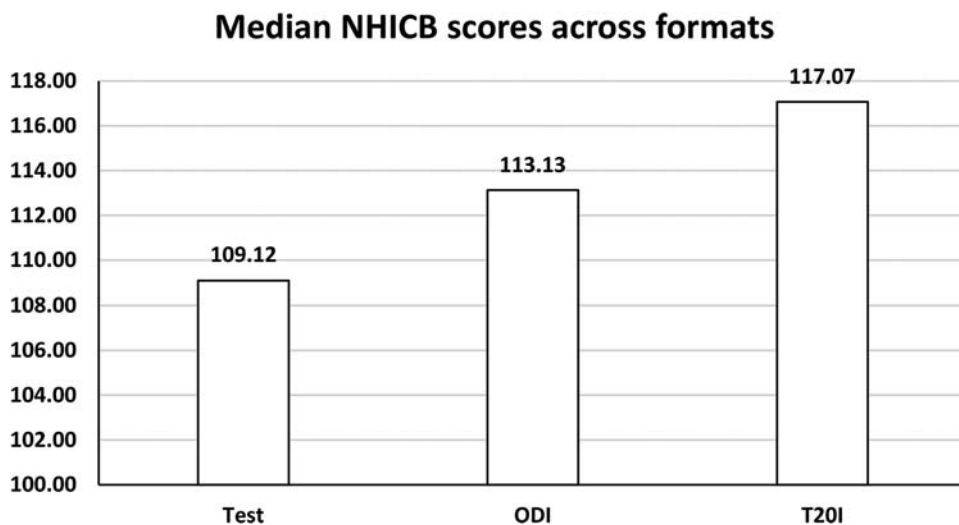
Figure 1. Median NHICB scores across various formats of international cricket.

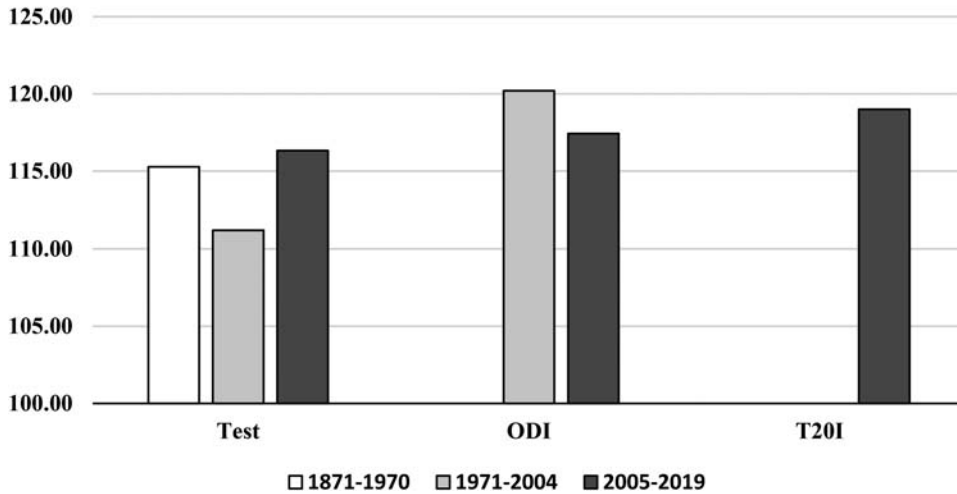**Figure 2.** Average NHICB scores in different formats of international cricket across different time periods.

Table 3. Correlation between time trends and NHICB.

Format	Observations	r	p
Test	15	−0.144	0.607
ODI	10	0.103	0.777
T20I	8	−0.724	0.042

18) = 2.94, R^2 = 0.329, p = 0.061]. The results are presented in Table 7.

It has been found that the increase in number of teams had a significant positive impact on NHICB scores, implying that competitive balance has declined with the increase in number of teams in the format. This is primarily due to new teams being at a lower sporting level during the initial periods than the already established teams. However, using the time period 1989–2004 as reference, we found that NHICB scores in ODI were worse between

1971 and 1988 than in 2005–2020. This implies a case of increasing competitive balance over time in ODI cricket as a consequence of the development of the format. It can further be concluded that the introduction of T20I cricket did not affect the improvement of competitive balance in ODI cricket over time.

4.3 Measuring the evolution of competitive balance in international cricket

The results of regression test measuring the evolution of competitive balance in cricket

Table 4. Correlation between number of teams and NHICB.

Format	Observations	r	p
Test	15	−0.082	0.771
ODI	10	0.119	0.743
T20I	8	−0.812	0.014

Table 5. Impact of ODI on test cricket.

$F_{(5,30)}$ = 0.90, p = 0.494, R^2 = 0.130, Adjusted R^2 = −0.015, Root MSE = 8.056
Number of observations = 36

NHICB	Coef.	Std. Err.	t	P>|t|
Number of teams	1.87	1.61	1.16	0.25
Year (1921–1970 is the reference)				
1877–1920	6.45	7.08	0.91	0.37
1971–1988	−6.54	4.32	−1.51	0.14
1989–2004	−6.52	6.37	−1.02	0.32
2005–2020	−5.18	7.19	−0.72	0.48
Constant	103.25	10.02	10.30	0.00

Table 6. Impact of T20I on test cricket.

NHICB	Coef.	Std. Err.	t	P>|t|
F (5,30) = 0.90, *p* = 0.494, R^2 = 0.130, Adjusted R^2 = −0.015, Root MSE = 8.056 Number of observations = 36				
Number of teams	1.87	1.61	1.16	0.25
Year (1989–2004 is the reference)				
1877–1920	12.97	11.46	1.13	0.27
1921–1970	6.52	6.37	1.02	0.32
1971–1988	−0.03	6.06	0.00	1.00
2005–2020	1.34	4.15	0.32	0.75
Constant	96.73	14.95	6.47	0.00

Table 7. Impact of introduction of T20I cricket on ODI cricket.

NHICB	Coef.	Std. Err.	t	P>|t|
F (3,18) = 2.94, *p* = 0.061, R^2 = 0.329, Adjusted R^2 = 0.217, Root MSE = 7.056 Number of observations = 22				
Number of teams	2.44	0.88	2.77	0.01
Year (1989–2004 is the reference)				
1971–1988	11.23	4.88	2.30	0.03
2005–2020	−13.77	5.73	−2.40	0.03
Constant	92.83	9.68	9.59	0.00

using fixed panel effects are displayed in Table 8.

We could not identify the evolution of competitive balance in international cricket using

Table 8. Measuring the evolution of competitive balance in international cricket.

NHICB	Coef.	Std. Err.	t	P>|t|
F (8,57) = 0.91, *p* = 0.527, R^2 = 0.112, Adjusted R^2 = −0.0131, Root MSE = 8.296 Number of observations = 66				
Maximum Overs Bowled	0.12	0.29	0.39	0.70
Number of teams	0.37	0.70	0.53	0.60
Year (1877–1920 is the reference)				
1921–1970	−1.35	5.20	−0.26	0.80
1971–1988	−3.92	5.53	−0.71	0.48
1989–2004	−3.02	5.88	−0.51	0.61
2005–2020	−3.47	7.35	−0.47	0.64
Format (T20I is the reference)				
ODI	−7.44	19.34	−0.38	0.70
Test	−51.83	119.20	−0.43	0.67
Constant	113.54	14.30	7.94	0.00

the regression model [F (8,57) = 0.91, R^2 = 0.112, *p* = 0.527]. We were also not able to identify any significant difference between competitive balance scores of test cricket and ODI cricket against T20I cricket, which has been used as a reference format (*p* > 0.10).

5. Discussion

As discussed earlier in the literature review, there have been no previous studies to longitudinally analyse competitive balance across all formats in international cricket, despite the measurement of demand-side externalities by authors such as Bhaskar (2009) and Bhattacharya and Smyth (2003) and measure the financial health of English County cricket (Plumley et al., 2019; Shibli & Wilkinson-Riddle, 1997, 1998). Therefore, this study makes a direct and relevant contribution to the literature of analysis of competitive balance by identifying and working on a sport and industry, where no research has been done before.

Based on the average NHICB scores, it can be said that over time test cricket has been the most competitive format, followed by ODI cricket and T20I cricket. Therefore, based on average NHICB scores, there is competitive imbalance in the T20I format of the game. However, this must be treated with a degree of caution as the average measure is a cross-sectional study. It should also be noted that T20I cricket has existed only for a short period of time (15 years) as compared to 144 years of test cricket and 50 years of ODI cricket, and as such it has not had similar time to evolve.

This study presented a mixed picture of competitive balance across various formats of International cricket. While NHICB scores have varied over time across various formats, the scores in test and ODI cricket are not statistically significant. On the other hand, it has been found out that the NHICB scores in T20Is have significantly improved over time. These findings were compared to European football, where significant research has been undertaken (e.g.

Goossens, 2006; Groot, 2008; Mondal, 2021; Plumley et al., 2018; Ramchandani, 2012; Szymanski, 2001). Our results show a similar trend to these studies. All these papers have either reported an improvement or decline in CB scores in the respective leagues they have examined.

This study now comes back to the point referred by Mondal and Rampersad (2020), who suggested that the shortest format of the game might impact competitive balance in the longest format of the game. However, Mondal and Rampersad (2020) did not explicitly mention whether they have pointed towards a decrease in fan attendances in the longer format as a younger audience might be more attracted to the shorter format of the game or a decrease in competitive balance scores linked to reduction in player quality. The regression tests employed failed to find any statistically significant impact of T20I and ODI cricket on test cricket and T20I cricket on ODI cricket. However, an improvement in competitive balance in ODI cricket was found, which can be attributed to the development of ODI cricket over time. As discussed in The Cricket Monthly, since the introduction of T20I cricket, batsmen have adopted a more aggressive strategy in other formats as well without the fear of getting out (Hotten, 2016). This change in aggression has led to more 300+ score being chased in ODI cricket since the introduction of T20I cricket. A total of 13 scores of 300 or more were chased between 1971 and 2004, while the number has risen to 80 between 2005 and 2020 (ESPNCricinfo, n.da). However, we did find an overall case of diminishing competitive balance in international cricket since the introduction of limited over formats in 1971.

In respect of "star quality" and players preferring to play T20 franchisee cricket all over the world rather than signing central contracts with the national board, this might have depleted the quality of the playing squad of some national teams leading to lop-sided

results in test cricket. However, we did not find any evidence suggesting that competitive balance has improved or declined in test since the introduction of T20I cricket.

The newly introduced domestic competition by England and Wales Cricket Board (ECB), called The Hundred is an interesting case. The introduction of the format has invited backlash as well as support from international cricketers, as they feel that it takes up more time in an already crunched international cricket calendar. Tresise (2020) identifies that young people live in a digital world and presenting cricket in a fresh and new way through The Hundred will have a positive impact on cricket in England and Wales. It has been further argued that the tournament is an opportunity for cricket to become a mainstream sport as 10 matches will be shown live on a primetime BBC television slot, giving cricket free-to-air exposure which will enable it to reach the masses again.

The introduction of The Hundred can be related to that of the introduction of T20 cricket at domestic level by the ECB. To address the falling attendances and decline in participation, the ECB introduced a new 20-over championship after figures revealed through market research that matches were being played at inconvenient times and were acting as barriers to participation and spectating. The product focused on two target groups: sporting public aged between 16–34 years who were general sports fans and women, members of the office crowd and children. There was a notion that if these groups were attracted, the event provided the best odds to be developed over long term. A total of 360,000 fans turned up the watch the tournament in 2003, with most of them being families with kids and the county grounds were not used to this kind of crowds in terms of both numbers and demographics (Mondal & Rampersad, 2020). While there were no plans to play T20 cricket at international level when it was first introduced, it is now the most widely played format at international level and time

will tell whether or not The Hundred will go a similar way in the future.

The development of the game of cricket outside traditional hotbeds such as India, Australia, Pakistan, Australia, Sri Lanka, Bangladesh and England have seen positive growth during the last decade since all T20 matches between nations have been granted recognised international status by the International Cricket Council (ESPNcricinfo, 2018). Despite the expansion of cricket to countries such as Germany, Brazil, Thailand, it is also still very clear that international cricket is dominated in terms of revenues by BCCI, CA and ECB, while the performances are usually dominated by India, Australia, New Zealand and England. There remains a question if the associate ICC members will ever be able to catch up to the full members in terms of finances as well as performances despite the recent success of Afghanistan and Ireland.

A further possibility of development is through the full members allowing their representative teams to take part in first class or other domestic competitions, provided there are no international commitments, in some of the developing cricket countries to help aid the growth of the players there. Some of the countries such as Afghanistan have an agreement with India to use the facilities in the latter's country to develop their performance and as such Afghanistan played their first home test match against West Indies in mid-2019s in India, due to the political tensions in their country. The Duleep Trophy (a first-class tournament in India) saw teams such as England Lions, Bangladesh, Sri Lanka A participate along with regional sides to improve the quality of the tournament as well as help foreign players acclimatise to Indian conditions. A similar approach can be taken where some of the representative teams of 'Big 3' nations participate in the domestic first-class tournament of nations such as Ireland and Afghanistan to enhance the quality of the tournament, while helping the players of the "Big 3" acclimatise

to English and sub-continental conditions. However, to develop the game in non-test playing nations, ICC must first find a way to deal with corruption issues that plagued the recent Qatar T10 Stars League. The investment in grassroots development is linked to the economic theory of professional sports teams to create better (and equally matched) teams to aid competitive balance and that has paid some dividends with the emergence of stars such as Rashid Khan from Afghanistan and Sandeep Lamichhane from Nepal, but these dividends are by far inconsistent and it is evident that developing cricket in non-test playing nations will be a slow and steady process for the ICC.

Despite the newly developed revenue system of the ICC (ESPNcricinfo, 2017) that cut the lion's share of the Big Three's revenues, the BCCI are still proposed to earn approximated $255-260 million in the next 8 years period. While it is within the laws to reward performance, the ICC can take some cues from the North American model of professional team sports by studying the revenue distribution model and rewarding 50% of the finances to the member nations on the basis of revenues and the remainder of 50% for development of the sport in the countries. Furthermore, ICC has a total of 105 member nations registered to it and the financial model only rewards the 12 full member nations. The remaining 93 nations are funded through the ICC Development Fund and cutting down financial rewards of some of the rich full-member boards will help add those funds to aid the development of cricket in the 93 associate member nations.

6. Conclusion

To the author's knowledge, this is the first study of its kind to analyse competitive balance in a longitudinal way in men's international cricket and as such the study provides a clear contribution and extension to knowledge. In

conclusion, the study indicates that it may be the case that competitive balance does not necessarily present a problem for ICC to consider at the current time, but they should continue monitoring the situation consistently as competitive balance is important to maintain the product on the field. The evidence in this study points to a generally stable state of competitive balance for the test and ODI formats and an improvement of competitive balance in T20I format of men's international cricket.

This study has some limitations, which include the inclusion of all results by a country within a given time period, which is five years in ODI cricket and ten years in test cricket. It is quite possible that in any given time period, the performance of a team both on and off the field has drastically improved or declined due to improvement in economy or turnover in the number of players in the national team. Furthermore, the points accumulated by teams over any given time period is over an unequal number of matches and some teams have played specific teams a greater number of times as compared to other teams and as such it has affected the overall points gained by both teams involved.

On the basis of the understandings regarding the developments of the two limited over formats, it can be said that there were no long-term plans to play them at the international level, as both of them were developed to address the dwindling attendances in first-class county cricket. The results in this paper show that ODI cricket has played a role in improvement of competitive balance in test cricket since its introduction in 1971. The finding of no significant changes in competitive balance in test cricket from 1877 till present day should be investigated further, given it is difficult to "fluke" a result over the course of four innings and five days of play, rather than a maximum of 100 overs as during the first few years, new full member nations cannot get a positive result in test cricket usually (e.g. Bangladesh won one of their first 40 tests, and Zimbabwe won 3 of their first 39 tests). Further research should be conducted with competitive balance considered in a single calendar year to investigate these findings.

Sporting competition and integrity are still at the heart of any debate around the structure of sport leagues and despite the theoretical debate around the measures and relevance of competitive balance, it can be argued that it remains an important component of modern-day sport. Future research should attempt to consider analysing the wider cricket industry by studying women's cricket, domestic first-class tournaments, and franchisee T20 tournaments and identify how these impact the overall competitive balance of international cricket. A further angle of academic enquiry can be conducted by measuring both financial and sporting performance of ICC member nations to present a holistic overview of competitive (im)balance in international cricket.

Disclosure statement

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Appendix

Table A1. Number of teams to feature in international cricket across different decades.

Time Period	No. of teams in Tests	No. of teams in ODIs	No. of teams in T20Is
1877–1880	2	–	–
1881–1890	3	–	–
1891–1900	3	–	–
1901–1910	3	–	–
1911–1920	3	–	–
1921–1930	4	–	–
1931–1940	6	–	–
1941–1950	6	–	–
1951–1960	7	–	–
1961–1970	7	–	–
1971–1980	7	8	–
1981–1990	7	9	–
1991–2000	9	11	–
2001–2010	10	11	16
2011–2020	12	19	74

Table A2. Overall results table of test cricket between 1877 and 2020 (for teams with more than 75 tests).

Team	Matches	Won	Lost	Tied	Draw	Win Ratio
Australia	832	394	225	2	211	0.60
England	1028	374	305	0	349	0.53
West Indies	550	175	199	1	175	0.48
South Africa	440	166	150	0	124	0.52
India	544	158	168	1	217	0.49
Pakistan	432	138	132	0	162	0.51
New Zealand	445	104	175	0	166	0.42

(*Continued*)

Table A2. Continued.

Team	Matches	Won	Lost	Tied	Draw	Win Ratio
Sri Lanka	290	92	110	0	88	0.47
Bangladesh	119	14	89	0	16	0.18
Zimbabwe	110	12	70	0	28	0.24

Table A3. Overall results table of ODI cricket between 1971 and 2020 (for teams with more than 50 ODIs).

Team	Matches	Won	Lost	Tied	NR	Win Ratio
Australia	955	579	333	9	34	0.63
India	990	514	426	9	41	0.54
Pakistan	930	488	413	9	20	0.54
West Indies	822	401	381	10	30	0.51
Sri Lanka	852	389	421	5	37	0.48
South Africa	625	385	216	6	18	0.64
England	752	378	337	9	28	0.53
New Zealand	772	351	374	7	40	0.49
Zimbabwe	532	138	375	8	11	0.28
Bangladesh	376	128	241	0	7	0.35
Ireland	159	68	80	3	8	0.46
Afghanistan	126	59	63	1	3	0.48
Kenya	154	42	107	0	5	0.29
Scotland	115	42	66	1	6	0.40
Netherlands	80	31	45	1	3	0.41
Canada	77	17	58	0	2	0.23
U.A.E.	59	17	42	0	0	0.29

Table A4. Overall results table of T20I cricket between 2005 and 2020 (for teams with more than 30 T20Is).

Team	Matches	Won	Lost	Tied	NR	Win Ratio
Pakistan	160	97	58	3	2	0.62
India	137	85	45	3	4	0.65
New Zealand	137	65	60	8	4	0.52
Australia	131	69	57	2	3	0.55
Sri Lanka	128	59	65	2	2	0.48
West Indies	127	54	64	3	6	0.46
England	126	64	55	2	5	0.54
South Africa	124	70	52	1	1	0.57
Ireland	98	41	48	2	7	0.46
Bangladesh	96	32	62	0	2	0.34
Afghanistan	81	55	25	1	0	0.69
Zimbabwe	79	18	59	2	0	0.24
Netherlands	75	39	32	1	3	0.55
Scotland	65	29	32	1	3	0.48
U.A.E.	49	24	24	0	1	0.50
Hong Kong	44	16	28	0	0	0.36
Kenya	38	15	23	0	0	0.39
Oman	36	16	19	0	1	0.46
Nepal	34	16	17	0	1	0.49
Canada	31	12	17	1	1	0.42