**Competitive Balance:
Results of Two Natural Experiments from Rugby Union**

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***Abstract*:** The paper presents results from two natural experiments on the impact of revenue sharing and salary caps on competitive balance in sports leagues arising from the introduction of professionalism in Rugby Union in 1995. The first involves the English Premiership, which traditionally applied a binding salary cap, and the French Top 14, which only introduced a (non-binding) salary cap relatively recently, while the Premiership also has a higher level of revenue sharing than its French counterpart. The second involves French rugby and soccer as the French soccer league is generally recognised as having a more even distribution of revenue and greater competitive balance than other major European soccer leagues. We find short- and long-run competitive balance is higher in the Premiership, than in the Top 14, while French soccer appears more evenly balanced than rugby. Unlike soccer, balance within and between leagues in rugby has not been negatively affected by European competitions. This could change as the Anglo-French teams' share of European competition revenues is set to increase from 2014/15 while broadcast revenues for both leagues are also set to increase substantially.

Key Words: Professional team sports, competitive balance, salary caps.

JEL Classifications: D12, D21, L22, L23, L83.

1: Introduction.

There is an extensive literature on the economics of professional sports leagues, much of which emphasises the importance of uncertainty of outcome in explaining the attractiveness of sport. (For a good summary see Dobson and Goddard, 2001; Borland and MacDonald, 2003; and Szymanski, 2003). The competitive balance argument has been advanced to justify a variety of arrangements that are commonly found in professional team sports such as revenue sharing, salary caps, collective selling of broadcasting rights and restrictions on players moving between teams. (Rottenberg, 1956, Neale, 1964 and Szymanski and Kesenne, 2004). The present paper reports the results of two natural experiments on the effect of revenue sharing and salary caps on competitive balance arising from the introduction of professionalism in Rugby Union in 1995. The first involves the English Premiership and French Top 14 The former has operated a binding salary cap and revenue sharing since 1998/99. In contrast the Top 14 has a much lower level of revenue sharing and only introduced a (non-binding) salary cap in 2010/11 The second involves French rugby and soccer as the French soccer league has been recognised as having a more egalitarian distribution of revenue and a higher degree of competitive balance than the other major European soccer leagues. (Dobson and Goddard 2001; Noll, 2007; Pawlowski et. al., 2010; and Vrooman, 2007). It has also been claimed that the UEFA Champions' League, has led to a significant deterioration in competitive balance in soccer both within national leagues and between leagues. (Noll, 2007; Szymanski, 2007; Vrooman, 2007; Pawlowski et. al., 2010; and Lee and Fort, 2012). The paper therefore also considers the impact on inter- and intra-league competitive balance of rugby's Champions' League equivalent - the European Rugby Cup (ERC).

The balance of the paper is structured as follows. The literature on competitive balance in professional team sports is summarised briefly in section 2. Section 3 provides a brief overview of the evolution of Rugby Union. In section 4 we test the relationship between team spending and final league position in French rugby and soccer as the view that measures such as revenue sharing and salary caps can improve competitive balance implicitly assumes that teams can buy success. Section 5 presents the results on competitive balance in the different leagues. Data on inter-league competitive balance as evidenced by performances in the ERC are outlined in section 6. Some conclusions are offered in section 7.

2: Competitive Balance in Sports Leagues.

A key theme running through the sports economics literature is that uncertainty of outcome is an essential feature of sport and is key to maintaining supporter interest. (Rottenberg, 1956, Neale, 1964, Borland and MacDonald, 2003, and Szymanski and Kesenne, 2004). This in turn requires a degree of equality between a league's member teams.

> "The special problem for sports leagues is the need to establish a degree of competitive balance on the field that is acceptable to fans. In the absence of cross subsidies from strong teams, teams in weak drawing cities lack the incentive to field teams that can compete at the level that would maximise league revenues." (Fort and Quirk, 1995, p.1265).

There is a widespread belief that leagues will be more successful the greater the degree of competitive balance because matches would be more uncertain and therefore more entertaining. (Szymanski and Kesenne, 2004). Szymanski (2003) states that the uncertainty of outcome argument can be reduced to three core elements:

1. Inequality of resources leads to unequal competition.
2. Fan interest declines when outcomes become less uncertain.
3. Specific redistribution mechanisms improve competitive balance and produce more outcome uncertainty.

The competitive balance argument has been advanced and frequently accepted as a justification for a range of practices such as joint selling of broadcast rights, revenue sharing, salary caps and restrictions on players' ability to move between clubs which would generally be considered illegal under competition law in most other industries in many countries. The effect of such measures on competitive balance has been widely debated in the literature.

Rottenberg (1956) pointed out that restrictions on players' freedom to move between teams in baseball had no effect on competitive balance. Empirical studies on the impact of revenue sharing on competitive balance have yielded mixed results. (See, for example, Quirk and El Hodiri, 1974; Downward and Dawson, 1995; Fort and Quirke, 1995; Cave and Crandall, 2001: Szymanski, 2003; Szymanski and Kesenne, 2004; Feess and Stahler, 2009; Garcia and Rodriguez, 2009). Fort and Quirk (1995) concluded that enforceable salary caps were the only effective device for maintaining financial viability and competitive balance. Lenten (2009a) found that salary cap and draft arrangements increased competitive balance in Australian Rules Football, although Lenten (2009b) found that such arrangements had to be

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revised periodically as clubs tended to find ways of evading them. Vrooman (2007) argues that revenue sharing and salary caps will improve competitive balance in leagues if team owners are win rather than profit maximisers. The evidence suggests that English and French rugby clubs like European soccer clubs are win maximisers.[1] The effects of salary caps also depend on how tight (binding) they are.

3: Rugby – A Brief Overview.

Unlike many other team sports Rugby Union remained an amateur sport until 1995.[2] England had no national club rugby league until 1987/88. Prior to that English clubs' fixture schedules consisted of "friendly" matches. Initially the league comprised 12 clubs which played each other once over the course of the season although there were no set dates for fixtures which were arranged on an ad-hoc basis by the individual clubs. Fixed Saturday fixtures were introduced the following season and in 1993/94 the teams first played each other on a home and away basis.[3] Disputes between the RFU, the sport's governing body in England, and the leading clubs over the terms for the release of players to play for the England team and over the division of television revenues following the introduction of professionalism led to the leading clubs establishing a new domestic league competition, known as the Premiership, which began in 1997/98. (McMillan, 1997). Originally the championship was decided on the basis of a straight league format but this was replaced by a play-off system in 2003/04.

The French national championship known as the Top 14 has a much longer history and traces its origins back to 1892. Prior to 2004/5 the league was split into sections with the top teams from each section reaching the play-offs.[4] In 2004/05 the French League was restructured

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[1] Aggregate losses of Top 14 clubs increased from €15m to €22m between 2008/09 and 20112/13 with clubs generally reliant on owners bailing them out. (DNACG, 2013). Similarly the majority of Premiership clubs are loss making. Frick (2007) notes that most European soccer clubs are win rather than profit maximisers.

[2] The Rugby Football Union (RFU) was established in London in 1871. In 1895 a number of clubs based in the North of England sought to introduce payments to compensate players for wages lost as a result of having to take time off work for matches but this was opposed by the majority of clubs. This resulted in a split leading to the establishment of Rugby League which permitted professionalism while Rugby Union remained amateur until 1995. The amateur union code remained the more widely played version of the sport. Throughout the present paper rugby refers to Rugby Union unless otherwise stated.

[3] Source: http://www.premiershiprugby.com/information/history.php

[4] In four of the nine seasons between 1995/96 and 2002/03 the fixture schedule was even more complicated. In those years, teams were divided into two sections and played the other teams in their sections home and away. The top four from each section were then divided into two new sections and each team played the others in their section home and away with the top two teams in each section based on the results of those six matches reaching the play-offs. The bottom four teams from each of the original sections played the bottom four from the other section home and away with the relegated teams decided on the basis of performance over the entire 22 match schedule. The top teams thus played 20 matches between the two league stages while the bottom teams played 22.

into a single division of 16 teams, which was reduced to 14 the following season, with the championship decided by end of season play-offs.

Both the Premiership and Top 14 operate a promotion and relegation system with the bottom team(s) at the end of the season being replaced by the top team(s) from the next tier. Only one team (out of 12) is relegated in England compared with two (out of 14) in France. For much of its history the English Premiership has operated a system of revenue sharing and salary caps. This was originally introduced in 1998/99 to ensure teams' viability rather than as a mechanism for promoting competitive balance. The Premiership nevertheless markets itself as "the most competitive league in world rugby (highest number of games finishing in less than one score compared to any other rugby competition in the world)."[5] The CEO of Premiership Rugby has also claimed: "We position it as the most competitive league in world rugby." (Maxwell, 2012, p.12). The French Top 14 traditionally has had much lower levels of revenue sharing and only introduced a salary cap in 2010/11 after some clubs had experienced financial difficulties.[6] The Top 14 salary cap is approximately double that of the Premiership cap and was set higher than total player salaries in the case of all Top 14 clubs and thus is essentially non-binding.

The Premiership's revenue sharing arrangements, however, provide that newly promoted teams receive far less revenue than incumbents. (Cain, 2013) This may explain why seven teams have been ever present in the Premiership since its inception in 1997/98 while three others have featured in every season bar one. The 12 team Premiership might therefore be better regarded as a semi-open league. Szymanksi (2003) observes that promotion and relegation increases the incentives for smaller teams to compete but reduces the incentive to share revenues.

The European Court of Justice ruling in the *Bosman* case means that, as in soccer, clubs are free to recruit players from other leagues and English and French clubs recruit players on a worldwide basis, particularly from the main Southern Hemisphere rugby playing nations, i.e. Argentina, Australia, New Zealand and South Africa. Top 14 club Toulon, for example, had 20 non-French international players in their 2013/14 squad. (Thornley 2014a). Toulon's club President expressed opposition to any limit on foreign player numbers observing "The French

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[5] http://www.premiershiprugby.com/premiership/structure/index.php
[6] One club, Montauban, went into liquidation in 2010.

league will get more than €70 million per season due to the foreign players who have come to improve the level of competition here and enhance its appeal to the general public". (O'Sullivan, 2014). Thus as in soccer the leagues compete for talent. (Palomino and Sakovics, 2004).

Fort and Quirk (1995) observe that a critical feature of play-offs, which now decide the championship in both leagues, is that they introduce randomness into the selection of the championship winners and therefore reduce the incentive for teams to over-invest in talent. It follows that leagues that are determined on the basis of play-offs should display greater short-run competitive balance than those that are not.

The European Rugby Cup (ERC) was established in 1995/96 coincident with the introduction of professionalism. It is similar in some respects to soccer's UEFA Champions League. The ERC involves 24 teams from six countries drawn from the three main European rugby leagues. In the Premiership, ERC revenues are shared amongst all the clubs in the league, in contrast to the Top 14.

4: Does Money Buy Success?

The exponential growth in team sports' revenues, particularly as a result of technological changes in broadcasting, has been widely documented. (See, for example, Noll, 2007) While rugby has benefitted from the increase in the value of sports broadcast rights, total revenue in the Top 14 and Premiership are much lower than in the top European soccer leagues as Table 1 illustrates.

Table 1: Total Club Revenue in Major European Rugby and Soccer Leagues 2011/12.

League	Country	Sport	Total Revenue €M
FAPL	England	Soccer	2,360
Bundesliga	Germany	Soccer	1,900
La Liga	Spain	Soccer	1,800
Serie A	Italy	Soccer	1,600
Ligue 1	France	Soccer	1,349
Top 14	France	Rugby	256.5
Premiership (2010/11)	England	Rugby	140.0

Notes: Premiership data are for 2010/11.
Source: Deloitte (2013), for the FAPL, Bundesliga, La Liga and Serie A, DNCG (2013a) for Ligue 1, DNACG (2013) for the Top 14 and *The Rugby Paper* for the Premiership.

Top 14 clubs total revenue in 2011/12 amounted to almost €260 million while the Premiership clubs had total revenue of approximately €140 million in 2010/11. Total revenue of both leagues is clearly well below that of the five major European soccer leagues. The table shows that the French soccer league is the fifth largest in revenue terms and has aggregate revenue that is five times greater than that of Top 14 rugby clubs. The emergence of competing pay TV channels in both England and France has led to a substantial increase in broadcast revenues for both the Premiership and Top 14 from the beginning of the 2014/15 season.[7]

The breakdown of club revenues also varies considerably between French rugby and soccer as Table 2 illustrates.

Table 2: % Distribution of Revenue 2011/12

	Ligue 1 (Soccer)	Top 14 (Rugby)
Broadcast Rights	54.0	12.6
Sponsorship	16.2	43.8
Match Revenues	10.9	18.7
Other	18.9	25.0
Total	**100.0**	**100.0**

Source: DNCG, 2013a and DNACG 2013.

In the case of French soccer broadcast rights, which are sold collectively, account for approximately 54% of total revenue which is broadly in line with the situation in the other major European soccer leagues. (Deloitte, 2013). However, league disbursements of broadcast revenue accounted for only 12.6% of Top 14 clubs' income, while sponsorship accounted for almost 44%. These figures illustrate the limited degree of revenue sharing in the case of the Top 14.[8] A large portion of sponsorship revenue in French rugby comes from club owners. Match receipts account for a very small proportion of clubs' total revenue in

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[7] Top 14 annual broadcast revenue is set to increase from €31m in 2013/14 to €71m with effect from 2014/15 following the conclusion of a new broadcast deal with Canal+, although this agreement has since been challenged by the French competition authority. Top 14 annual broadcast revenue in 2002/03 was just €11.9m. Premiership Rugby concluded a deal with BT that will see annual broadcast revenue rise to €46 million. (Rodden, 2014)

[8] We do not have a revenue breakdown for individual clubs but league disbursements of broadcast revenue do not appear to vary between clubs to any great extent. DNACG (2013) provides a breakdown of revenue by groups of clubs which indicates that the average payment per club was approximately €2.2m.

French rugby and soccer and match revenue in Ligue 1 accounts for a significantly lower proportion of revenue than in the other major European soccer leagues.

Dobson and Goddard (2001) reported that revenue was more evenly distributed in the French Ligue 1 than in the other four major European soccer leagues.[9] However, the distribution of broadcast revenue in French soccer was revised in 2005 giving a larger share to the more successful clubs. The stated reason was to improve French teams ability to compete at European level. (Vrooman, 2007).

Figure 1 shows the Gini coefficient for expenditure in the top divisions of the French rugby and soccer leagues over time and this gives some idea of how the degree of financial balance in the two leagues has evolved.[10]. The Gini coefficient for soccer is significantly higher than that for rugby. This is perhaps surprising given that rugby has much less revenue sharing. Given that French soccer has a more even distribution of revenue than the other major European soccer leagues it suggests that the distribution of expenditure in the Top 14 is not too unbalanced compared with other leagues. The Gini coefficient in both leagues has risen in recent years indicating that the expenditure has become more concentrated. This trend is particularly noticeable in the case of soccer where the Gini coefficient has increased from 0.36 in 2007/08 to 0.53 in 2012/13 compared with 0.3 in the case of the Top 14. The sharp increase in concentration in soccer is largely due to one club - Paris Saint Germain (PSG) – which has recorded a substantial increase in revenue and expenditure in recent years following its acquisition by an Arab consortium. The increase in the Gini coefficient is far lower when PSG are excluded.[11] To put these figures in perspective, Dobson and Goddard (2001) reported a Gini coefficient of almost 0.58 for English soccer in the late 1990s.[12]

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[9] They estimated the difference in natural logarithms of expenditure by league for 2000 and reported a value of 0.34 for Ligue 1 compared with 0.39 for Germany, 0.52 Italy, England 0.57 and Spain 0.79.

[10] The formula for the Gini coefficient is

$$G(S) = 1 - \frac{2}{n-1}\left(n - \frac{\sum_{i=1}^{n} iy_i}{\sum_{i=1}^{n} y_i}\right)$$

[11] As noted the share of broadcast revenue going to the top clubs in Ligue 1 has increased since 2005. In 2004/5 the largest broadcast revenue payment was 5.7 times the lowest amount. By 2012/13 the largest payment was 6.5 times the smallest.

[12] If we calculate the Gini coefficients for the top 2 divisions (available on request) in each sport, we find that they are higher than those for the top divisions in each case and have risen in recent years. This suggests a widening gap between clubs in the top division and those in the second tier in both sports,
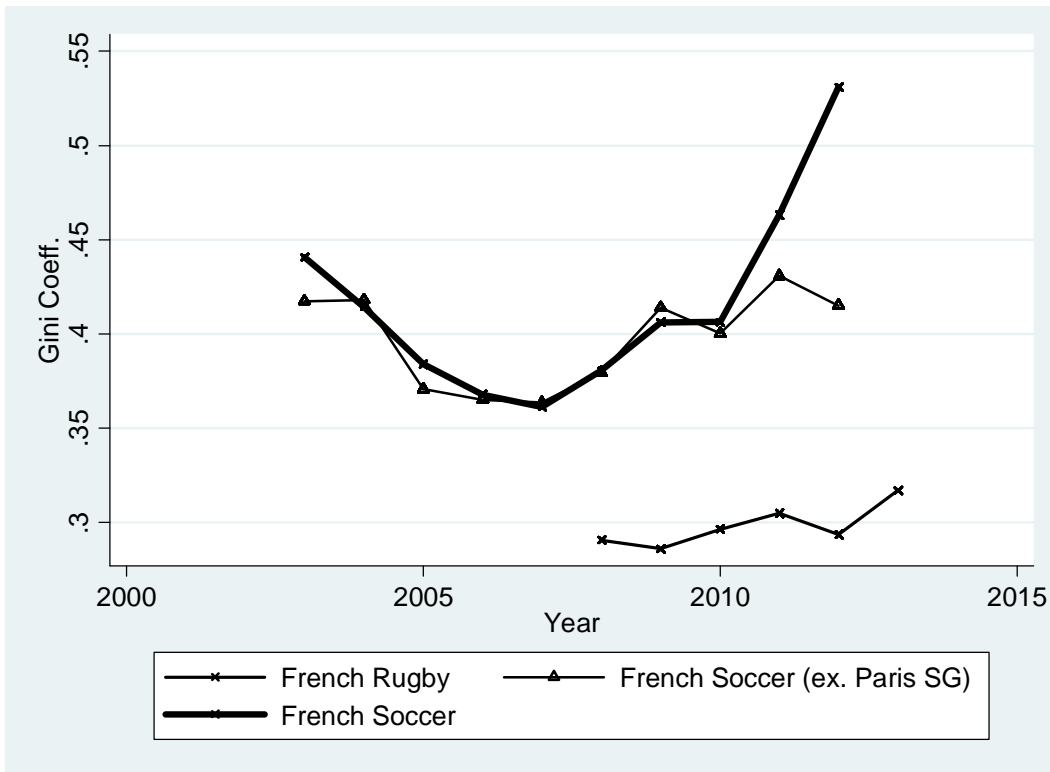
Figure 1: Gini Coefficient of Club Expenditures.

Note: The 2012/13 results for rugby are based on provisional data.

Source: DNACG and DNCG *Annual Reports*, various years.

The view that measures such as revenue sharing and salary caps can improve competitive balance implicitly assumes that teams can buy success. Empirical evidence for other sports leagues indicates that spending more increases teams' chances of winning, particularly in soccer. (Szymanski, 2009). Data on total expenditure by all clubs in the top two divisions of French rugby and soccer is available which allows us to test the relationship between total expenditure and final league position.[13]

Table 3 below shows the coefficients from the regression of final league position in each season on log of expenditure in that season for both the French soccer and the French rugby leagues. Plausibly causation could run both ways, so the regression is best thought of as illustrating the correlation between position and expenditure. Nevertheless, both leagues illustrate a strong positive correlation between the log of expenditure and finishing position. Thus a 10% increase in expenditure is associated with an improvement of one place in a

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[13] For Ligue 1 expenditure data is available from 2003/04 onwards and from 2008/09 onwards for the Top 14.

team's final league position i.e. a move from 5th place to 4th place. This is true for both leagues.

Table 3: Expenditure vs Position

VARIABLES	(1) French Soccer Position	(2) French Rugby Position
Expenditure (log)	-10.78***	-11.49***
	(0.331)	(0.415)
Constant	128.6***	121.0***
	(3.330)	(3.822)
Observations	393	181
R-squared	0.730	0.810

*** p<0.01, ** p<0.05, * p<0.1

5: Measuring Competitive Balance.

The sports economics literature defines three different measures of competitive balance.

- *Short-run uncertainty of match outcome*, i.e. uncertainty regarding the outcome of an individual match which should increase supporter interest in individual matches.

- *Medium term or seasonal uncertainty of outcome*, i.e. uncertainty over which team will ultimately win the league, which should serve to maintain supporter interest in matches involving a wider range of teams over the course of the season;

- *Long term uncertainty of outcome*, i.e. a lack of domination by one or more clubs over a number of seasons, sometimes referred to as dynamic competitive balance. (Szymanski, 2003).

Fourie and Siebrits (2008) reported that the Premiership was more balanced than the Top 14, although their study covered just three seasons. Vrooman (2007) reported that the French soccer league displayed a greater level of dynamic competitive balance than the other four major European soccer leagues in the period since the European Court of Justice *Bosman* judgment. Similarly Pawlowski et. al. (2010) noted that the Champions League had increased competitive imbalance to a lesser extent in France's Ligue 1 than in the other major European soccer leagues. Interestingly Lenten (2009b) found that in Australia, rugby league displayed a higher level of competitive balance than Australian Rules football, although the latter league made greater use of measures designed to promote competitive balance such as salary caps

and player drafts. As in the case of Australian Rules and Rugby League, traditionally there was relatively little geographic overlap between rugby and soccer in France. Southern France has traditionally been a rugby stronghold with only Paris and Toulouse consistently having clubs in the top division in both sports.[14]

(i) Short-Run Competitive Balance.

The most commonly used measure of short-run competitive balance in the literature is the adjusted standard deviation (ASD) of teams' win ratios, which is attributed to Noll (1988) and Scully (1989). Information on team win ratios is readily available. The ASD allows comparisons to be made when the number of teams differs between leagues or over time. Humphreys (2002) argues that this ratio is better than other measures of competitive balance, although Lenten (2009b) points out that it is highly sensitive to occasional outliers.[15] The ASD is calculated by dividing the actual standard deviation of teams' win ratios over the course of a season by an idealised standard deviation (ISD) of win ratios. The ISD is the standard deviation that would be generated by a perfectly balanced league and is given by the formula $0.5/\sqrt{n}$ (where n is the number of matches played).

Figure 2, shows how the ASD has changed over time for the two rugby leagues and for French soccer's Ligue 1.

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[14] Bordeaux has occasionally featured in the top tier in rugby and soccer while in recent years Montpellier has also had teams in the top tier in rugby and soccer.
[15] There have been significant outliers in some seasons in both rugby leagues with instances of teams failing to win a match all season. Owen (2010) argues that the ASD is sensitive to the number of teams in a league and is therefore not suitable for comparisons between leagues and over time.
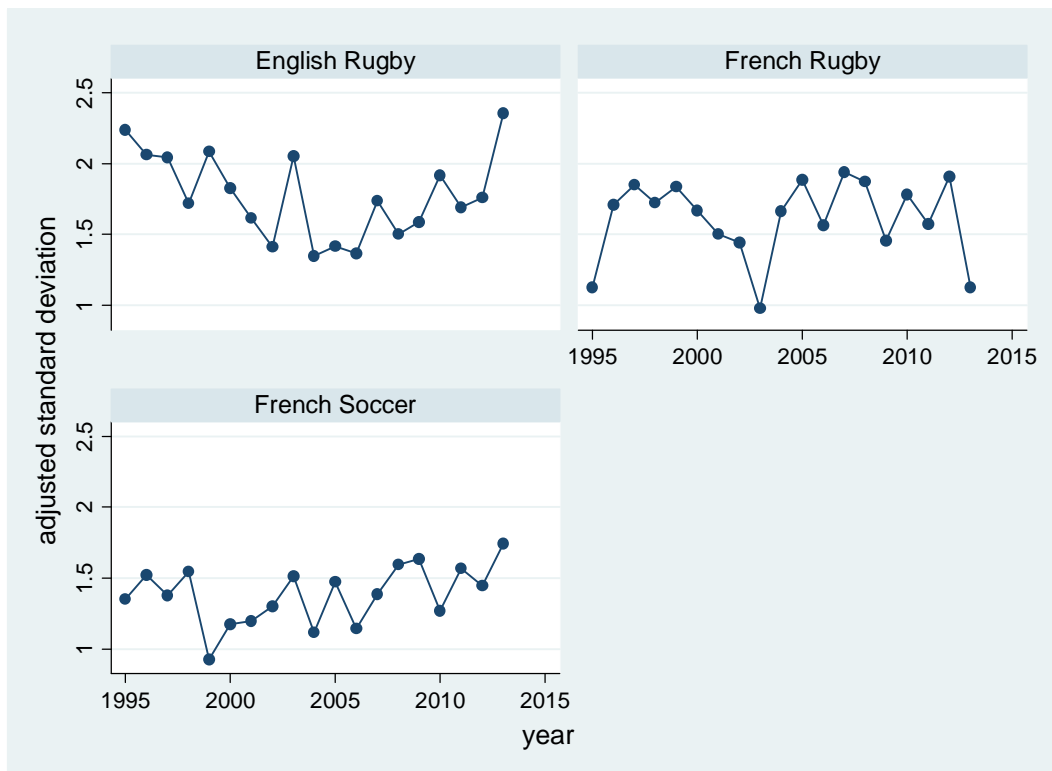
Figure 2: ASD by League

The graphs suggest that French soccer displays a greater degree of short-run balance than rugby. The ASD's for the two rugby leagues, however, are broadly similar and the ASD is slightly lower in the case of the Top 14 in 11 out of 19 seasons. A difficulty arises with the ASD data for the Top 14 because of the unbalanced fixture schedule used in some years, although the ASD results were not significantly affected by whether it was calculated on the basis of the first round of 14 matches or by combining the two series of league matches giving a 20/22 match schedule. Nevertheless, the unbalanced fixture schedule used in some years raises questions about the reliability of the ASD results for the Top 14.[16]

A further problem with using measures based on win ratios to measure competitive balance arises because team sports frequently display a home team bias, i.e. home wins occur far more frequently than away wins. In the extreme if every team in a league won all its home matches they would all have identical win ratios indicating the league was competitively balanced, while simultaneously displaying a very low level of uncertainty. Dobson and Goddard (2001) suggest that a steady decline in the rate of home wins in English soccer over

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[16] Lenten (2008) proposes a mechanism for addressing the impact of unbalanced fixture schedules in a somewhat less complex case involving soccer's Scottish Premier League.

time indicated an increase in competitive balance. Figure 3 shows home wins as a percentage of total matches for English and French rugby and French soccer.
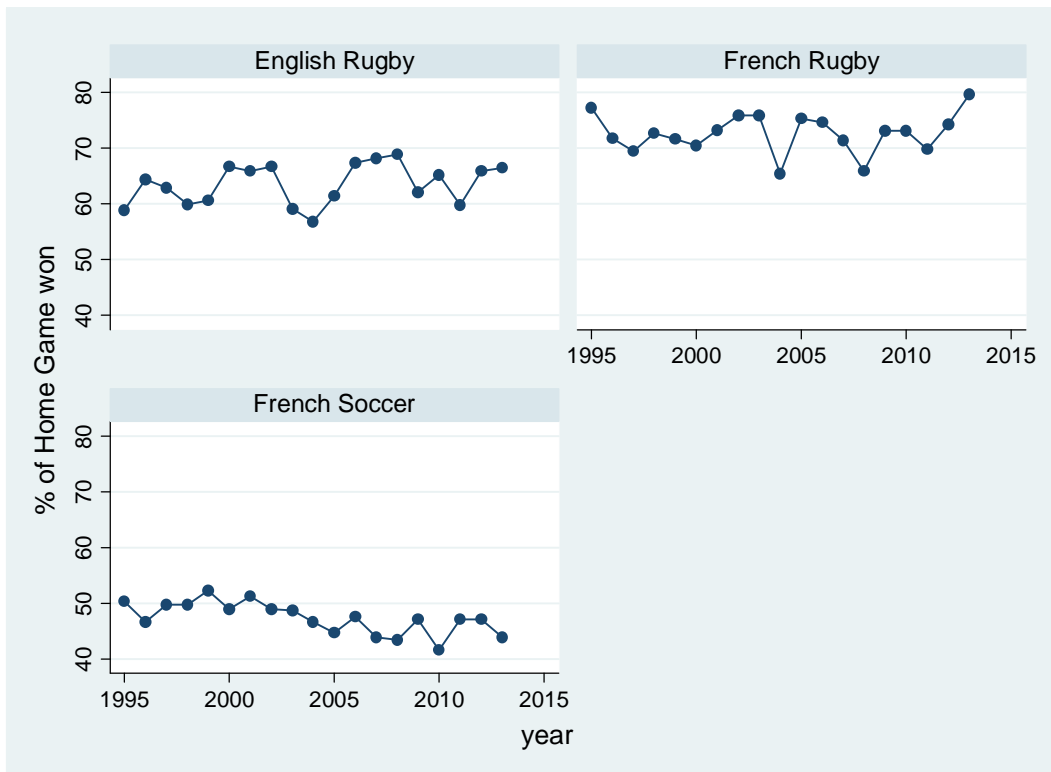

Figure 3: % Home Wins by League

The Top 14 has a higher ratio of home wins than the Premiership. In fact for most of the period covered more than 70% of Top 14 matches resulted in home wins.[17] The ratio of home wins in French soccer at around 45-50% is significantly lower than in either of the two rugby leagues.[18]

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[17] Anecdotally it is sometimes claimed that Top 14 teams frequently put out second string teams away from home.

[18] In part this is because draws are more common in soccer while they are relatively rare in rugby.
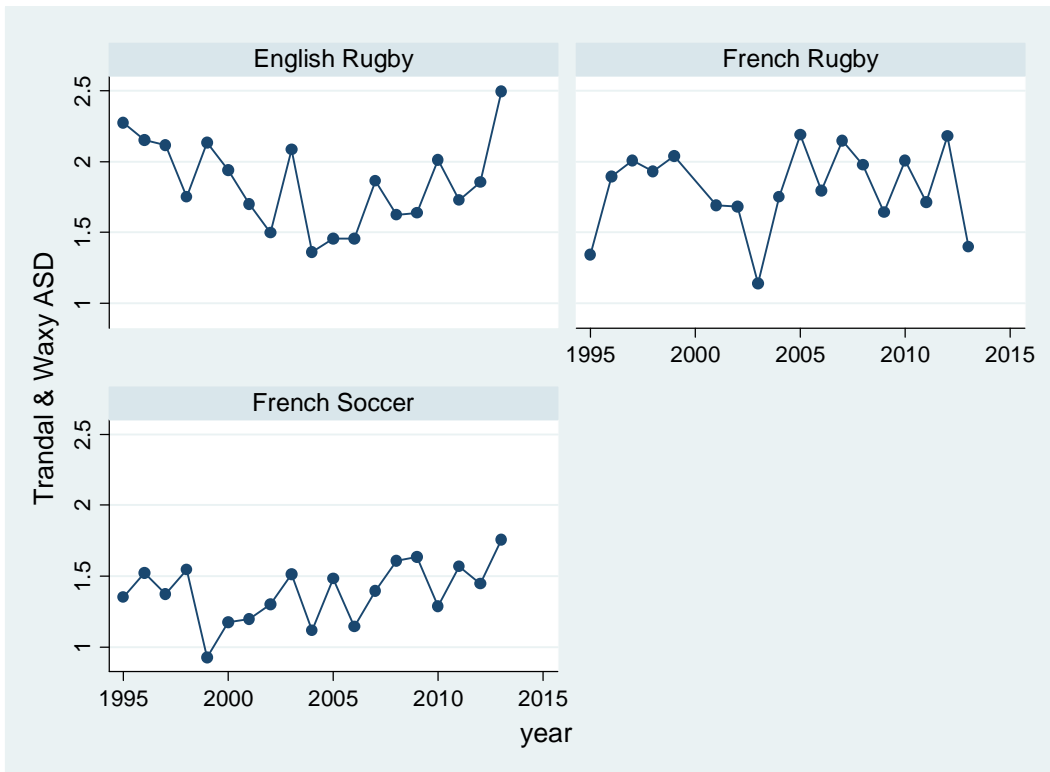
Figure 4: ASD corrected for Home Bias

Figure 4 shows the ASD corrected for home bias, using the method of Trandal and Waxy (2011). As can be seen from a comparison with figure 1, the pattern through time and across leagues is largely unaffected by the adjustment for home bias. The results confirm that short – run competitive balance is significantly higher in French soccer than in French rugby. They suggest that the Premiership may be slightly more balanced than the Top 14.

Both the Premiership and Top 14 award a bonus point when a team loses a match by seven points or less. In theory, a difference of seven points or less means that the teams were divided by a single score at the end of the match (seven points is the equivalent of a converted try) suggesting that the outcome (likely winner) was uncertain up to the final whistle. The number of "close" matches defined as matches where there was just a single score (seven points or less) between the teams (including drawn matches) thus provides an alternative measure of short-run competitive balance in rugby.[19]

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[19] The CEO of Premiership Rugby cited the fact that 55% of Premiership matches involved a winning margin of seven points or less as indicating that the league was highly balanced. (Maxwell, 2012). Draws (ties) are much rarer in rugby than in soccer. In the 18 seasons since the Premiership was established less than 4% of matches have been drawn.

Figure 5 shows the percentage of games that were "close" in the Premiership and Top 14.
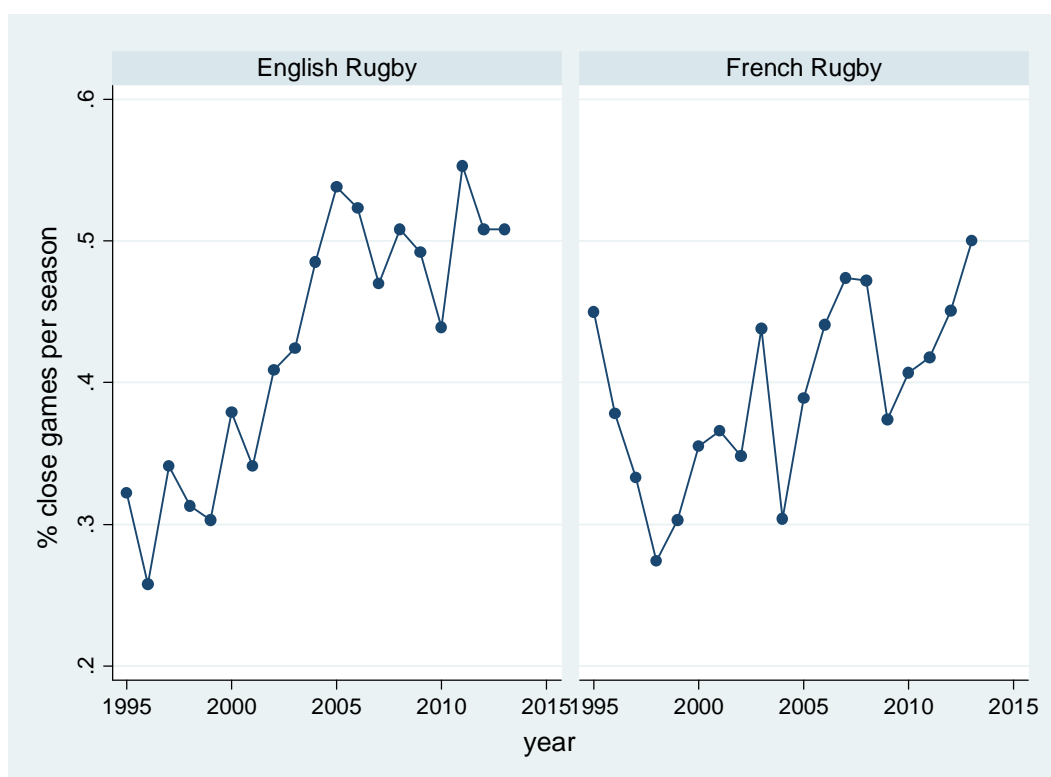

Figure 5:

% Close Games

The percentage of close matches in the Premiership increased sharply over time and is significantly higher than in the Top 14 indicating that English rugby displays a higher degree of short-run competitive balance. As previously noted, the Premiership regularly cites such data as evidence that it is the most competitive rugby league in the world.

(ii)   Long-Run Competitive Balance.

Long term or dynamic competitive balance depends on the extent to which a league is dominated by a small number of teams or whether the championship rotates between a larger number of teams. Table 4 gives details of the number and frequency of championship wins for the Premiership and the Top 14 since the introduction of professionalism in 1995/96. Similar data is included for the five major European soccer leagues and the American National Football League (NFL), generally recognised as the most evenly balanced sports league in the world, for comparative purposes as well as for the other main European rugby

league, the Celtic League.[20] The table ranks the leagues according to their Herfindahl-Hirschman Index (HHI) values. The HHI is widely used to measure market concentration in the industrial organisation literature and can be used to measure dynamic competitive balance in sports leagues. (Leeds and von Allmen, 2005). In this case a team's "market share" can be defined as the number of championship wins over a period of time. Teams' "market shares" are squared and summed to arrive at the HHI in the normal way for each league. The maximum value of the HHI in each case is 1 which would arise where a single team "monopolised" the league by winning it every season while the minimum value is $1/t$ where t is the number of seasons.

Table 4: Championship Winners in Various Leagues 1995/96-2012/13.					
League	Sport	Country	Number of seasons	Number of winners	HHI
NFL	American Football	US	19	12	0.097
Ligue 1	Soccer	France	19	10	0.186
Premiership	Rugby Union	England	19	9	0.224
Top 14	Rugby Union	France	19	7	0.241
Celtic	Rugby Union	Multi-country	13	5	0.254
Serie A	Soccer	Italy	18	5	0.284
La Liga	Soccer	Spain	19	5	0.302
Bundesliga	Soccer	Germany	19	6	0.391
FAPL	Soccer	England	19	4	0.396

Notes: Rugby's Celtic League comprising teams from Ireland, Scotland, Wales and (since 2010/11) Italy only began in 2000/01. Juventus were stripped of the Serie A title in 2004/05 due to alleged match fixing and so that year has been excluded in the case of Serie A.
Source: As Table 1 for the three rugby leagues; http://int.soccerway.com/ for the soccer leagues and http://www.nfl.com/superbowl/history for the NFL.

The HHI data confirm the view that the NFL displays the highest level of dynamic competitive balance while English Soccer's FA Premier League (FAPL) has the lowest level of dynamic competitive balance. In rugby, the Premiership has a slightly lower HHI than the Top 14 which is consistent with expectations, while the Celtic League is slightly more unbalanced than the other two rugby leagues. The three rugby leagues have a higher degree of dynamic competitive balance than four of the five major European soccer leagues. French

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[20] The Celtic League was established in 2000/1 comprising teams from Ireland, Scotland and Wales. Two Italian teams were added in 2010/11.

soccer displays a significantly higher level of dynamic competitive balance than the Top 14, which is in line with expectations. It also has a much higher level of dynamic competitive balance than the other four major European soccer leagues which is consistent with previous studies.

While evidence on the extent to which the championship rotates among teams over time provides some indication of the level of dynamic competitive balance, it is somewhat limited. First it only focuses on the winning team and provides no information on the performance of the remaining teams. Second in the NFL, Top 14, the Premiership (since 2002/03) and Celtic League (since 2009/10), the championship is ultimately decided on the basis of an end of season play-off in contrast to the five soccer leagues where the champions are decided on the basis of a straightforward league format. Play-offs introduce an element of randomness into the determination of the champions (Fort and Quirk, 1995) and thus, other things being equal we would expect a larger number of teams to win the championship over time where the contest is decided on a play-off basis compared with a straight league. Viewed in that light the high level of dynamic competitive balance in French soccer's Ligue 1 is striking.

We therefore apply an alternative measure of dynamic competitive balance using a test proposed by Vrooman (2007). The test measures teams' performances on the basis of points obtained over the course of a season as a percentage of the maximum possible points obtainable. The test assumes that the points obtained by a team would follow an autoregressive process over playing seasons. If the auto regression has close to a unit root then the league would be largely deterministic i.e. the league structures act to keep the imbalance between teams constant with any change being the result of a random shock. The Vrooman test includes all the teams in the league and relates only to the regular season schedule.

Table 5 shows the results from the Vrooman (2007) regressions applied to the panel of teams that constitute each league. The data used in the first two columns have been adjusted to eliminate bonus points in both rugby leagues which might bias comparison as the bonus structure varies across the leagues and through time. The first column shows the standard Vrooman measure applied to the English Premiership. The second column reports the corresponding results for the French Top 14. As can be seen, the coefficient is far from a unit

root in both cases.[21] However, it does appear that French Rugby is considerably less balanced than its English counterpart. In France any imbalances that occur are more likely to persist over time as team's performance exhibits more persistence.[22]

The third column gives the results for French soccer's Ligue 1. The results show that dynamic competitive balance was much higher in French soccer than rugby.

Table 5: Results of Vrooman Test

VARIABLES	(1) English Rugby Vrooman Score	(2) French Rugby Vrooman Score	(3) French Soccer Vrooman Score	(4) English Rugby Vrooman Score (incl. bonus pts.)	(5) French Rugby Vrooman Score (incl. bonus pts.)
Vrooman Score Last Season	0.549*** (0.0664)	0.654*** (0.0571)	0.579*** (0.0582)	0.534*** (0.0643)	0.827*** (0.0451)
Constant	0.226*** (0.0365)	0.173*** (0.0327)	0.188*** (0.0284)	0.223*** (0.0337)	0.0843*** (0.0288)
Observations	197	257	296	197	257
R-squared	0.260	0.340	0.252	0.262	0.569

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

The fourth and fifth columns perform the same analysis for both Rugby Leagues but include bonus points in the calculation of the Vrooman coefficient.[23] As can be seen the adjustment, makes the differences between the two leagues more stark but it is still the case that imbalances persist for longer in the French league.

6:   Inter-League Competitive Balance.

Several authors have concluded that revenue accruing to leading European soccer clubs from participating in the Champions League has resulted in a decline in competitive balance in

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[21] The results are for OLS estimation of the autoregressive equation. If the Random Effects panel data estimator is employed, essentially the same results apply. Similarly including fixed team effects renders the coefficient insignificant, as would be expected.

[22] A further adjustment is possible for the French league to reflect the four year period when the league was conducted in two phases (see above). When the Vrooman calculation is adjusted to account for this the autoregressive coefficient reduces to 0.6 with a standard error of 0.058.

[23] Both rugby leagues award bonus points to a team losing by seven points or less. In addition the Premiership awards a bonus point for a team scoring four tries or more while the Top 14 awards a bonus point for a team winning a match by three tries or more.

both national leagues and in the Champions League itself. (Noll, 2007; Szymanski, 2007; Vrooman, 2007; Pawlowski et. al., 2010; and Lee and Fort, 2012).

> "European Champions League has distorted competitive balance throughout domestic European football. Elite teams have long outgrown their respective leagues, and the small revenue clubs are going under to keep a distant pace." (Vrooman, 2007, p.344).

The results in the previous section do not suggest that the ERC has distorted competitive balance within European rugby leagues. We now consider the evidence on balance at ERC level.

In general Top 14 teams have much greater financial resources than those in the other ERC participating countries. Table 1 indicated that total revenue of Premiership clubs was equal to approximately 55% of the total revenue of Top 14 clubs. Deloitte (2011) estimated that nine of the top ten European rugby teams in revenue terms were in the Top 14 with just one Premiership team making the top 10. According to Owen (2010) the average annual player salary in the Top 14 was £100,000 compared to £80,000 in the Premiership.

Table 6 gives data on total revenue of English and French teams that participated in the ERC in 2010/11, the most recent season for which we have data for all of the English participants. It confirms that, with the possible exception of Leicester, participating English clubs revenue was generally much lower than that of the Top 14 clubs. The table also shows that Toulouse, who have won the ERC four times, were well ahead of their Anglo-French rivals in financial terms.

The greater financial resources and absence of any salary cap would suggest that French clubs should outperform their English and Celtic counterparts in the ERC. The evidence on this is considered in Table 7 which looks at the number of championships, quarter-final appearances and percentage wins in pool stages in the ERC by teams from each of the three leagues.

Table 6: Revenue of Premiership and Top 14 ERC Participating Teams 2010/11		
Team	Country	Revenue €m
Toulouse	France	35.6
Clermont Auvergne	France	25.2
Racing Metro	France	23.5
Leicester Tigers	England	22.7
Toulon	France	22.3
Biarritz	France	18.6
Perpignan	France	16.7
Castres	France	15.9
Northampton Saints	England	15.4
Bath	England	11.2
London Wasps	England	9.6*
London Irish	England	9.6
Saracens	England	8.9

Notes: London Wasps relates to 2009/10. The €/£ average exchange rate for the period 1 July 2010 to 30 June 2011 was used to convert revenue for English teams to Euros. News paper reports suggest that the top Irish Celtic League teams have budgets in the region of €8m (Thornley, 2014b) while top Welsh side Cardiff reportedly had a budget of around €10m in 2009/10.

The results indicate a high level of dynamic competitive balance. Top 14 teams won the ERC seven times while Premiership and Celtic League teams recorded six wins apiece. If we look at the number of quarter-final appearances, again it is quite evenly balanced with English clubs registering slightly fewer appearances than teams from the other two leagues, although this is partly due to the fact that they did not participate in the competition in 1998/99. If we look at win percentages in pool stage matches, again we find that English and French teams have a very similar record, while in this case the Celtic League lags somewhat behind. The other interesting feature of the table is the fact that Irish teams have outperformed those of the other Celtic League countries. All six Celtic League ERC wins were due to Irish teams, while

they have a much higher win ratio and number of quarter final appearances than the Scots or Welsh teams. In fact Scottish teams have only reached the quarter finals twice in 18 seasons and have a win ratio of just over 31%.[24] These results suggest that the ERC is relatively evenly balanced, despite differences in resources and in the application of salary caps. Anecdotally it has been suggested that French clubs attach greater importance to winning their domestic league than the ERC, although the fact that Toulouse won the trophy four times, more than any other team is hardly consistent with this view.

Table 7: ERC Performances by League

	Champions	Appearances in Quarter-Finals	% Wins in Pool Stages
Top 14	7	52 (48)	56.8
Premiership	6	41 (41)	56.5
Celtic League	6	51 (47)	47.4
Of which			
Ireland	6	30 (28)	62.6
Scotland	0	2 (2)	31.1
Wales	0	19 (17)	43.8
Italy	0	0 (0)	11.3

Notes: Figures in parentheses exclude the 1998/99 season as English clubs did not participate in the ERC that season. The aggregate data for the Celtic League does not include Italian teams as they only joined the league in 2010/11. Prior to this the Italian ERC participants were drawn from their national league.

Source: http://www.ercrugby.com/heinekencup/history/

In soccer the distribution of Champions' League revenue favours teams from larger countries, based on their larger broadcast markets, which explains why it has an unbalancing effect. In contrast ERC revenues were distributed more evenly effectively, resulting in a transfer from the two larger countries to the smaller ones. Total ERC revenue was believed to be in the region of €50 million of which Premiership and Top 14 clubs each received €15m while the Irish, Scots, Welsh and Italians received approximately €5m each.[25] One commentator described the ERC arrangements as "preposterously slanted in favour of the Irish and Scottish, despite the fact that through their television and other commercial deals, the Irish provide very little for the community pot." (Jones, 2014) The English and French clubs

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[24] Only 12 teams entered the ERC in its first season and thus there were no quarter finals so that while the competition operated for 19 seasons there were only quarter finals in 18 of those seasons.
[25] 85% of revenue was distributed between the three participating leagues with the remaining 15% based on merit payments.

threatened to withdraw from the ERC at the end of the 2013/14 season unless they received a larger share of the revenue. After a lengthy stand-off a new competition to be known as the European Champions Cup (ECC) is to be introduced in 2014/15 replacing the ERC. The Anglo-French clubs will receive a higher share of revenue in the new competition than in the ERC. The increased share of revenue from the new European competition allocated to English and French clubs, along with the hike in their domestic broadcast revenue suggests that the new ECC may not be as evenly balanced as the former ERC was.

7:   Conclusions.

The paper considers the results of two natural experiments on the impact of revenue sharing and salary caps on competitive balance in sports leagues arising from the introduction of professionalism in rugby in 1995. The English Premiership has operated revenue sharing and a salary cap for most of the subsequent period while the French Top 14 for the most part has not. If such measures were effective in promoting competitive balance, *a priori* we would expect the Premiership to display greater competitive balance. A number of measures suggest that the Premiership displays greater short-run and long-run competitive balance than the Top 14. We also find that the French Top 14 is more unbalanced than France's Ligue 1 soccer league, which is regarded as the most evenly balanced of the major European soccer leagues. The Top 14 may become even more unbalanced in future. Following the announcement that Top 14 broadcast revenue was set to more than double in 2014/15, Toulon club president Mourad Boudjellal called for the distribution of broadcast revenue to be merit related:

> "...the broadcast rates have been increased, but now we need them to be distributed in a rational manner. Merit has a price. If these criteria are not honoured I will oppose the screening of RCT's [Racing Club de Toulon] matches at the Stade Mayol." (O'Sullivan, 2014)

Palomino and Sakovics (2004) suggest that, when there is competition between leagues for players, performance based revenue sharing represents an equilibrium outcome as the increase in skill (quality) levels is likely to outweigh any decline in competitive balance.

Historically revenue from the ERC was more evenly distributed between different countries and leagues than is the case for soccer's UEFA Champions' League. Consequently the ERC had not increased imbalances within leagues and at European level in the same way as the Champions' League in soccer. This may change in the future as English and French clubs

will receive a larger share of revenue from the new ECC while their domestic broadcast deals have also increased substantially.

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