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COMPETITIVE BALANCE IN AMERICAN COLLEGE FOOTBALL: THE GI BILL, GRANT-IN-AID AND THE COLLEGE FOOTBALL ASSOCIATION

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This paper identifies three historical events, listed in the title, representing key changes in the business structure of American college football and then tests to see whether these events are associated with changes in competitive balance. The analysis shows that balance has been relatively stable despite these alterations. The significant effects that are uncovered are confined to single conferences suggesting these events are not tied to widespread changes in balance throughout the sport. Additionally, the margin of victory ratio, a metric accounting for game closeness is introduced. Based on this measure, game uncertainty in individual conferences has improved over time.

Introduction

Research on competitive balance is a centerpiece topic in the sports economics literature (Rodney Fort, 2006). Despite this, empirical work examining competitive balance in big-time college football has largely been ignored. This paper addresses this deficiency by investigating the behavior of balance in response to three key historical changes in the business structure of the sport – the introduction of the GI Bill, the formalization of athletic grant-in-aid (GIA) and the cessation of the College Football Association (CFA).

The idea of competitive balance stems from the uncertainty of outcome hypothesis (UOH) introduced by Simon Rottenberg (1956).

Essentially, if consumers respond to close contests, tight conference championship races or year-to-year uncertainty – then blowouts, runaway champions and dynasties reduce the value of the product to fans and subsequently college football conference members. Thus, monitoring balance is important since balance appears to matter to both fans and conferences.

Past research on competitive balance in college football is severely limited and each of the existing contributions examines the behavior of competitive balance in response to events viewed as key business changes at the National Collegiate Athletic Association (NCAA) or the individual conference level. This strand of scholarship is known as the analysis of competitive balance (ACB) literature and aims to track the behavior of balance over time or in response to an event which altered the business structure of the sport (Rodney Fort and Joel Maxcy, 2003). Existing work has examined the effects of television deregulation (Randall W. Bennett and John L. Fizel, 1995), changes in scholarship limits (Daniel Sutter and Stephen Winkler, 2003), conference realignment (James Quirk, 2004), and NCAA rules enforcement (E. Woodrow Eckard, 1998; Craig A. Depken II and Dennis P. Wilson, 2004a, 2004b and 2006) on competitive balance.

This contribution continues the ACB line of investigation by examining balance in response to three key historical events which were substantial changes to the business structure of college football. First, the GI Bill is a college parallel to free agency. The formalization of athletic GIA regulated student-athlete compensation following years of failed reform. Lastly, the cessation of the CFA represented a change in the revenue distribution structure in big-time college football.

To preview the results, the behavior of competitive balance at the highest levels of college football has been relatively stable despite these three alterations in the business structure of the sport. The analysis uncovers significant changes in balance around each event, but in each case the effects are confined to a single conference. This means that while there appears to be some evidence of changes in balance at the individual conference level associated with each event, it is clear that the events are not associated with changes in balance that span the entirety of the sport. Additionally, because competitive balance metrics accounting

for game closeness are absent for the sport of American football, a new metric, the margin of victory ratio is created. According to this metric, it is clear that individual game closeness within the conferences measured has improved over time, representing an improvement in one aspect of balance.

The paper proceeds with a description of each historical event, a brief outline of competitive balance, data description, methods, results, discussion and conclusion.

The GI Bill

The introduction of the GI Bill[1] is a college parallel to "free agency" involving the immediate post-World War II (WWII) rearrangement of revenues toward players. WWII caused an exodus of playing talent out of college football following the attack on Pearl Harbor in December of 1941 (Paul A. Reimann, 2004). Before the end of 1940, Congress had required males between the ages of 18 and 45 to register with the Selective Service. Shortly thereafter, the draft was put into effect and 18 to 20 year old males were forced into service. Military obligations were mandated to last the duration of the war plus an additional six months (Charles C. Moskos, 1988). This chain of events caused the widespread exit of both varsity level high school and college playing talent away from athletic competition and into military service. The impact on college football programs was substantial – 39 percent of universities that fielded a major college football program ceased operations for at least one year during the war. At levels of competition below Division I-A, a massive 82 percent of institutions halted programs between 1943 and 1946 (Harold Claassen and Steve Boda Jr., 1961).

The GI Bill entitled any veteran with ninety or more days of service time to one year of college education. Each additional month of active duty service time netted an additional month of schooling, with a maximum of 48 months. The Bill paid up to $500 per year in tuition, fees and supplies; an amount exceeding the cost of the most expensive institutions at the time. The GI Bill also granted single veterans a stipend of $50 per month and married veterans $75 (Michael D. Haydock, 1996).

With the war in the rear view mirror and the GI Bill in place, veterans returned to U.S. institutions of higher education *en masse*. With

both the 1942 senior class of high school athletes and those who were already playing college football at the onset of the war returning home, the nature of college recruiting changed drastically in 1946. In conjunction with the returning influx of playing talent, the lenient restrictions associated with the GI Bill sparked a recruiting rampage. GI Bill regulation allowed those veterans who played only one year of college football prior to the war to attend any institution of their choosing upon return *without losing any eligibility*. Major college football programs which had previously suspended play due to a lack of numbers now not only had enough athletes to field competitive teams, but fierce recruiting battles for their services ensued (Donald S. Andrews, 1984; Reimann, 2004). This limited type of "free agency" clearly sent more of the generated revenue to athletes as compared to before the GI Bill.

Prior to WWII, recruiting was primarily a regional activity. The combination of increased access to air travel, enhanced recruiting budgets and larger bowl payouts following the troops' return elevated the process to the national stage (Jack Falla, 1981; Walter Byers, 1995; Reimann, 2004). Institutions were aware that their ability to attract talent and subsequently field competitive football programs could enhance their national recognition. This scenario resulted in some returning servicemen "selling" their services to the highest bidder. With little serious NCAA regulation and with some programs naturally possessing more resources than others, programs were able to compensate players in various manners including reports of programs simply "buying" players. In many cases, the financial compensation was rumored to be "fabulous" for the time period (Andrews, 1984). Thus, beginning with the 1946 season, football players enjoyed a bit of "free agency" that did not exist prior to the passage of the GI Bill, making this event suitable for competitive balance testing.[2]

Formalization of Athletic Grant-In-Aid

The formalization of athletic GIA in 1956 is the event which formalized student athlete compensation. However, based on the NCAA's extensive history of unsuccessful attempts at reform, the historical accounts regarding NCAA regulation are mixed and this

necessitates a description of the series of events leading up to the formalization of GIA.

It is commonly noted that, after the demise of the Sanity Code[3], the passing of the NCAA "12-Point Code" in 1952 was the turning point in NCAA regulation (Falla, 1981; Eckard, 1998). Included in this new legislation were two items focused on student-athlete compensation. The first was point number seven in the 12-Point Code, which was to "limit the number and amount of financial grants to athletes." The second was an excerpt in a section titled "Principle Governing Financial Aid" which stated, "any athlete who receives financial assistance other than that administered by his institution, shall not be eligible for intercollegiate athletic competition" (Falla, 1981, pp. 135-136). This legislation passed by the NCAA did prohibit outside entities from providing financial assistance to athletes, but it did not set specific limits on financial aid or compensation that can be provided to an athlete by their institution. Therefore, without specific compensation limits set and enforced by the NCAA, it is unreasonable to assume that programs across the country would uniformly be providing compensation packages of equal value to athletes. Based on the specifics of the 12-Point Code, this 1952 change in NCAA regulation should not be considered the event which regulated student athlete compensation.

Instead, the effectual turning point in the regulation of NCAA athlete compensation occurred in 1956, with the formal adoption of athletic GIA (Byers, 1995). This ruling established guidelines for student-athlete compensation across the NCAA and ended a roughly 30-year period of either non-regulation or unsuccessful enforcement of regulation where significant variation in compensation among institutions was the norm. This policy change was ratified at the 1956 NCAA Convention. The GIA program allowed for institutions to compensate undergraduate athletes regardless of their financial need or academic potential. It provided them with "commonly accepted educational expenses," which included tuition, fees, room and board, books and $15 per month for laundry. Grants were provided for a maximum of four years and could not be annulled even if an athlete decided to remove himself from the athletic program. The goal was to provide athletes with only what they would need in order to bring

compensation back to levels appropriate with amateur status (Byers, 1995).

Establishment of the GIA program was due largely in part to the explosion of lucrative offers made to athletes following WWII and the failure of the Sanity Code. Officials from the Southern, Southeastern and Southwest conferences lobbied for the new system, while the traditional football powers in the Ivy League and Big 10 Conference supported the status quo. Supporters of the GIA program, consisting largely of the southern schools and traditional non-powers believed that the shift would level the playing field in terms of the ability to recruit talent (Byers, 1995).

Under the new athletic grant system, institutions would be able to provide compensation only up to the levels set forth in NCAA bylaws. The previous structure was identified by erratic levels of athlete compensation based largely on an institution's desire to produce a quality football program and on the levels of booster and alumni contributions (Andrews, 1984; Byers, 1995). The shift to the GIA program eliminated direct payments to athletes and their parents by athletic boosters and alumni. The new athletic grant system resulted in an arrangement where boosters paid the institution directly and in turn those contributions were used to fund athletic grants (Byers, 1995).

Previous literature marks the 12-Point code in 1952 as the point in time where large scale enforcement of NCAA regulations actually began to materialize (Falla, 1981; Eckard, 1998). While the historical documents largely appear to support this stance, further evidence points to the 1956 introduction of athletic GIA as the event marking a tangible shift in the manner in which student-athletes were compensated. The 1952 legislation was the catalyst leading to more stringent enforcement of regulations following years of ineffective regulation. However, it is clear based on the account of Walter Byers, NCAA Executive Director from 1951 to 1988, that the establishment of athletic GIA in 1956 was the event that normalized compensation and largely eliminated direct payments to student-athletes (Byers, 1995).

Therefore, the 1956 formal adoption of athletic GIA is taken as the event that formally standardized student-athlete compensation. As with the GI Bill, the institution of GIA altered the share of revenue generated

by athletes that they were able to keep for themselves, making this event suitable for testing of competitive balance.

The Demise of the CFA

Previous literature has used changes in revenue sharing arrangements as testing points for the behavior of competitive balance. An important parallel occurred in the NCAA in the mid-1990s with a significant change in the way television broadcast revenue was collected and distributed in big time college football. This shift transpired following the 1995 season with the conclusion of the CFA national television contract. Following this event, the television broadcasting model shifted from a single contract dominated by the CFA to the current characterization where each individual conference negotiates their own deals and distributes those revenues to member institutions.

The CFA was formed in 1976, with 62 of the major college football programs, excluding the Big Ten Conference and Pacific Ten Conference members, joining the organization. With the NCAA firmly entrenched as the single entity controlling college football television rights, the CFA was established largely to gain influence over the broadcasting process. In 1981, the CFA negotiated a separate television deal with NBC that provided more exposure and was more lucrative than the deal constructed by the NCAA (David Greenspan, 1988). But the NCAA threatened CFA members with severe penalties including expulsion from the NCAA, exile from participation in the NCAA Men's Basketball Tournament and elimination of bowl game affiliations if any institution were to sign the broadcasting deal with NBC. In response, the CFA collectively declined to enter into contract with the network (John J. Siegfried and Molly G. Burba, 2004).

By the early 1980s, NCAA control over college football telecasts was in the midst of another serious challenge by some of college football's most successful programs. With television exposure being artificially restricted by the NCAA[4], the Supreme Court granted individual institutions the right to negotiate their own broadcast deals (Greenspan, 1988) through the *The Board of Regents of the University of Oklahoma, et al. v. the NCAA* case. This verdict also resulted in the voidance of the NCAAs existing television contracts, worth $280 million

(Siegfried and Burba, 2004). Consequently, the number of televised college games increased dramatically as the CFA, several conferences, and individual institutions all began signing broadcasting deals.[5]

This series of events marked the emergence of the CFA as the leading entity in television negotiations.[6] The CFA negotiated four separate deals with multiple network and cable partners from 1984 to 1995. Under the CFA contracts, member schools collected revenues based on two factors. First, each program received a direct payment for being a CFA member – approximately 20 to 25 percent of the total contract amounts. The remaining revenue was distributed based on the number of television appearances per program. The CFA deals allowed for programs to appear on television more frequently as compared to the NCAA reign. Naturally, the strongest programs were the financial beneficiaries of this decision, but some conferences did share appearance revenues between their members (Siegfried and Burba, 2004).

Despite the backing of the majority of the most successful programs in the nation, the CFA began to weaken in 1990. The first considerable blow came early that year when Notre Dame, the independent member of the CFA with the strongest national appeal, left the organization to sign a four-year, $38 million broadcasting deal with NBC.[7] The fallout from the move arrived when ABC mandated a $25 million payment reduction to the CFA in their upcoming broadcasting deal (Richard Sandomir, 1991). This was a substantial setback, but it was the events of 1995 that signaled the end for the CFA. With the current CFA television deal expiring at the end of the year, CBS made an aggressive move to acquire the rights to Southeastern Conference (SEC) football. Despite previous overtures from ABC in the late 1980s that the conference declined, the SEC decided to withdraw from the CFA and accept the five-year, $85 million offer from CBS. With both Notre Dame and the SEC gone from the CFA, the organization's collective bargaining power was virtually eliminated and the CFAs role in negotiating broadcasting deals ended with the conclusion of the 1995 contract (Siegfried and Burba, 2004).

Following the conclusion of the 1995 CFA television deal, 1996 marked a massive reorganization of partnerships between conferences and the major networks and cable companies. In addition to the SEC contract, CBS also acquired the rights to Big East Conference contests.[8]

The Atlantic Coast Conference (ACC) followed by signing five-year deals with both ABC and ESPN for the 1996-2000 seasons. The ABC deal paid the ACC approximately $50 million while the ESPN deal grossed the conference $30 million (Associated Press, 1994). The Big 12 Conference inked an eight-year deal with ABC and Liberty/Prime Sports and a secondary broadcasting deal with Fox Sports (B.G. Brooks, 1995).[9] The Pac-10 also signed a deal with Fox beginning in the 1996 season. In addition to these new partnerships, the Pac-10 and Big Ten both had existing contracts with ABC that were arranged during the reign of the CFA. The demise of the CFA marked the shift from a single entity collectively negotiating television deals to the current characterization where conferences individually bargain contracts.

The result of this shift away from a unified CFA television deal marked a significant change in the way revenue was distributed among college football's largest programs. The CFA deals consisted of membership and appearance payments that subsidized all members, but clearly benefitted the nation's most popular programs. Once the reign of the CFA ended, the new system enabled conferences to distribute broadcasting revenues as each saw fit. This resulted in a discernible change from the CFA era where a single contract was negotiated and each member was bound to the membership and appearance payout structure collectively determined by the organization. Under this revenue distribution structure, a maximum of 25 percent of the yearly television revenue was split evenly among programs as a payment for being a CFA member. Consequently, at least 75 percent of the television revenue collected by the CFA was distributed based on number of television appearances.[10] As expected, the more successful and traditional powerhouse programs were the financial beneficiaries of the CFAs payout scheme.

Competitive Balance Concepts and Measures

It is fairly straightforward to characterize fans as caring about multiple balance concepts – the closeness of individual games, the closeness of season outcomes for entrance into the post-season, and the level of uncertainty about championships across-seasons (dynasties). These concepts reveal "competitive balance" as multi-faceted and

therefore, no single metric is appropriate for measurement. P.J. Sloane (1976) introduced these concepts and over time his contributions have morphed into three distinct categories of competitive balance – game uncertainty (GU), playoff uncertainty (PU), and consecutive-season uncertainty (CSU) (John A. Cairns, 1987). The empirical literature has produced multiple metrics for each category.

Prior to 2014, the non-playoff postseason bowl structure in college football was unique in North American sports. Based on the ever changing number of bowl games and the varying contractual tie-ins to those bowl games, this paper focuses on the concepts of GU and CSU, as discussing PU over time in the sport is largely uninformative. Existing metrics assessing GU have examined the dispersion of team winning percentages and the degree of game closeness. Measures of CSU are less developed and the existing metrics have attempted to capture the degree of variance in team quality over successive seasons. The metrics utilized here are detailed below.

The well-known ratio of standard deviations of winning percentages (RSD) will be used to proxy for a measure of winning percentage dispersion and account for one aspect of GU (for additional background on RSD, see Quirk and Fort, 1992 and Fort and Quirk, 1995). This metric is the ratio of the standard deviation of winning percentages in an actual league to the standard deviation of winning percentages in the idealized or perfectly balanced league. RSD was introduced by Roger G. Noll (1988) and first utilized by Gerald W. Scully (1989). Assume ASD_t is the actual standard deviation of winning percentage in year *t*. Assume ISD_t is the standard deviation of winning percentages in a conference where the probability that any team wins a given game is 0.5. It is well-known that $ISD_t = \frac{0.5}{\sqrt{G_t}}$ where G_t is the length of season *t* (Rodney Fort and James Quirk, 1995). Given this, $RSD_t = \frac{ASD_t}{ISD_t}$. As RSD_t approaches a value of one, there is less dispersion in conference winning percentages and the league is more balanced. Alternatively, a conference with increased dispersion in winning percentages and less balance will have larger positive RSD_t values.

Measures of game closeness are absent for the sport of American football despite their existence in other sports including soccer (world football) baseball, and hockey (Fort, 2006). Based on the need for a metric to be applicable over the entire history of the sport, the "margin of victory ratio" is developed and utilized here for season *t* (MVR_t):

$$MVR_t = \frac{1}{G_t}\sum_{g=1}^{G_t}\frac{MV_{g,t}}{TP_{g,t}},$$

where *t* is conference year $t = 1,\ldots, T$, $MV_{g,t}$ is the margin of victory in conference game $g = 1,\ldots, G_t$ in year *t*. Ties, including 0-0 ties, produce a single game value of zero. Shutouts generate a single game value of one. We also normalize on total points scored in a conference game g in year *t*, $TP_{g,t}$, as the cumulative level of scoring in the sport has been rising over time.[11] All single conference game values in a season are then averaged to produce a single value for a given conference for conference year *t*. MVR_t controls for changes in season length and the number of conference teams in any season. $0 \leq MVR_t \leq 1$ and game uncertainty is greater, and contests more balanced, as $MVR_t \to 0$. Alternatively, game uncertainty is less, so that contests are less balanced as $MVR_t \to 1$.

Lastly, the correlation of year-to-year winning percentages (WPC_t) in a conference will be used to account for the CSU category of competitive balance. Where W_t is winning percentage in year *t* and W_{t-1} is winning percentage in year *t–1*, WPC_t is defined as:

$$WPC_t = CORREL(W_t, W_{t-1})$$

This metric was originally utilized by Michael R. Butler (1995) and is employed here to determine the degree of churning in the season-to-season conference standings with $-1 \leq WPC_t \leq 1$. Lower WPC_t values suggest more churning in the conference standings and increased balance within a conference while higher values suggest less churning in conference positioning and therefore less balance.

Data

The analysis here focuses on the current members of Bowl Championship Series (BCS) in the NCAA Football Bowl Subdivision (FBS, previously known as Division I-A for football) – the ACC, Big 12, Big East, Big Ten, Pac-12, and SEC. The raw data were collected from two primary sources – James P. Quirk and Quentin Quirk (2012) and the college football pages at www.sports-reference.com. The measures described in the previous section were calculated from this raw data. In order to control for differences in out-of-conference scheduling between teams within a given conference, only conference games are included.

The data covers the entire playing history of each conference and ends with the conclusion of the 2010 season. Each conference began play at a different point in time, with the Big Ten the earliest conference to begin formal play in 1896. Table 1 displays the historical playing periods in each conference. Due to the amount of conference churning that has taken place over the history of the sport, there is also a need to clarify the examination periods for each conference. Some conferences, such as the ACC, Big East and SEC have operated under the same name throughout their existence. Therefore, the examination period for each of these conferences is clear and begins at the time of original conference formation and continues through the completion of the 2010 season. Meanwhile, the Big Ten, Big 12 and Pac-12 conferences have operated under multiple names over their respective histories.

Table 1 – Historical Playing History by Conference

Conference	Dates
ACC	1953-present
Big 12	1928-present
Big Ten	1896-present
Big East	1991-present
Pac-12	1916-present
SEC	1933-present

The history of each conference is traced back to its inception. For a detailed historical account of conference churning and patterns of conference stability in college football, see Quirk (2004).

Methods

The methodology used to measure whether the various competitive balance metrics changed at statistically significant levels following each historical event[12] is straightforward. We begin by following the approach of Quirk and Fort (1992) by using paired t-tests to compare competitive balance metric values in the pre-event and post-event periods in each conference. This approach serves two purposes. First, the pre- and post-period metric averages serve as a proxy for displaying traditional summary statistics. More importantly, this approach allows for the ability to measure whether a significant change in a metric exists following a given event. But due to the fact that a number of factors have the potential to influence the value of a balance metric over time, generalized linear modeling (GLM)[13] is also used to regress each conference level competitive balance metric series on a set of covariates. Each model is optimized through maximum likelihood estimation specifying the Gaussian distribution and the identity link function. This selection assumes a random distribution and random errors for the response variable and returns an unaltered effect of the combination of predictors on the response (Long, 1997). The general form is specified below:

$$CBMETRIC_{c,t} = \beta_0 + \beta_1 EVENT_i + \beta_2 NTEAMSCONF_{c,t} + \beta_3 NCONFGAMES_{c,t} + \beta_4 TREND + \varepsilon_{c,t}$$

where CBMETRIC is the given competitive balance metric in conference *c* in year *t*, EVENT is an indicator variable equal to one in each year following historical event *i*, NTEAMSCONF is the number of teams in conference *c* in year *t*, NCONFGAMES is the number of conference games played by each conference team in conference *c* in year *t*, TREND is a yearly trend variable, β_0 represents a constant term and ε denotes the error term.

EVENT is the variable of interest and is included to capture any potential change in a given balance metric following a given historical event. NTEAMSCONF is included based on the work of Quirk (2004) and P. Dorian Owen (2010) who illustrate that churning in conference membership and changes in the number of teams in a conference can influence the value of a balance metric. NCONFGAMES controls for

changes in the number of conference games played per season within a given conference which could potentially influence the value of a balance metric over time (Owen, 2010; P. Dorian Owen and Nicholas King, 2013). TREND is included to account for any potential directional change in a balance metric over time.

In order to isolate the effect of a single historical event on a single competitive balance metric for a given conference, 54 individual regressions are estimated. Each is estimated on a 20-year period which includes a ten-year pre-period and ten-year post-period in accordance with the date of each historical event. Based on the suggestion of Gary King and Margaret E. Roberts (2014), as a diagnostic tool and to identify potential misspecification, each model was estimated with both classical and robust standard errors. The models are robust to various specifications.

Results

Tables 2-10 display metric averages and paired t-test results for each conference in reference to each historical event. Table 11 illustrates regression results which are truncated to show only the three estimations (out of 54 specifications run[14]) in which a significant effect on EVENT is uncovered.[15] Paired t-tests and regression results are discussed in tandem to illustrate when regression estimates both support and fail to support the results of the t-tests.

Table 2 displays conference averages for the RSD_t metric in both ten-year and five-year pre- and post-periods in relationship to the initiation of the GI Bill in 1946. It is important to note that the pre-event periods exclude the years of 1942-1945 because many programs eliminated football or lost players for a year or more because of WWII. The only significant differences between the pre- and post-periods are seen in the Pac-12 and Big Ten and are statistically significant at the 10 percent level. The Pac-10 shows an increase in RSD_t while the Big Ten shows a decrease.

The regression results reported in Table 11 support the effect found in the Big Ten as RSD_t declined at a statistically significant level following the initiation of the GI Bill in 1946. This suggests an

improvement in balance by way of a decrease in the spread of conference winning percentages in the Big Ten following the GI Bill.

Table 2 – RSD_t and the GI Bill

Conference	Time Length (Pre Versus Post)	Pre-GI Bill	Post-GI Bill
ACC	10-Years	N/A	N/A
	5-Years	N/A	N/A
Big Ten	10-Years	1.5680	1.3804
	5-Years	1.4608	1.2481*
Big 12	10-Years	1.4320	1.5453
	5-Years	1.4184	1.5124
Big East	10-Years	N/A	N/A
	5-Years	N/A	N/A
Pac-12	10-Years	1.5625	1.6870*
	5-Years	1.5689	1.7407*
SEC	10-Years	1.6214	1.5386
	5-Years	1.6183	1.5409

Note 1: 10 year pre-period = 1932-1941; 10-year post-period = 1946-1955
Note 2: 5 year pre-period = 1937-1941; 5-year post-period = 1946-1950
***Significant at 0.01; ** Significant at 0.05; * Significant at 0.10

The behavior of MVR_t in relationship to the GI Bill is displayed in Table 3. Significant reductions in the metric are evident in the ten-year examination periods in each of the four conferences which are able to be tested. This suggests that balance as measured by game closeness improved following the GI Bill.

Table 3 – MVR_t and the GI Bill

Conference	Time Length (Pre Versus Post)	Pre-GI Bill	Post-GI Bill
ACC	10-Years	N/A	N/A
	5-Years	N/A	N/A
Big Ten	10-Years	0.5948	0.4944***
	5-Years	0.5577	0.5132
Big 12	10-Years	0.6415	0.5083***
	5-Years	0.6170	0.4952
Big East	10-Years	N/A	N/A
	5-Years	N/A	N/A
Pac-12	10-Years	0.6050	0.5310**
	5-Years	0.5669	0.5359
SEC	10-Years	0.6033	0.5247***
	5-Years	0.5881	0.5617

Note 1: 10 year pre-period = 1932-1941; 10-year post-period = 1946-1955
Note 2: 5 year pre-period = 1937-1941; 5-year post-period = 1946-1950
***Significant at 0.01; ** Significant at 0.05; * Significant at 0.10

However, a closer look at the raw data (see Figure 1) shows that MVR_t has systematically decreased over time in each of the BCS

conferences. The corresponding conference level regressions show no significant effect on any of the EVENT coefficients. This suggests the significant differences found in the paired t-tests are not associated with the GI Bill once controlling for other factors.

Figure 1 – Historical MVR_t for Six FBS Conferences

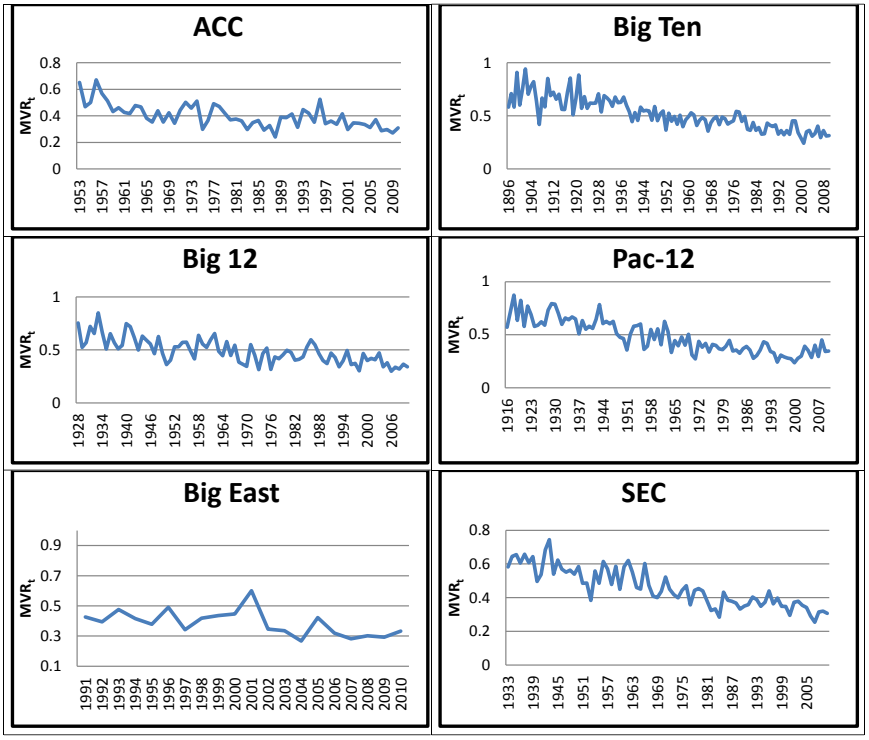

Table 4 presents WPC_t metric averages and t-test results in the pre and post-GI Bill periods. In three of the four conferences, WPC_t decreases in the post-GI Bill period, however none of these reductions are statistically significant. The only significant change is in the positive direction in the Big 12 and is interpreted as a reduction in balance. This suggests no clear pattern of behavior in WPC_t in response to the introduction of the GI Bill. The estimated conference level regressions support these findings as no significant effects on the EVENT coefficients are found.

Table 4 – WPC_t and the GI Bill

Conference	Time Length (Pre Versus Post)	Pre-GI Bill	Post-GI Bill
ACC	10-Years	N/A	N/A
	5-Years	N/A	N/A
Big Ten	10-Years	0.5032	0.3756
	5-Years	0.4918	0.3980
Big 12	10-Years	0.4649	0.7367***
	5-Years	0.3429	0.8153**
Big East	10-Years	N/A	N/A
	5-Years	N/A	N/A
Pac-12	10-Years	0.4704	0.3998
	5-Years	0.3831	0.3964
SEC	10-Years	0.5344	0.3936
	5-Years	0.5105	0.3945

Note 1: 10 year pre-period = 1932-1941; 10-year post-period = 1946-1955
Note 2: 5 year pre-period = 1937-1941; 5-year post-period = 1946-1950
***Significant at 0.01; ** Significant at 0.05; * Significant at 0.10

Conference metric averages and paired t-test results associated with the formal enactment of athletic Grant-In-Aid (GIA) in 1956 are shown in Tables 5, 6 and 7. These tables include an alternative post-event period, which allows for a four-year buffer period following the introduction of the regulation. The ten-year comparisons show a significant reduction in RSD_t in the Pac-12 and a significant increase in the SEC. A significant increase is also evident in the Big 12 in the five-year alternative period. Although no significant effect is uncovered in the ten-year alternative period in the Big 12, the conference level regression uncovers a significant positive effect associated with the initiation of GIA in this period. Together, this suggests a decrease in balance in the Big 12 as measured by the dispersion of conference winning percentages following the institution of GIA.

Interestingly, despite the gradual decline of MVR_t over time, the paired t-tests reported in Table 6 show no significant pre- to post-GIA changes in any conference. Conference level regression results support these findings. Regarding WPC_t, Table 7 shows a significant increase in the measure in the SEC and the Pac-12 (alternative period only) with a significant decrease (improved balance) in the Big 12. However, associated conference level regressions uncover no significant changes in WPC_t, suggesting the significant results found in the paired t-tests could be attributable to factors other than the implementation of GIA. Overall, no consistent behavior in any of the three metrics is evident across conferences, which suggests that the formalization of athletic GIA was

Table 5 – RSD_t and Athletic Grant-In-Aid

Conference	Time Length (Pre Versus Post)	Pre-Grant-In-Aid	Post-Grant-In-Aid	Alt. Post-Grant-In-Aid
ACC	10-Years	N/A	N/A	N/A
	5-Years	N/A	N/A	N/A
Big Ten	10-Years	1.3813	1.4179	1.5084
	5-Years	1.4487	1.4614	1.4487
Big 12	10-Years	1.5564	1.5963	1.6456
	5-Years	1.5545	1.5035	1.7143*
Big East	10-Years	N/A	N/A	N/A
	5-Years	N/A	N/A	N/A
Pac-12	10-Years	1.6497	1.4367**	1.4053**
	5-Years	1.5778	1.4545	1.3521
SEC	10-Years	1.4984	1.6398*	1.6269*
	5-Years	1.5002	1.6239	1.5774

Note 1: 10 year pre-period = 1947-1956; 10-year post-period = 1957-1966; Alt. post-period = 1961-1970
Note 2: 5 year pre-period = 1952-1956; 5-year post-period = 1957-1961; Alt. post-period = 1961-1965
***Significant at 0.01; ** Significant at 0.05; * Significant at 0.10

Table 6 – MVR_t and Athletic Grant-In-Aid

Conference	Time Length (Pre Versus Post)	Pre-Grant-In-Aid	Post-Grant-In-Aid	Alt. Post-Grant-In-Aid
ACC	10-Years	N/A	N/A	N/A
	5-Years	N/A	N/A	N/A
Big Ten	10-Years	0.4819	0.4714	0.4609
	5-Years	0.4505	0.4778	0.4780
Big 12	10-Years	0.5019	0.5341	0.4848
	5-Years	0.5389	0.5457	0.5523
Big East	10-Years	N/A	N/A	N/A
	5-Years	N/A	N/A	N/A
Pac-12	10-Years	0.5068	0.4692	0.4436
	5-Years	0.5272	0.4719	0.4684
SEC	10-Years	0.5254	0.5356	0.4990
	5-Years	0.5059	0.5337	0.5337

Note 1: 10 year pre-period = 1947-1956; 10-year post-period = 1957-1966; Alt. post-period = 1961-1970
Note 2: 5 year pre-period = 1952-1956; 5-year post-period = 1957-1961; Alt. post-period = 1961-1965
***Significant at 0.01; ** Significant at 0.05; * Significant at 0.10

Table 7 – WPC_t and Athletic Grant-In-Aid

Conference	Time Length (Pre Versus Post)	Pre-Grant-In-Aid	Post-Grant-In-Aid	Alt. Post-Grant-In-Aid
ACC	10-Years	N/A	N/A	N/A
	5-Years	N/A	N/A	N/A
Big Ten	10-Years	0.3814	0.3472	0.5427
	5-Years	0.2897	0.2445	0.5132
Big 12	10-Years	0.7460	0.6042*	0.5106*
	5-Years	0.6557	0.6487	0.5516
Big East	10-Years	N/A	N/A	N/A
	5-Years	N/A	N/A	N/A
Pac-12	10-Years	0.4432	0.5390	0.6244**
	5-Years	0.5155	0.4241	0.5712
SEC	10-Years	0.3747	0.6168**	0.6761**
	5-Years	0.4281	0.6070	0.6325

Note 1: 10 year pre-period = 1947-1956; 10-year post-period = 1958-1967; Alt. post-period = 1962-1971
Note 2: 5 year pre-period = 1952-1956; 5-year post-period = 1958-1962; Alt. post-period = 1962-1966
Note 3: Post-periods start one year following GIA because *WPC* is correlation is between years *t* and *t-1*
***Significant at 0.01; ** Significant at 0.05; * Significant at 0.10

not associated with systematic changes in competitive balance according to the metrics utilized here.

Tables 8, 9 and 10 illustrate conference metric averages and paired t-test results for RSD_t, MVR_t and WPC_t in response to the cessation of the CFA in 1995. Table 8 shows that the only significant change in RSD_t is seen in the Pac-12 as a decrease in competitive balance.

Table 8 – RSD_t and the Cessation of the CFA

Conference	Time Length (Pre Versus Post)	Pre-CFA Average	Post-CFA Average
ACC	10-Years	1.5743	1.5638
	5-Years	1.6717	1.7159
Big Ten	10-Years	1.5608	1.5558
	5-Years	1.5071	1.5933
Big 12	10-Years	1.7105	1.6153
	5-Years	1.6537	1.6888
Big East	10-Years	N/A	N/A
	5-Years	1.7853	1.6069
Pac-12	10-Years	1.3683	1.5644***
	5-Years	1.4019	1.5518
SEC	10-Years	1.5296	1.6145
	5-Years	1.6104	1.6285

Note 1: 10 year pre-period = 1986-1995; 10-year post-period = 1996-2005
Note 2: 5 year pre-period = 1991-1995; 5-year post-period = 1996-2000
***Significant at 0.01; ** Significant at 0.05; * Significant at 0.10

Table 9 illustrates that the only significant changes are evident in the Pac-12 as both the five and ten-year comparisons show balance improvements (reduction in the value of the metric) according to MVR_t. Taken together, these two results suggest that over the 20-year examination period surrounding the death of the CFA, the spread of Pac-12 winning percentages increased while individual games within the conference became more competitive. Conference level regressions support these findings, but not at statistically significant levels.

Table 10 shows significant reductions in WPC_t in the Big 12 in both the five and ten-year comparison periods. Regression estimates support these results, meaning a significant decrease in the metric (decreased conference winning percentage correlation) and improved balance according to this measure in the Big 12 following the cessation of the CFA in 1995.

Table 9 – MVR_t and the Cessation of the CFA

Conference	Time Length (Pre Versus Post)	Pre-CFA Average	Post-CFA Average
ACC	10-Years	0.3581	0.3613
	5-Years	0.3889	0.3957
Big Ten	10-Years	0.3687	0.3463
	5-Years	0.3571	0.3732
Big 12	10-Years	0.4512	0.3923
	5-Years	0.4266	0.3804
Big East	10-Years	N/A	N/A
	5-Years	0.4182	0.4266
Pac-12	10-Years	0.3450	0.2996*
	5-Years	0.3534	0.2783**
SEC	10-Years	0.3684	0.3642
	5-Years	0.3742	0.3796

Note 1: 10 year pre-period = 1986-1995; 10-year post-period = 1996-2005
Note 2: 5 year pre-period = 1991-1995; 5-year post-period = 1996-2000
***Significant at 0.01; ** Significant at 0.05; * Significant at 0.10

Table 10 – WPC_t and the Cessation of the CFA

Conference	Time Length (Pre Versus Post)	Pre-CFA Average	Post-CFA Average
ACC	10-Years	0.4746	0.5788
	5-Years	0.5370	0.5981
Big Ten	10-Years	0.5801	0.4846
	5-Years	0.4913	0.5671
Big 12	10-Years	0.8656	0.6583***
	5-Years	0.8535	0.6878**
Big East	10-Years	N/A	N/A
	5-Years	0.6546	0.6426
Pac-12	10-Years	0.4952	0.4221
	5-Years	0.3503	0.3609
SEC	10-Years	0.5629	0.6256
	5-Years	0.4634	0.5391

Note 1: 10 year pre-period = 1986-1995; 10-year post-period = 1996-2005
Note 2: 5 year pre-period = 1991-1995; 5-year post-period = 1996-2000
***Significant at 0.01; ** Significant at 0.05; * Significant at 0.10

Table 11 – Competitive Balance Estimation Results

	Big 10 RSD: GI BILL	Big 12 RSD: ALT GIA	BIG 12 WPC: CFA
NGAMESCONF	0.3392*** (2.57)	0.1930** (2.14)	N/A
NTEAMSCONF	0.1447* (1.90)	-0.1521 (-1.24)	N/A
TREND	-0.0031 (-0.24)	-0.0202** (-2.14)	-0.0079 (-1.36)
EVENT	-0.4012** (-2.00)	0.2887** (2.03)	-0.1284* (-1.92)
CONSTANT	-1.7423 (-1.62)	2.6482*** (3.53)	1.6187*** (2.93)
R^2	0.5438	0.4277	0.7055
N	20	20	20

Note 1: GLM with classical standard errors
Note 2: z-statistics in parentheses
Note 3: N/A = variable omitted as it remains constant over examination period
***Significant at 0.01; ** Significant at 0.05; * Significant at 0.10

Discussion

A number of relevant outcomes regarding the behavior of competitive balance in big-time American college football are apparent from the completed analysis. First, it is evident that balance has been relatively stable despite the three identified changes in the sport's business structure which have altered the mobility of playing talent, student-athlete compensation and the distribution of television revenues. This is clear as paired t-tests show numerous significant changes in balance metrics over time, but none of these changes span across conferences. The significant changes that are seen are either confined to a single conference or apply to multiple conferences, but show disagreement regarding the direction of the effect.

More importantly, only three of 54 conference level estimations exhibited a significant effect on the EVENT coefficient. In other words, when controlling for changes in conference season length, changes in league membership and temporal factors, there is little statistically significant evidence of changes in competitive balance within individual conferences which can be tied to the historical events identified. Overall, this means that balance has been fairly stable around these three key historical events and the significant changes apparent have taken place within and not across-conferences.

While regression results provide little evidence of changes in balance which span across conferences, there is support for significant changes in balance at the individual conference level which are tied to each of the events highlighted. A significant reduction in the spread of conference winning percentages is found in the Big 10 following the implementation of the GI Bill. Improvements in balance are seen in all three metrics in the Big 10 during this era, but RSD_t is the only measure which displays statistical significance. With the Big 10 arguably the top conference at the time, perhaps a disproportionate percentage of high-quality football playing veterans returned to play for Big 10 programs as compared to schools in other conferences.

According to the estimated regressions, the Big 12 is the only other conference displaying any significant change in balance associated with the identified events. An increase in RSD_t (reduction in balance) is found in the alternate period following formalized GIA. Considering that

the Big 12 was dominated by Oklahoma and Nebraska in the later portion of this era, this result could be explained if these schools adopted alternative methods to compensate athletes while the rest of the conference abided by GIA guidelines. Bearing in mind the noted historical accounts regarding compensation during this era (Andrews, 1984; Byers, 1995), this is within the realm of possibility. A reduction in WPC_t (improvement in balance) is also found in the Big 12 following the cessation of the CFA. It is possible that the shift towards conferences negotiating their own television contracts and dispersing revenues as each saw fit was beneficial in promoting churning in Big 12 conference standings. Reports state that the Big 12 shared 57 percent of revenues equally following the demise of the CFA (Wendall Barnhouse, 2011) – a clear increase from the maximum of 25 percent shared equally during the previous regime.

In all, with no significant changes in balance found in more than a single conference for a given event, it is evident that the three events identified are not associated with widespread changes in balance across the premier conferences of college football. The changes in balance that are associated with a given event are constrained to single conferences, suggesting only localized effects tied to the identified changes in business structure.

However, when examining MVR_t ,a metric which is developed here to account for the degree of game uncertainty within a conference, it is clear that the competitiveness of individual games in each of the six conferences has improved over time. In addition to a visualization of the raw data (see Figure 1), paired t-tests display significant reductions in MVR_t over time. This is especially true in the post-WWII era which follows the enactment of the GI Bill. Conference level regressions confirm this through significant and negative TREND coefficients. However, there is no statistically significant evidence that any of the historical events are directly associated with a reduction in MVR_t. Overall, this suggests an improvement in game closeness within these individual conferences over the history of the sport, but these changes cannot be tied directly to the historical events identified. Future research should consider investigating this metric and game closeness in more detail to better understand why balance in this area has improved.

Conclusion

This paper addresses an area of the sports economics literature which has been largely ignored – competitive balance in college football. Three historical events are identified which represent key changes in the business structure of the sport and we test to see whether these events are associated with changes in the behavior of competitive balance in the largest FBS conferences. Analysis shows that balance has been relatively stable across conferences despite changes in the access to playing talent, the standardization of student-athlete compensation and changes in the distribution of television revenues. Several significant changes in balance are uncovered, but these are confined to single conferences around a given event. In sum, this suggests that any change in competitive balance associated with these events is conference specific and not tied to widespread alterations in balance in the sport.

Lastly, a new competitive balance measure, the margin of victory ratio is introduced in this paper. This metric accounts for the degree of individual game closeness within a given conference and is useful given that measures capturing the degree of game closeness are absent for the sport of American football. This paper shows that this metric has been declining steadily over time. While the analysis here does not confirm that any of the three identified events was associated with the decline in the metric, it is evident that game closeness has improved over time in the six FBS conferences examined. This represents an improvement in balance according to this measure.

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NOTES

[1] Formally, the GI Bill was known as the Servicemen's Readjustment Act of 1944. This law granted numerous benefits to every active duty

veteran who served at least ninety days without being dishonorably discharged. By 1956, approximately 2.2 million veterans utilized the educational benefits from the Bill to attend colleges or universities (Glenn C. Altschuler and Stuart M. Blumin, 2009).

[2] Although rules regarding free agency in North American professional sports leagues vary, when a player reaches free agency status he is able to sign a contract with any team of his choosing.

[3] The NCAA instituted the Sanity Code in 1948 in order to combat issues facing the organization's ideals regarding "amateurism." The regulation focused on topics such as academic standards, financial compensation and recruitment policies. Though the Code was the precursor to future regulation that ultimately proved successful, this attempt was widely considered a failure (Falla, 1981. pp 132-133).

[4] In an effort to protect ticket sales against rising interest in televised contests, the NCAA restricted output of televised college football games beginning in 1952. Only 12 national games per year were televised with individual programs allowed a maximum of two appearances per season. Revenue was split between competing programs and the NCAA. This arrangement remained largely the same until the late 1970s (Greenspan, 1988).

[5] The Big Ten and Pac-10 (now Pac-12) were not a part of the CFA and were the only large conferences with television broadcasting deals.

[6] The Big Ten and Pac-10 conferences remained unaffiliated with the CFA and negotiated separate television deals.

[7] At the time, a large and successful contingent of independent programs including Miami (FL), Florida State, Penn State, Louisville, Virginia Tech, Syracuse, South Carolina, Boston College, West Virginia and Pittsburgh were all CFA members

[8] The Big East began play in football during the 1991 season with eight members (Boston College, Miami, Pittsburgh, Rutgers, Syracuse, Temple, Virginia Tech, West Virginia).

[9] The Big 12 Conference was formed on February 12, 1994 and football play began in 1996, joining all members of the Big 8 Conference (Colorado, Iowa State, Kansas, Kansas State, Missouri, Nebraska, Oklahoma, Oklahoma State) with 4 members of the Southwest Conference (Baylor, Texas, Texas A&M, Texas Tech).

[10] The percentage of revenues distributed based on CFA membership and number of television appearances changed over the course of the CFA's reign. Percentages of total revenue paid out based on membership ranged from 20 to 25 percent and percentages paid out based on the yearly number of television appearances fluctuated between 75 and 80 percent Siegfried and Burba, 2004).

[11] For example, from 1900 to 1910 the average total points scored in a Big Ten conference game were 25.07 and from 2000 to 2010 it increased to 51.49.

[12] Over the history of the sport, other noteworthy events have occurred within proximity to the three events identified here. These events could potentially be associated with the behavior of competitive balance. Notable events include: NCAA Sanity Code (1948), NCAA 12-Point Code (1952), expanded racial integration in the southern states (early 1960s), reduction in scholarships to 95 (1977), reduction in scholarships to 85 (1992), Bowl Coalition (1992), Bowl Alliance (1995), and the Bowl Championship Series (1998).

[13] A small percentage of dependent variables in the 54 regressions estimated were found to have non-normal distributions through Shapiro-Wilk tests. GLM was selected because it can accommodate both normal and non-normal distributions.

[14] Individual regressions were estimated for each of the six conferences for each of the three competitive balance metrics for each of the four historical event periods (GI Bill, Grant-In-Aid, alternate Grant-In-Aid and the CFA). This results in 72 individual estimations (6 x 4 x 3 = 72). However, because the Big East began play in 1991, regressions are only able to be estimated for the CFA period, resulting in 54 total regressions (72 - 18 = 54).

[15] Complete estimation results are available at the request of the author.

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