Property Rights, Competition, and Wealth:
A Public Choice Perspective on Markets and Institutions

By

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Dedication

Sandra Letz Parker
(1945-2025)

Woneda Kaye Barker
(1941-2023)

During the work on this dissertation, my children lost both of their grandmothers. Most recently, we lost my wife's mother, Sandra, after a short illness. Early in my mother-in-law's marriage, her husband went through a doctoral program, so she was very sympathetic to the stresses we faced as a family due to time constraints and multiple responsibilities during this process. We all miss her.

A little more than a year earlier, I lost my mother. She was my first and best teacher and instilled in me a love of education and learning. Though she never attended college, she taught me more about life, people, decisions, and love than any book, teacher, or class ever could. She taught me by living a good life and teaching me to love God, to love people, and to be good. Before I left for college, I asked her what subject to study. Her answer surprised me considering her determination that I should attend college. Her response was, "I don't care. Just be a good man." Whether I have succeeded, God will judge, but I have tried every day to live up to her example.

To Sara and Caleb

You both have been my bright spots in every day. You bring joy to every room you enter.

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ABSTRACT

This dissertation focuses on the fundamentals of a free economic society. Chapter one begins with how economists deal with the basic institution of property rights. Economists generally hold that a free economic society cannot exist without property rights. This chapter examines how those beliefs are dealt with in economic textbooks. If economists believe that property rights are primary to economic thought, then one would assume that those rights should be explored and discussed in basic, entry level textbooks. Chapter two progresses to another fundamental basis of a free market system: competition. The example used in this chapter is the National Collegiate Athletic Association, which is charged with managing athletic events among colleges and universities, and their decision to change the method in which a championship is determined. This chapter evaluates the mixed results of the change and some possible reasons for the results. Lastly, chapter three focuses on how state control of an economy affects the accumulation of wealth and the ability of the individual to better themselves in a free market. Popular culture would say that a free market would benefit some people to the detriment of others. This examination attempts to show that the economy is more complex than simply a binary choice between a “free market” or a “command and control” system. The institutions and markets that create an economy are extremely complex and cannot be condensed into a single metric but are rather the culmination of the decisions of the myriad individual participants of the economy.

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“The investigation of causal relations between economic phenomena presents many problems of peculiar difficulty, and offers many opportunities for fallacious conclusions. Since the statistician can seldom or never make experiments for himself, he has to accept the data of daily experience, and discuss as best he can the relations of a whole group of changes; he cannot, like the physicist narrow down the issue to the effect of one variation at a time. The problems of statistics are in this sense far more complex than the problems of physics.”

“Measurement does not necessarily mean progress. Failing the possibility of measuring that which you desire, the lust for measurement may, for example, merely result in your measuring something else – and perhaps forgetting the difference – or in your ignoring some things because they cannot be measured.”

- Udny Yule

Chapter One

Property Rights and Economic Teachings: An Examination of Economics Textbooks

Are property rights neglected in economics textbooks? Since textbooks are the primary exposure to the field for undergraduate students, the exclusion of property rights would provide undergraduate students, and thus future voters, with a deficient understanding of the role of property rights in economic growth and the maintenance of civil liberties. This paper examines the treatment of property rights in 162 economics textbooks from 1951 to 2019. Only 57% of textbooks mention property rights. Advanced and macroeconomic textbooks, as well as those written by authors from Ivy League institutions, are more likely to exclude property rights. I hypothesize that property rights are excluded either because textbook authors, facing page constraints, drop them as a marginal topic or due to ideological opposition on the part of textbook authors to the primacy of property rights. I test these competing hypotheses by 1) examining whether longer textbooks are more likely to include property rights and 2) examining whether textbook authors from Ivy League universities are more likely to exclude property rights.

1.1 Introduction

Are property rights neglected in economics textbooks? Property rights are foundational to economics and civil liberties.[1] They are included in Fraser's Economic Freedom of the World Report as a key component of economic freedom, which has a robust positive relationship with economic growth and income (Alchian and Demsetz 1973; Biser 2020; Cooter and Schäfer 2012; Lawson, Miozzi, Tuszynski 2014; North and Thomas 1973). Property rights are also robustly associated with civil liberties (Benzecry, Reinarts, and Smith 2024; Freyfogle 2010; Gaus 1994; Powell 1963). Even the socialists Oscar Lange and Abba Lerner (1944, p.55) concurred with this point, arguing that "private ownership of the means of production (private enterprise) provides economically independent citizens and thus forms a bulwark of political democracy" (Benzecry, Jensen, and Smith 2024).

Yet, outside the field of economics and law, property rights are often either neglected or held to be controversial. Karl Marx, most notably, advocated for the "abolition of private property" (as quoted in Brenkert 1979, p. 122). More moderate thinkers argue that property rights are secondary to social justice goals, human rights, or collective ownership. In recent years, some groups have begun to argue that property rights law should be manipulated to rectify social or other injustices.[2] These arguments echo the claims of Marx and others that private property ownership is the root cause of many of society's ills.

Textbooks are the primary, and often only, exposure to economics that undergraduate students receive.[3] The exclusion of property rights in economics textbooks would fail to provide

[1] More fundamentally, property rights may be foundational to the human species (Wilson 2020).
[2] Some examples include Ladson-Billings, Tate (1995) and Harris (1993). Additionally, Walsh (2021) discusses a concept called "progressive property," elaborating on how Irish law is using property rights to fulfill social justice goals.
[3] See Bäuerle (2021) on the "[p]ower of [e]conomics [t]extbooks."

undergraduate students with an understanding of the arguments for and against the role of property rights in economic growth and development. For instance, in making the case for the inclusion of property rights in economics textbooks, Boulding (1988, p. 119) argues that a "very important background to the economy is the whole institution of property, its rights or obligations, legitimacy, and so on. Exchange would be impossible without property, for each party has to have property in the things exchanged." Or, as Gwartney and Shaw (2013) write, "In spite of the central importance of property rights to the understanding of how alternative forms of economic organization operate, this topic is almost universally excluded from principles courses."

The exclusion of property rights would be particularly concerning given that, with the exception of law, undergraduates are unlikely to be exposed to the importance of property rights in any other field (Gwartney and Shaw 2013). As Mankiw (2016, p. 170) notes, "the typical student is not a future economist but is a future voter," this can have serious societal implications.

This paper examines the treatment of property rights in 162 economics textbooks from 1951 to 2019. Textbooks were coded for either mentioning or failing to mention property rights. In addition, for textbooks mentioning property rights, the number of pages devoted to property rights was also recorded. Additional textbook information including the type of textbook, the institution where the author earned a Ph.D., and the date of publication were also collected.

I find that only 57% of textbooks mention property rights. Advanced textbooks and macroeconomic textbooks, as well as textbooks written by authors from Ivy League institutions, are more likely to exclude property rights.

I hypothesize two possible explanations for this exclusion of property rights. Property rights may be excluded since textbook authors, facing page constraints, drop them as a marginal topic. Textbook authors may also exclude property rights due to ideological opposition to the primacy of property rights, especially given the controversial impression of property rights outside of economics. I test these competing hypotheses by 1) examining whether longer textbooks are more likely to include property rights, and 2) examining whether textbook authors coded as being from Ivy League universities were more likely to exclude property rights.

This paper extends the literature examining the content of economics textbooks (Bowles and Carlin 2020; Colander 2011 & 2015; Green 2012; Levy and Peart 2011; Stevenson and Zlotnik 2018; Stiglitz 1988). For instance, Kent (1989) and Kent and Rushing (2010) examine the treatment of entrepreneurship in economics textbooks. Coyne and Lucas (2016) examine the treatment of market failure and government failure in fifty economics textbooks. Magness, Witcher, and Horpedahl (2023) survey economics and history books on their treatment of the Great Depression.

Section 1.2 describes the data and the empirical strategy. Section 1.3 presents the results of two estimations. While section 1.4 concludes and suggests possible extensions.

1.2 Data and Empirical Strategy

To compile a database of economics textbooks, I used a variety of sources. To collect these texts, I primarily used the Internet Archive (https://archive.org/), the Middle Tennessee State University library system, and several texts from previous classes or the classes of colleagues. The database includes some of the most popular economics textbooks since 1951, including texts by Paul Samuelson, Hal Varian, Karl Case (of the Case-Shiller Index), Joseph Stiglitz, Greg Mankiw, Campbell McConnell, and Ben Bernanke. It also includes relatively unknown texts, by authors such as Clifford James, Nelson Peach, Clement Harriss, and Roger Chisolm. Some texts

are principles-level, while others are more advanced, including texts routinely used in graduate courses. *Intermediate Microeconomics* by Hal Varian and *Intermediate Microeconomics and its Applications* by Walter Nicholson are common secondary-level economics texts. Varian's *Microeconomic Analysis* is a common text for first-year Ph.D. programs as is *Modern Macroeconomics* by Sanjay Chugh.

The database contains 162 textbooks. There are 60 general economics texts, 54 microeconomics texts, and 48 macroeconomics texts which represent approximately 30 – 40% of each type.[4] Sixty-one texts contain the word "principles" in the title and another seven contain either "introduction" or "introductory." Another six texts define themselves as more advanced using the descriptor "intermediate." Additionally, there are a few Ph.D.-level texts in the sample. Twenty-seven of the authors wrote at least two textbooks, usually a combination of a general and microeconomics textbook or a microeconomics and macroeconomics text.[5] Ten authors wrote three texts, primarily a general, microeconomics, and macroeconomics textbook.[6]

The context of property rights found in the texts often falls into one of three categories: a definition and explanation of property rights, the existence of property rights in relation to public goods and market failure (externalities), or the existence of property rights as a function of economic growth. The first exposure to the concept of property rights is crucial to an understanding of economics. Secondary remarks, either through externalities or economic growth, are generally applications of the original context.

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[4] Please see Appendix A for a comprehensive list of the textbooks.

[5] In recent decades, authors have written a combination text that contains both a complete general economics text as well as a microeconomics and macroeconomics text. Instructors and students then have the option to purchase (or rent) either the complete book (for both microeconomics and macroeconomics) or only the specific text for the course (microeconomics or macroeconomics).

[6] Please note that I made an arbitrary cap for no more than three texts by any one author since many writers publish three texts (a general, microeconomics, and macroeconomics text), and then revise them periodically. If we included multiple editions of the same text, Samuelson, Mankiw, and McConnell would, most likely, proliferate the sample.

In determining the texts that mention property rights, I searched the indices of each text looking for either "property rights" or "private property." Ninety-three texts (57.4%) mention one or both phrases in their indices. By a narrow margin, the most common type of text was the general economics textbook with slightly more than 68% of the texts mentioning the subject (41 out of 60 texts), followed closely by the microeconomics texts with 67% (36 out of 54 texts), and macroeconomics texts had the least mention of property rights at 33% (16 out of 48 texts). Table 1.1 provides this analysis.

Table 1.1: Breakdown of Textbooks by Type

Type	Number	Percentage (by Type)	Mentions Property Rights	Percentage
General Economics	60	37%	41	68.33%
Microeconomics	54	33.33%	36	66.67%
Macroeconomics	48	29.63%	16	33.33%
Total	162	100%	93	57.40%

While researching the authors of the textbooks, I denoted the primary author of the text as the first listed in the text. For example, Robert Frank is credited with three texts although his coauthor is Ben Bernanke. Of the 162 textbooks in the sample, authors earned their Ph.D.s at 55 different schools. Of these schools, three produced graduates who authored over ten texts: MIT (24 texts), Harvard (14), and the University of California at Berkeley (13). Additionally, the Ivy League schools produced 32 textbooks in the sample. Therefore, the Ivy League schools along with MIT and the University of California Berkeley produced 43% or 69 texts from the sample.[7] Table 1.2 provides the complete breakdown of the number of texts by school.

[7] Seven of the eight recognized Ivy League schools have authors in the sample (Dartmouth does not have an author). The Ivy League schools produced 33 texts in the sample. So approximately 13% of the schools produced 20% of the texts (or one out of every five texts). This is a very heavy Ivy League influence on textbook production. If MIT and UC Berkeley are included, those nine schools (16% of the schools in the sample) produced seventy texts, or about 43%.

Table 1.2: Breakdown of Textbooks by University

University	Texts Written	Percentage of Total
MIT	24	14.80%
Harvard	14	8.64%
UC Berkeley	13	8.02%
Princeton	8	4.94%
Chicago	8	4.94%
London School of Economics	7	4.32%
Duke	6	3.71%
Stanford	6	3.71%
Four schools with 4 texts	16	9.88%
Three schools with 3 texts	9	5.56%
Eleven schools with 2 texts	22	13.58%
Twenty-nine schools with 1 text	29	17.90%
Total	162	100.00%

The empirical strategy looks at the relationship between a textbook's characteristics (level, focus, publication year) and those of its author(s) on the one hand and whether and how comprehensively the textbook discusses property rights. To investigate the first question, I rely on a Binary Response Model (Logit) of the following form with the probability that a text mentions property rights ($M_i = 1$) given by the equation:

$$log(\frac{\pi}{1-\pi}) = \beta_0 + \beta_\tau x_1 + \beta_\theta x_2 + \beta_\delta x_3$$

where Pr(M_i = 1) = π, and τ_i is the vector of the three types of economics textbooks, θ_j is a binary variable for the authors' school (Ivy League = 1, non-Ivy League = 0), and δ_i is a vector of binary variables for the seven decades covered in the database of texts (1950s through 2010s).

To estimate the second question, I rely on Ordinary Least Squares (OLS) to estimate the following equation:

$$y_i = \beta_0 + \beta_t x_1 + \beta_s x_2 + \beta_d x_3 + \varepsilon,$$

where y_i is the estimated number of pages discussing property rights in a particular text, β_t is the coefficient based on the type of text, β_s represents whether the author's Ph.D. was earned at an Ivy League versus a non-Ivy League school, and β_d signifies the decade in which the text was published.

1.3 Results

1.3.1 Logistic Regression

Table 1.3 shows the results of the Logit regressions focusing on whether property rights is or is not mentioned within the texts. When looking at the type of text alone in column 1, general texts and macroeconomics texts have statistically significant coefficients but in opposite directions. Macroeconomics texts have a coefficient of -1.462 which translates to a low probability of 0.18 of mentioning property rights in a text compared with 0.48 probability for microeconomics texts, while general texts have a probability of 0.69. Column 2 compares which authors are more likely to mention property rights in their texts. By only a slight margin, Ivy League-trained Ph.D.s have a greater probability of mentioning property rights with a coefficient of 0.491 (a probability of 0.62) compared with 0.202 (a probability of 0.55) for non-Ivy League Ph.D.s. Neither of these values is statistically significant in the regression, so we may assume that where the author received their Ph.D. does not statistically affect whether they include property rights in their texts. However, since both probabilities are greater than 0.50, the regression does correspond to the sample that over 50% of the texts mention property rights.

Table 1.3: Logit Model of Mentions with all Dependent Variables

Multiple Logit Model

	Dependent Variable			
	Mentions			
	Type	Ivy PhD	Decade	Combined
	(1)	(2)	(3)	(4)
Constant	0.769***	0.202	16.566***	16.169***
	(0.282)	(0.203)	(1.080)	(1.178)
Macro	-1.462***			-1.521**
	(0.567)			(0.645)
Micro	-0.076			-0.140
	(0.548)			(0.645)
Ivy PhD		0.491		0.545
		(0.640)		(0.740)
1960s			-16.566***	-16.442***
			(1.080)	(1.085)
1970s			-16.161***	-15.835***
			(1.080)	(1.142)
1980s			-16.923***	-15.918***
			(1.080)	(1.183)
1990s			-15.755***	-15.073***
			(1.080)	(1.173)
2000s			-16.292***	-15.395***
			(1.080)	(1.217)
2010s			-16.135***	-15.173***
			(1.080)	(1.213)
Observations	162	162	162	162
Log Likelihood	-102.384	-109.765	-105.551	-97.998
Akaike Inf. Crit.	210.769	223.530	225.102	215.996
Significance levels				*p<0.1;* ***p<0.05;*** p<0.01

The third Logit regression focuses on the decade in which the text was published. As can be seen from the table, each decade is statistically significant with only the 1950s having a positive coefficient. This may be due to the small number of texts in each decade (the 2000s was the largest decade with 44 and the 1950s with only four). As is expected, the 1950s have a probability of 0.999 of mentioning property rights, which corresponds to the sample database where all four texts mention them. The remaining decades have almost zero probability of

mentioning property rights. Additionally, the standard errors for this regression are clustered at the decade level. The allocation of textbooks by the decade published can be found in Table 1.4.

Table 1.4: Breakdown of Textbooks by Decade

Decade	Total Texts	Texts with Mentions	Percentage
1950s	4	4	100.00%
1960s	6	3	50.00%
1970s	15	9	60.00%
1980s	34	14	41.18%
1990s	26	18	69.23%
2000s	44	25	56.82%
2010s	33	20	60.61%
Total	162	93	57.40%

The final regression combines the variables with the constant as the only statistically significant positive coefficient. Macroeconomics texts and the remaining decades are all still statistically significant but negative. Interestingly, the Logit for Type and Combined have the lowest Akaike score (AIC) showing that these models are estimated as the "best fit." Regarding probabilities, since the Decades Logit implies a zero probability, these two models are essentially the same (considering that the Ivy League Ph.D. is not statistically significant). Overall, the Type Logit has the lowest AIC score of 210, which may tell us that both where the author received their Ph.D. and the decade in which the text was written may just be noise in the sample.

1.3.2 Ordinary Least Squares Regression

The results of the OLS regressions are found in Table 5 and follow the same format as the Logit regression model, except the outcome variable is the number of pages focusing on property rights. The first regression complements the Logit regression of textbook type, with the intercept being significantly positive, a significantly negative relationship for macroeconomics textbooks

(-2.988), and a slightly negative (and not significant) relationship (-0.772) for microeconomics texts. This equates to macroeconomics texts estimated to have three fewer pages than an average general text, and microeconomics texts approximately one fewer page on the subject. The only statistically significant values are macroeconomics text values and general texts (the intercept value) which is estimated to contain four additional pages discussing property rights.

The second regression (column 2) focuses on the author's training and regresses the outcome variable against the institution where the author earned his or her degree. In the Logit regression model, neither coefficient was statistically significant, but both had a probability greater than 0.50. In the OLS regression, the outcome variable is the number of pages instead of simply the mention of property rights. From our table, we see that there is a statistically significant, positive relationship between non-Ivy League authors and the number of pages mentioning property rights in the texts. The coefficient implies that non-Ivy League authors would devote almost three more pages to the discussion of property rights than would an Ivy League author. The third regression compares the decades the texts were published. The 1950s, 1960s, 1970s, and 1990s all have a positive relationship, but none of them are statistically significant. This shows that time may not play a substantial role in the number of pages in which an author discusses the topic (and may augment the results of the Logit model). Although the 1950s have a greater magnitude than the other decades, as stated earlier, this may be due to the lower sample size for that decade (there were only four texts from the 1950s and all of them mention property rights).

Table 1.5: Linear Regression of Number of Pages

Linear Regressions

	Dependent Variable			
	Number.pages			
	Type	Ivy League	Decade	Combined
	(1)	(2)	(3)	(4)
Constant	3.883***	2.829***	3.000	3.344*
	(0.472)	(0.339)	(1.926)	(1.940)
Macro	-2.988***			-2.901***
	(0.708)			(0.781)
Micro	-0.772			-0.929
	(0.686)			(0.742)
Ivy PhD		-0.436		-0.458
		(0.751)		(0.755)
1960s			0.667	0.552
			(2.486)	(2.402)
1970s			0.800	1.012
			(2.168)	(2.148)
1980s			-1.294	-0.041
			(2.036)	(2.068)
1990s			0.462	1.121
			(2.069)	(2.075)
2000s			-0.500	0.651
			(2.012)	(2.057)
2010s			-0.121	0.969
			(2.039)	(2.072)
Observations	162	162	162	162
R^2	0.105	0.002	0.032	0.119
Adjusted R^2	0.094	-0.004	-0.006	0.067
Residual Std. Error	3.657 (df = 159)	3.849 (df = 160)	3.852 (df = 155)	3.710 (df = 152)
F Statistic	9.315*** (df = 2; 159)	0.336 (df = 1; 160)	0.846 (df = 6; 155)	2.282** (df = 9; 152)
Significance levels				*p<0.1;* ***p<0.05;*** p<0.01

In the multivariate regression, similar to earlier regressions, macroeconomics texts still have a negative statistically significant coefficient to the number of pages for property rights by almost the same magnitude while the intercept of 3.344 has dropped in significance, and the remaining variables did not change significantly. Lastly, in these regressions, we see the R^2 for the Type regression to be at 0.105 while the Combined regression was only slightly higher at 0.119.

1.4 Conclusion

Any analysis of textbooks is complex due to the exogenous factors existing in the time period of publication. Additionally, the texts used in the sample could have differing effects depending on the edition used. A possible future extension of this research would be to examine long-term texts to evaluate whether the approach to property rights changes over time within the same text or to possibly utilize the same number of texts within each decade to mitigate some exogeneities. My hope is that this evaluation will continue the existing conversation regarding the importance of textbooks in economic teaching.

For scholars who believe that property rights are vitally important to the study of economics, there is still much room for improvement in textbooks. In the field of economics, property rights are one of the oldest, most fundamental arguments to support a free-market economy and should be included in most economics textbooks. The analysis in this paper examined a slate of 162 textbooks to verify whether property rights were mentioned in the texts and how many pages were devoted to the topic. Also examined were the factors of type of text, where the authors earned their terminal degree, and the time period in which the text was written to evaluate whether those factors influenced the mentioning of property rights and, if so, to what extent. The examination finds that, in total, only a little more than half of all texts include

property rights with general texts slightly more likely to mention and discuss property rights than microeconomics texts and significantly more than macroeconomics texts. Authors who did not receive their Ph.D.s from an Ivy League university appear to devote more pages to the topic of property rights.

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Stevenson, Betsey, and Hanna Zlotnick. "Representations of Men and Women in Introductory Economics Textbooks." *AEA Papers and Proceedings.* Vol. 108, 2014 Broadway, Suite 305, Nashville, TN 37203: American Economic Association, 2018.

Stiglitz, Joseph E. "On the Market for Principles of Economics Textbooks: Innovation and Product Differentiation." *The Journal of Economic Education.* Vol. 19, No. 2, 1988: 171-177.

Walsh, Rachael (2021) *Property Rights and Social Justice: Progressive Property in Action.* Cambridge University Press.

Wilson, Bart. *The Property Species.* Oxford University Press, 2020.

APPENDIX A - Textbook Sample

General Economics Textbooks

Author(s)	Title	Edition	Year	Publisher
Alchian, Armen, & William R. Allen	*University Economics: Elements of Inquiry*	3	1972	Wadsworth
Alchian, Armen, & William R. Allen	*Exchange and Production: Competition, Coordination, and Control*	3	1983	Wadsworth
Amacher, Ryan C.	*Principles of Economics*	2	1983	South-Western College Publishing
Baumol, William J., & Alan S. Blinder	*Economics: Principles and Policy*	7	1997	The Dryden Press
Bobzin, Hagen	*Principles of Network Economics*	1	2006	Springer
Bowden, Elbert V.	*Principles of Economics: Theory, Problems, Policies*	3	1980	South-Western Publishing
Bowmaker, Simon	*The Heart of Teaching Economics: Lessons from the Leading Minds*	12	2010	Edward Elgar
Brandis, Royall	*Principles of Economics*	2	1968	Richard D. Irwin, Inc.
Carbaugh, Robert	*Contemporary Economics*	2	2003	South-Western College Publishing
Case, Karl, Ray C. Fair, & Sharon E. Oster	*Principles of Economics*	12	2017	Pearson
Chenault, Lawrence R., & Kenneth H. Smith	*Economics*	1	1965	Doubleday & Co.
Chisholm, Roger K., & Marilu McCarty	*Principles of Economics*	2	1981	Scott, Foresman and Company
Cowen, Tyler & Alex Tabarrok	*Modern Principles of Economics*	1	2010	Worth Publishers
Craven, John	*Introduction to Economics: An Integrated Approach to Fundamental Principles*	1	1984	Blackwell Publishing

Davis, Ronnie & Semoon Chang	*Principles of Managerial Economics*	1	1986	Prentice-Hall
Drummond, Ian	*Economics: Principles and Policies in an Open Economy*	1	1976	Irwin-Dorsey Limited
Fairchild, Fred, Norman S. Buck, & Reuben Slesinger	*Principles of Economics*	1	1954	MacMillan Company
Ferguson, Charles E., & Juanita M. Kreps	*Principles of Economics*	2	1965	Holt, Rinehart and Winston
Fischer, Stanley & Rudiger Dornbusch	*Economics*	1	1983	McGraw-Hill
Frank, Robert H.	*The Economic Naturalist: Why Economics Explains Almost Everything*	1	2008	Random House
Gemmell, James, & Howard L. Balsey	*Principles of Economics*	1	1953	D. C. Heath and Co.
Gottheil, Fred	*Principles of Economics*	7	2013	Cengage
Gwartney, James D., & Richard Stroup	*Economics: Private and Public Choice*	3	1982	Academic Press
Hailstones, Thomas J.	*Principles of Economics*	1	1985	South-Western Publishing
Hall, Robert Ernest, & Marc Lieberman	*Economics: Principles and Applications*	2	2001	South-Western College Publishing
Harriss, Clement L.	*The American Economy: Principles, Practices, and Policies*	5	1965	Richard D. Irwin, Inc.
Heap, Shaun H., Martin Hollis, Bruce Lyons, Robert Sugden, & Albert Weale	*The Theory of Choice: A Critical Guide*	1	1992	Blackwell Publishing
Hogan, Lloyd	*Principles of Black Political Economy*	1	1984	Routledge & Kegan Paul
Ison, Stephen	*Economics*	1	1996	Pitman Publishing
James, Clifford L.	*Principles of Economics*	1	1951	Prentice-Hall
Koslowski, Peter	*Principles of Ethical Economy*	1	2001	Kluwer Academic Press
Lancaster, Kelvin	*Modern Economics: Principles and Policy*	1	1973	Rand McNally & Co.
Lindauer, John	*Economics: A Modern View*	5	1977	WB Saunders Co

Lipsey, Richard G., & K. Alec Chrystal	*Principles of Economics*	9	1999	Oxford University Press
Mabry, Rodney H., and Holley Ulbrich	*Introduction to Economics Principles*	2	1994	McGraw-Hill
Main, Robert S. & Charles W. Baird	*Elements of Microeconomics*	1	1977	West Publishing Co
Mankiw, N. Gregory	*Principles of Economics*	1	1998	Dryden Press
Mastrianna, Frank & Thomas J. Hailstones	*Basic Economics*	12	2001	South-Western College Publishing
McConnell, Campbell R., Stanley L. Brue, & Sean M. Flynn	*Economics*	20	2015	McGraw-Hill
McKenzie, Richard & Gordon Tullock	*Modern Political Economy*	1	1978	McGraw-Hill
Melvin, Michael, & William Boyes	*Principles of Economics*	9	2013	South-Western
Mings, Turley	*The Study of Economics: Principles, Concepts & Applications*	4	1991	Dushkin Publishing
O'Sullivan, Arthur	*Urban Economics*	5	2003	McGraw Hill
O'Sullivan, Arthur, Steven Sheffrin, & Stephen Perez	*Survey of Economics: Principles, Applications, and Tools*	4	2010	Prentice Hall
Peach, W. Nelson	*Principles of Economics*	2	1960	Richard D. Irwin, Inc.
Phelps, Edmund S.	*Political Economy: An Introductory Text*	1	1985	W.W. Norton
Ragan, Jr., James F., & Lloyd B. Thomas, Jr.	*Principles of Economics*	1	1990	Harcourt Brace Jovanovich
Reynolds, Lloyd G.	*Economics: A General Introduction*	1	1963	Richard D. Irwin, Inc.
Rockwell, Llewellyn H., ed.	*The Economics of Liberty*	1	1990	The Ludwig von Mises Institute
Ruffin, Roy, & Paul R. Gregory	*Principles of Economics*	1	1983	Scott, Foresman and Company
Samuelson, Paul	*Economics: An Introductory Analysis*	4	1958	McGraw-Hill
Saunders, Phillip, & William B. Walstad	*The Principles of Economics Course: A Handbook for Instructors*	1	1990	McGraw Hill

Sowell, Thomas	*Applied Economics*	1	2004	Basic Books
Sowell, Thomas	*Basic Economics*	4	2011	Basic Books
Taylor, John, & Akila Weerapana	*Principles of Economics*	1	2010	Cengage
Tucker, Irvin	*Survey of Economics*	1	1995	West Publishing Co
Tucker, Irvin	*Economics for Today*	2	2000	West Publishing Co
Vohra, Rakesh & Lakshman Krishnamurth	*Principles of Pricing: An Analytical Approach*	1	2012	Cambridge University Press
Welfling, Weldon	*Principles of Economics*	1	1971	McGraw-Hill
Wonnacott, Paul & Ronald Wonnacott	*Economics*	1	1979	McGraw-Hill

Microeconomics Textbooks

Author(s)	Title	Edition	Year	Publisher
Arnold, Roger	*Microeconomics*	12	2016	Cengage
Bade, Robin, & Michael Parkin	*Foundations of Microeconomics*	2	2004	Pearson
Baird, Charles	*Prices and Markets: Microeconomics*	1	1975	West Publishing Co
Barreto, Humberto	*Intermediate Microeconomics with Microsoft Excel*	1	2009	Cambridge University Press
Barrett, Nancy Smith	*The Theory of Microeconomic Policy*	1	1974	DC Heath & Company
Baumol, William J., & Alan S. Blinder	*Microeconomics: Principles and Policy*	7	1994	The Dryden Press
Besanko, David & Ronald R. Braeutigam	*Microeconomics: An Integrated Approach*	1	2002	John Wiley & Sons
Beveridge, Thomas	*A Primer on Microeconomics*	1	2013	Business Expert Press
Blad, Michael (dec.), & Keiding, Hans	*Microeconomics: Institutions, Equilibrium, and Optimality*	1	1990	Elsevier
Browning, Edgar K., & Mark Zupan	*Microeconomics: Theory and Applications*	4	1992	HarperCollins
Case, Karl, Ray C. Fair, & Sharon E. Oster	*Principles of Microeconomics*	9	2009	Pearson
Clower, Robert W., Philip E. Graves, & Robert L. Sexton	*Intermediate Microeconomics*	1	1988	Harcourt Brace Jovanovich Publishers
Colander, David	*Microeconomics*	2	1995	Richard D. Irwin, Inc.
Dewey, Donald	*Microeconomics: The Analysis of Prices and Markets*	1	1975	Oxford University Press
Dolan, Edwin G.	*Introduction to Microeconomics*	2	2006	Best Value Textbooks
Eaton, B. Curtis & Diane Eaton	*Microeconomics*	5	2002	Prentice-Hall
Frank, Robert H. & Ian C. Parker	*Microeconomics and Behaviour (Canadian)*	4	2010	McGraw-Hill

Goodwin, Neva, Julie Nelson, Frank Ackerman, & Thomas Weisskopf	*Microeconomics in Context*	1	2005	Houghton Mifflin
Goolsbee, Austan, Steven Levitt, & Chad Syverson	*Microeconomics (Intermediate)*	1	2013	Worth Publishers
Hall, Robert Ernest, & Marc Lieberman	*Microeconomics: Principles and Applications*	3	2006	South-Western College Publishing
Hubbard, R. Glenn, & Anthony P. O'Brien	*Microeconomics*	4	2013	Pearson
Koutsoyiannis, A.	*Modern Microeconomics*	2	1975	The Macmillan Press LTD
Krugman, Paul, Robin Wells, & Anthony Myatt	*Microeconomics*	1	2006	Worth Publishers (Canadian ed.)
Landsburg, Steven E.	*Price Theory and Applications*	9	2011	Cengage
Lipsey, Richard G., & Peter O. Steiner	*Microeconomics*	5	1979	Harper & Row Publishers
Mansfield, Edwin	*Principles of Microeconomics*	2	1977	W.W. Norton
Mansfield, Edwin	*Microeconomics: Theory and Applications*	4	1982	W.W. Norton
Mathis, Stephen & Janet Koscianski	*Microeconomic Theory: An Integrated Approach*	1	2002	Pearson
McConnell, Campbell R., Stanley L. Brue, Sean M. Flynn, & Thomas P. Barbiero	*Microeconomics*	12	2010	McGraw-Hill
McEachern, William A.	*Microeconomics*	5	2000	South-Western College Publishing
Nechyba, Thomas J.	*Microeconomics: An Intuitive Approach*	1	2011	Cengage
Nicholson, Walter	*Microeconomic Theory: Basic Principles and Extensions*	3	1985	Dryden Press
Nicholson, Walter	*Intermediate Microeconomics and its Applications*	7	1997	Dryden Press

Ormiston, Michael	*Intermediate Microeconomics*	1	1992	Dryden Press
Parkin, Michael	*Microeconomics*	2	1990	Addison-Wesley Publishing
Perloff, Jeffrey M.	*Microeconomics*	2	2001	Addison-Wesley Publishing
Peterson, Willis L.	*Principles of Economics Micro*	7	1989	Richard D. Irwin, Inc.
Pindyck, Robert & Daniel Rubingeld	*Microeconomics*	6	2005	Pearson
Reynolds, Lloyd G.	*Microeconomics: Analysis and Policy*	5	1985	Richard D. Irwin, Inc.
Riley, John G.	*Essential Microeconomics*	1	2012	Cambridge University Press
Samuelson, Paul, & William D. Nordhaus	*Microeconomics*	15	1995	McGraw-Hill
Sayre, John E. & Alan J. Morris	*Principles of Microeconomics*	8	2015	McGraw-Hill
Schotter, Andrew	*Microeconomics: A Modern Approach*	3	2001	Addison-Wesley Publishing
Sexton, Robert	*Exploring Microeconomics*	1	1999	The Dryden Press
Silberberg, Eugene	*Principles of Microeconomics*	3	2002	Pearson
Steinemann, Anne, William C. Apgar, & H. James Brown	*Microeconomics for Public Decisions*	1	2005	Thompson South-Western
Stiglitz, Joseph E. & Carl E. Walsh	*Principles of Microeconomics*	3	2002	W. W. Norton
Taylor, John, & Akila Weerapana	*Principles of Microeconomics*	7	2012	South-Western
Thompson, Gerald E.	*Microeconomics: A Computational Approach*	1	2001	M.E. Sharpe
Varian, Hal R.	*Microeconomic Analyisis*	3	1978	W.W. Norton
Varian, Hal R.	*Intermediate Microeconomics: A Modern Approach*	2	1990	W.W. Norton
Waldman, Don E.	*Microeconomics*	1	2004	Pearson
Waud, Roger	*Microeconomics*	2	1983	Harper & Row Publishers

Wetzstein, Michael E.	*Microeconomic Theory: Concepts and Connections*	1	2005	Thompson South-Western

Macroeconomics Textbooks

Author(s)	Title	Edition	Year	Publisher
Abel, Andrew, Ben S. Bernanke, Gregor W. Smith, & Ronald D. Kneebone	*Macroeconomics*	6	2008	Pearson
Arnold, Roger	*Macroeconomics*	5	2001	South-Western College Publishing
Barro, Robert J.	*Macroeconomics*	1	1984	John Wiley & Sons
Barron, John M., Mark A Loewenstein, & Gerald J. Lynch	*Macroeconomics*	3	1989	Addison-Wesley Publishing
Baumol, William J. & Alan S. Blinder	*Macroeconomics: Principles and Policy*	10	2007	Thompson South-Western
Case, Karl, Ray C. Fair, & Sharon E. Oster	*Principles of Macroeconomics*	9	2009	Pearson
Cherneff, Robert V.	*Macroeconomics: Theory and Policy (Canadian)*	1	1983	Prentice-Hall
Chugh, Sanjay K.	*Modern Macroeconomics (Ph.D.)*	2	2015	MIT Press
Coddington, Alan	*Keynesian Economics: The Search for First Principles*	1	1984	George Allen & Unwin
Cutler, Harvey	*Principles of Macroeconomics*	2	2006	Kendall Hunt
Doepke, Matthias, Andreas Lehnert, and Andrew W. Sellgren	*Macroeconomics (Ph.D.)*	7	1999	UCLA
Edgmand, Michael	*Macroeconomics: Theory and Policy*	3	1987	Prentice-Hall
Ekelaund, Jr., Robert B., Rand W. Ressler, & Robert D. Tollison	*Macroeconomics: Private Markets and Public Choice*	7	2006	Pearson
Feenstra, Robert C., & Alan M. Taylor	*International Macroeconomics*	3	2014	Worth Publishers
Feigenbaum, Susan K., & R.W. Hafer	*Principles of Macroeconomics: The Way We Live*	1	2012	Worth Publishers
Fischer, Stanley & Rudiger Dornbusch	*Introduction to Macroeconomics*	5	1983	McGraw-Hill

Frank, Robert H. & Ben S. Bernanke	*Principles of Macroeconomics*	2	2004	McGraw-Hill
Froyen, Richard T.	*Macroeconomics: Theories and Policies*	2	1986	MacMillan Publishing
Froyen, Richard T., & Douglas F. Greer	*Principles of Macroeconomics*	1	1989	MacMillan Publishing
Gordon, Robert J.	*Macroeconomics*	9	2003	Addison-Wesley Publishing
Gottheil, Fred	*Principles of Macroeconomics*	6	2009	Cengage
Hall, Robert Ernest & Marc Lieberman	*Macroeconomics: Principles and Applications*	2	2003	South-Western College Publishing
Hoover, Kevin D.	*Applied Intermediate Macroeconomics*	1	2012	Cambridge University Press
Hyman, David N.	*Macroeconomics*	2	1992	Irwin
Leeds, Michael A., Peter von Allmen, & Richard C. Schiming	*Macroeconomics*	1	2006	Pearson
Lewer, Joshua	*Principles of Macroeconomics*	1	2012	Cognella
Lipsey, Richard G., Douglas D. Purvis, & Peter O. Steiner	*Macroeconomics*	6	1988	Harper & Row Publishers
Mankiw, Gregory	*Macroeconomics*	9	2016	Worth Publishers
Mankiw, Gregory, & Laurence M. Ball	*Macroeconomics and the Financial System*	2	2011	Worth Publishers
McConnell, Campbell R., Stanley L. Brue, & Sean M. Flynn	*Macroeconomics*	12	2010	McGraw-Hill
McEachern, William A.	*Macroeconomics*	5	2000	South-Western College Publishing
Miller, Norman C.	*Macroeconomics*	1	1983	Houghton Mifflin Co
Niepelt, Dirk	*Macroeconomic Analysis*	1	2019	MIT Press
O'Sullivan, Arthur & Steven Sheffrin	*Macroeconomics: Principles and Tools*	4	2006	Pearson
Peterson, Willis L.	*Principles of Economics Macro*	6	1986	Richard D. Irwin, Inc.
Samuelson, Paul, & William D. Nordhaus	*Macroeconomics*	13	1989	McGraw-Hill

Sayre, John E. & Alan J. Morris	*Principles of Macroeconomics*	7	2012	McGraw-Hill
Sexton, Robert	*Exploring Macroeconomics: Pathways to Problem Solving*	1	1999	The Dryden Press
Sheffrin, Steven, David A. Wilton, & David M. Prescott	*Macroeconomics: Theory and Policy*	1	1988	South-Western College Publishing
Sherman, Howard J.	*Staglation: Introduction to Traditional and Radical Macroeconomics*	2	1983	Harper and Row
Sherman, Howard J. & Michael A Meerpol	*Principles of Macroeconomics: Activist vs Austerity Policies*	2	2015	Routledge
Spencer, Milton H.	*Contemporary Macroeconomics*	7	1990	Worth Publishers
Stiglitz, Joseph E.	*Principles of Macroeconomics*	1	1993	W.W. Norton
Taylor, John, & Akila Weerapana	*Principles of Macroeconomics*	7	2012	South-Western
Taylor, Lance	*Reconstructing Macroeconomics: Structuralist Proposals and Critiques of the Mainstream*	1	2004	Harvard University Press
Vane, Howard R., & John L. Thompson	*An Introduction to Macroeconomic Policy*	3	1989	Harvester Wheatsheaf
Wachtel, Paul	*Macroeconomics: From Theory to Practice*	1	1989	McGraw-Hill
Williamson, Stephen D.	*Macroeconomics (Canadian)*	1	2004	Pearson (Canadian)

Chapter Two

The Impact of the Bowl Championship Series on Competitive Balance in Major College Football

How effective is the National Collegiate Athletic Association (NCAA) at achieving competitive balance among its conferences in major college football? There is mixed literature on the ability of the NCAA to achieve competitive balance. This paper contributes to that literature by examining the effect of the 2014 transition from the Bowl Championship Series to the College Football Playoff on competitive balance in major college football, as measured by win-loss percentages and the Herfindahl-Hirschman Index from 2005-2022. A difference-in-differences estimation is used to measure the effects of the change in post-season play on conference competitiveness. The results show that the NCAA's transition to the College Football Playoffs reduced the overall competitive balance in major college football. The effects of competitive balance on bowl or championship success are also examined, but results show there is little correlation between competitive balance and bowl or championship success.

2.1 Introduction

To ensure its ability to achieve its mission of providing "a world-class athletics and academic experience for student-athletes," the NCAA prioritizes obtaining "sustainable funding" by cultivating an exciting fan experience.[1] A key factor in managing spectator excitement in sports is to achieve competitive balance to maintain outcome uncertainty (El-Hodiri and Quirk 1971; Humphreys 2019; Neale 1964; Schmidt and Berri 2001; Szymanski 2003; Zimbalist 2002). The NCAA should, therefore, be particularly concerned about competitive balance when it comes to major college football, the most popular sport it oversees.[2]

How effective is the NCAA in achieving competitive balance in major college football? There is mixed empirical literature on this question. While studies find that the NCAA has, at times, improved competitive balance (Dittmore and Crow 2010; Noble et al 2016), other studies find that it has either failed to promote competitive balance (Sutter and Winkler 2003) or even undermined competitive balance at times (Eckard 1998; Shooshtari and Rodriguez 2014; Quirk 2004).[3]

One of the major avenues for the NCAA to encourage competition in major college football is the structure and determination of the National Championship. This paper contributes to this mixed literature by evaluating how the NCAA's 2014 transition from the Bowl Championship Series (BCS) to the College Football Playoff (CFP) affected competitive balance in major college football. Following Dittmore and Crow (2010), competitive balance is measured by win-loss percentages and the Herfindahl-Hirschman Index but extended to data from 2005-

[1] https://www.ncaa.org/sports/2021/6/28/mission-and-priorities.aspx
[2] The legalization of sports betting, by increasing viewership even for less competitive contests, can offset the loss of fans from reduced competition (Salaga, Tainsky, and Mondello 2019).
[3] There is also evidence that the NCAA has failed to generate revenue equity in college football (Caro and Benton 2012).

2022 to capture the NCAA's 2014 transition. This timeframe offers a unique opportunity to examine the impact of the CFP before its expansion to a twelve-team format, the possible dissolution of the PAC-12 Conference, and the introduction of name, image, and license revenue to college athletics.[4]

While the transition from the BCS to the CFP does not provide a true treatment as provided in most Difference-in-Differences estimations, it does provide a pseudo-treatment effect. (As will be discussed later, only one non-Power Five team ever made the college playoffs.) Therefore, we will use the transition as a treatment effect for our estimation purposes occurring in 2014 when the playoff system was implemented. Additionally, in recent years, major college football has been unofficially divided between groups of conferences known as the Power Five conferences and the Group of Five conferences, providing a natural control group (Group of Five) and treatment group (Power Five).

Tabulated conference records for all Football Bowl Subdivision (FBS) teams are used to assess the competitive balance annually within each conference and the outcome of all bowl games. The established measures of competitive balance, the Herfindahl-Hirschman Index (HHI) and a ratio of the standard deviations of actual to ideal winning percentages, on each conference from 2005 to 2022 are assessed and then compared against the NCAA bowl records of teams for the same conferences.

The results show that adopting the CFP led to a slight decrease in intraconference competitive balance across college football. This effect was greater in the Power Five conferences. The number of teams that won conference championships in the Power Five decreased significantly, while the Group of Five experienced an increase in teams that won their

[4] These factors determine the end period for this research. Although the four-team playoff continues through the 2023-24 school year, NIL funds have already been distributed to athletes, so we use the cut-off year of 2022-23.

conferences. In interconference competition, both the Power Five and the Group of Five were evenly competitive during the BCS period. However, both groups decreased in competitiveness during the CFP, again with the Power Five decreasing more so than the Group of Five. Furthermore, teams from the more competitive conferences were less likely to win championships or bowl games. The data show that the NCAA's transition to the CFP did not increase competitive balance in major college football.

Section 2.2 provides a brief background on NCAA Major College Football and the transition to the CFP. Section 2.3 describes the data and empirical strategy. Section 2.4 provides the results. Section 2.5 concludes.

2.2 A Brief Background on NCAA Major College Football

The fundamental problem with college football may be rooted in the structure and organization of the NCAA. For all the enforcement power in the governing body, economically it is a cartel (Blair and Harrison 1990; Blair and Romano 1997; Blair and Wang 2018; DeSchriver and Stotlar 1996; Fleischer, Shughart, Tollison, and Goff 1988; Harrison and Harrison 2009; Humphreys and Ruseski 2009; Sanderson and Siegfried 2017). More precisely, it is a cartel managing cartels with each conference essentially an independent cartel, or sub-market, within the NCAA. Each conference has the incentive to maximize its revenue by negotiating its television contracts (interconference competition) and developing better football programs through recruiting (intraconference competition).

As observed in other cartels, there is an incentive in the NCAA for individual college programs to cheat or to break with the governing cartel. However, as discussed by Depken and Wilson (2006) and DeScriver and Stotler (1996), there is also an incentive for colleges to report cheating and rules violations among competitors, which are often built into the revenue-sharing

agreements for a conference.[5] Due to this structure, there exists a misalignment of incentives between the governing cartel (NCAA) and the member cartels (conferences). The NCAA and to some extent, the individual conferences, have an impetus to make their games more competitive to maximize revenue. At the same time, each college has the motive to develop a dominating, winning football team and become a monopoly within each conference to win the conference title and earn a bowl invitation. On the surface, these goals appear to support each other, but upon further inspection, they can be opposing forces.

In sports economics literature, competitive balance is determined by the incentive structure an organization, such as a conference, league, or division, implements to ensure that the results of games are not decidedly in one team's favor. This is driven by the desire to set an even playing field to enhance the fan experience and thus maximize revenues. As Humphreys (2019, p. 76) observes, "Fans clearly care about competitive balance." To promote competitive balance, teams must be more equal in strength with the probability of winning closer to 50%-50% of their conference games to maximize revenues for each team and, ultimately, for the conference as a whole. However, if a single team dominates a conference or wins consecutive championships so frequently that the game results are a foregone conclusion, it will reduce competition, at least within the conference (the probabilities of winning are extremely close to one), and could therefore jeopardize revenues to fund the conference football programs. That is because only the most die-hard fans will repeatedly watch games in which the outcome is virtually certain (Karg, Nguyen, and McDonald 2020).

[5] Depken and Wilson (2006) discusses the enforcement and punishment effects of the NCAA, while DeSchriver and Stotler (1996) examine the cost-benefit analysis of rules violations in college basketball and the enforcement policies of the NCAA.

The NCAA usually also requires championship teams to share their winnings with the other teams within their conference. If one team dominates, that team may receive higher ticket revenues and conference or bowl championship revenues, but it will also subsidize other less successful colleges within the conference through these conference revenue-sharing agreements since television revenue contracts are made at the conference level. As a result, one team's domination of a conference will likely diminish overall conference revenue rather than enhance it, compared to a more competitive conference.

The second issue is the unusual method of selecting the national championship (Stern 2004, Annis and Wu 2012). In other major college team sports, there is often an extensive playoff system to determine the national championship. The exception is the upper division of college football, which uses a polling system of either football coaches or sports writers to rank the teams. This method allowed for arbitrary versus non-biased ranking (alumni could vote their alma mater or current employer higher and rivals lower).[6] Until the College Football Playoff system began in 2014, there was no playoff to determine the teams playing for the national championship. In most years, these were not difficult decisions, but, on occasion, they could be and resulted in a split national championship.[7] Additionally, there can be a bias in the polling for or against a particular team and a misunderstanding of whether polls are meant to be a ranking of previous play or a forecast of which team will ultimately win the National Championship.[8]

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[6] The three currently used polls are the *USA Today* Coaches Poll, the *Associated Press* Top 25, and the College Football Playoff Poll. The *USA Today* polls 63 coaches, the *AP* polls 62 sports writers and broadcasters, and the College Football Playoff selection committee is comprised of "13 high-integrity individuals with experience as coaches, student-athletes, college administrators and journalists, along with sitting athletics directors…" (https://collegefootballplayoff.com/sports/2016/9/30/overview, accessed 2/6/2024).

[7] Since 1950, there have been eleven years in which there was a split national championship: 1954, 1957, 1965, 1970, 1973, 1974, 1978, 1990, 1991, 1997, and 2003. In the past one hundred years, there have been two years where there were actually three declared national champions: 1964 was split between Alabama, Arkansas, and Notre Dame, and 1970 between Nebraska, Texas, and Ohio State. Prior to 1920 it was not uncommon to have multiple national champions.

[8] The 2023-2024 football presented an excellent example. The Florida State Seminoles had an undefeated season, however, in one of their last games of the year, their starting quarterback was injured and out for the remainder of

Depending on which perspective a pollster selects, differing rankings may be created. In the past few years, the NCAA has agreed to move toward a broader playoff from the current four-team playoff to a minimum of twelve scheduled to begin in 2024. The difficulty with the current polling is that only the top four teams have an opportunity to compete for the championship, while in previous years it was only the top two. Moving to a twelve-team playoff reduces the likelihood that the best team will be left out of the competition.[9]

The BCS from 2005 to 2013 included the Power Five and the Group of Five conferences when they were eligible according to the BCS ranking system (which was an amalgam of human polling and computer rankings). During this period, only the top two ranked teams from the appropriate ranking system would play for the national championship, while the next best teams would play in the remaining top-tier bowl games. Generally, the top eight teams were invited to four bowl games, with the national championship games matching the first and second ranks teams and the location rotating between the historically significant bowl venues.[10] Starting in the 2006-2007 season, the bowls were expanded by one. This increased the number of teams selected to ten for the five bowl games.

Starting in 2014, the NCAA adjusted the format to a four-team selection, the CFP, where the two first-round games of the playoff would again be a rotating historic bowl game followed

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the season. The team won its remaining games and conference championship but was left out of the College Football Playoffs. The playoffs that year included two teams with a one-loss record. One of those two teams was beaten by the other team earlier in the season. Lastly, both of those teams lost in the first round of the playoffs. This choice of polling mechanism shows the lack of clarity of the poll's purpose: a forecast of what college is most likely to win the championship or the ranking of play up to that point in the season.

[9] Weeber (2022) discusses that prior "to the BCS, the Associated Press's number one and two teams met in bowl games only eight times in 56 years". After the BCS, the two top teams played against each other for the next decade. He also elaborates on the growing frustration among fans for a more objective system to determine the national championship that included neither personal nor computer-generated rankings.

[10] These were the Fiesta, Orange, Rose, and Sugar Bowls.

by the national championship game two weeks later. [11] The top four teams ranked by the College Football Selection Committee would compete in this playoff to determine the national champion.

One could argue that the incentive for the college teams to compete for the national championship "doubled" with the change in systems since, previously, to contend for the championship, a team would have to be ranked either first or second in the BCS polling, but with the playoff system, this increased that number to four. So, the pool of contenders for the championship doubled. Additionally, the emergence of the Power Five conference meant that if a team won their conference, they had a four out of five probability of being included in the playoffs. Knowing this, one would then expect to see the conferences become more competitive to achieve one of these four slots.

Based on the work by Dittmore and Crow (2010), it appears that the two competing incentives of the "profit maximization versus win maximization" problem had been aligned with the introduction of the BCS. The remainder of this paper will examine whether that improvement has continued with the transition to the CFP.

2.3 Data and Empirical Strategy

To examine competitive balance in major college football, the conference records of all teams in the Power Five and the Group of Five conferences were collected from 2005 to 2022. This data included each team's conference win-loss records, bowl appearances, and bowl results. It was collected from the website Sports Reference – College Football.[12]

The empirical strategy of Humphreys (2019) is followed to determine the best method for calculating competitive balance. Since the data covers nine years in each period and only eighteen overall, it would be excessive to use a dynamic method for the calculation. Therefore,

[11] These were the Rose, Sugar, Orange, Cotton, Fiesta, and Peach Bowls.
[12] www.sports-reference.com/cfb/

the traditional static methods of the Standard Deviation Based Measure and the Herfindahl-Hirschman Index (HHI) are utilized. Humphreys (2019) argues that these methods are "functionally" related, which is preferable to the estimation needs.

The Standard Deviations Based Measure (SDBM) is a standard measure of competitive balance commonly used in the economics of sports literature (Humphreys 2019; Fort and Maxcy 2003; Noble, et al. 2016; Rhoads 2004). One of the most common SDBM used is the Ratio of Actual Results Compared to Ideal Outcomes (RAI). It is calculated by taking the standard deviation of the win-loss percentages (WPCT) for each team's conference record and comparing it to the *ideal* standard deviation of .500, where evenly matched teams win 50% of their conference games. As conferences grow more competitive, this ratio approaches one, and vice versa. This method is best suited for measuring intraconference analysis, comparing teams and conferences over several years to evaluate how competitive balance has changed within the conference due to the teams playing the same number of intraconference competitors each year. The non-conference schedule for each team may change yearly and, therefore, cannot be used for comparison. Additionally, the RAI cannot be used for post-season play since appearances and opponents often vary each year. This is the primary reason the functional similarity between the RAI and the HHI is beneficial to this examination.

The following equation is used to calculate the actual standard deviation:

$$\sigma A = \frac{\Sigma\sqrt{((WPCT-.500)^2)}}{N}$$

WPCT is the conference winning percentage of each team and N equals the number of conference games played. The ideal standard deviation, where each team wins 50% of their games, would be:

$$\sigma I = \frac{0.5}{\sqrt{N}}$$

To obtain the ratio, we will divide the actual standard deviation by the ideal standard deviation:

$$R = \frac{\sigma A}{\sigma I}$$

The closer this ratio is to one, the greater the competitive balance, the closer to zero, the less competitive.

The Herfindahl-Hirschman Index (HHI) is a standard measure of market concentration in industrial organization. It is often used to determine whether a merger or acquisition will create anti-trust or competition issues within a market. In sports economics, the HHI can measure the concentration of championships within a conference, as well as measure the concentration of a conference winning bowl games against other conferences (e.g., the number of bowl games can be seen as market share). When the HHI is applied to markets or football conferences, a lower value indicates a more competitive conference while a higher value indicates a more monopolized or concentrated conference.

Calculating the HHI requires collecting the number of teams in each conference and the percentage of times each team has won the conference championship. For the evaluated period, this will provide the "market share" of championships for each team. The totals for each team are squared and then added together. For example, over fifteen years, Figure 2.1 shows the championships for the six teams in the conference:

Figure 2.1: Championships for the ACC from 2005-2022

Team	Championships
Clemson	8
Florida State	4
Virginia Tech	3
Wake Forest	1
Georgia Tech	1
Pittsburgh	1

To calculate the HHI for the conference, these shares are squared and totaled together, as reflected in Figure 2.2.

Figure 2.2: HHI Competitiveness for the ACC, 2005-2022

Team	Percentage Won	Percentage Squared
Clemson	44.44	1975.31
Florida State	22.22	493.83
Virginia Tech	16.67	277.78
Wake Forest	5.56	30.86
Georgia Tech	5.56	30.86
Pittsburgh	5.56	30.86
	HHI Score	**2,839.50**

Prior to the recent change at the Justice Department, markets totaling less than 1,500 are not very concentrated and, therefore, more competitive, while 1,500 to 2,500 are "moderately concentrated" or somewhat competitive, and over 2,500 are "highly concentrated" or more monopolistic.[13] In this particular example, the conference is heavily concentrated. This method can also be utilized for examining competitiveness of either intraconference or interconference games.

To examine the effect of the adoption of CFP, the data is split into a pre-treatment period, 2005-2013, and a post-treatment period, 2014-2022. A difference-in-differences estimation, using the RAI and HHI, is utilized to analyze the major change in the college football postseason in 2014. The Group of Five conferences are used as the control group, and the Power Five conferences serve as the treated group. While major college football presents a landscape filled

[13] The definition and explanation come from the Justice Department (https://www.justice.gov/atr/herfindahl-hirschman-index, accessed August 14th, 2024) On January 17, 2024, the definition changed to a two-tier system with the division occurring at 1800. For this paper, we will use the older, broader measurement.

with variables, this timeframe, the variation in the conferences, and the significant structural change in the postseason provide an exceptional opportunity to examine competitive balance and the NCAA's management of competition in collegiate football.

The equation used for the Difference-in-Differences (DiD) estimation is:

$$Y_{it} = \beta_0 + \beta_1 Treatment_i + \beta_2 Post_t + \beta_3 (Treatment_i \times Post_t) + \varepsilon_{it}$$

where β_0 is the average of the control group. β_1 is the average difference between the control group and the treatment group. β_2 is the average increase in the control group from the pre-treatment period to the post-treatment period. β_3 is the causal effect of the treatment on the treatment group. After the DiD estimation, the results will be compared to the RAI and HHI calculations.

2.4 Results of Empirical Tests

2.4.1 Intraconference Results

Table 2.1 shows where each conference stands for the overall period, 2005-2022, which provides a baseline average for intraconference competition. Note, that the Western Athletic Conference eliminated football after the year 2012-13, so their RAI is calculated from 2005 to that final year. Lower values represent more competition, and the RAI measures how closely the records of each team in a conference are to .500.[14] The closer to .500, the more competitive the conference. On the other hand, the Herfindahl-Hirschman Index (HHI) measures the distribution of conference champions, not the probability of wins or losses. Even though a conference may be extremely competitive according to the RAI, it could still be uncompetitive according to the HHI, and vice versa.

[14] Another way to interpret the RAI is that it shows the probability that one team will win a random intraconference game.

Table 2.1: Competitiveness in Power Five and Group of Five Conferences, 2005-2022

Conference	**RAI**	**HHI**
Power Five		
ACC	1.392	2839.506
Big Ten	1.617	3132.716
Big Twelve	1.558	3827.16
PAC 12	1.532	2145.062
SEC	1.566	2777.78
Power Five Mean	1.533	2944.445
Group of Five		
Big East/Am Athletic	1.563	1487.483
Conference USA	1.447	987.654
Mid-American	1.491	1543.21
Mountain West	1.646	1563.786
Sun Belt	1.482	1836.42
Western Athletic	1.787	2994.792
Group of Five Mean	1.569	1735.558
Combined Mean	**1.551**	**2340.001**

Table 2.2, using the RAI to measure competitiveness, divides the data into the two postseason systems, 2005 to 2013 for the Bowl Championship Series (BCS) and 2014 to 2022 for the College Football Playoff (CFP).

Table 2.2: The Impact on RAI Competitiveness of the Transition from the BCS to the CFP

Conference	BCS (2005-2013)	CFP (2014-2022)	Change
Power Five			
ACC	1.341	1.442	-7.53%
Big Ten	1.583	1.651	-4.30%
Big Twelve	1.501	1.616	-7.66%
PAC 12	1.515	1.55	-2.31%
SEC	1.617	1.515	6.31%
Power Five Mean	1.5114	1.5548	-2.87%
Group of Five			
Big East/Amer Athletic	1.419	1.707	-20.30%
Conference USA	1.464	1.431	2.25%
Mid-American	1.548	1.435	7.30%
Mountain West	1.721	1.57	8.77%
Sun Belt	1.361	1.604	-17.85%
Western Athletic	1.787		
Group of Five Mean	1.55	1.5494	0.04%
Combined Mean	**1.5307**	**1.5521**	**-1.40%**

Based on the data, the RAI shows that in four of the Power Five conferences, the values increased, meaning that, from the BCS period to the CFP period, these conferences became less competitive. The one outlier was the SEC, which not only increased its competitive balance (6.31%) but increased more than the average decrease of the other Power Five conferences. But in total, the Power Five conferences decreased in competitive balance, as measured by the RAI, by 2.87%. Additionally, two of the Group of Five conferences dropped in balance significantly (Big East/American Athletic and Sun Belt), while three increased in competitive balance slightly. Overall, this only averages to a slight increase in overall competitiveness. Finally, looking at major college football collectively, the competitive balance dropped slightly by 1.40% over the eighteen years under review.

Table 2.3, using the HHI to measure competitiveness, divides the data into the two postseason systems, 2005 to 2013 for the Bowl Championship Series (BCS) and 2014 to 2022 for the College Football Playoff (CFP).

Table 2.3: The Impact on HHI Competitiveness of the Transition from the BCS to the CFP

Conference	BCS (2005-2013)	CFP (2014-2022)	Change
Power Five			
ACC	2,592.59	6,296.30	-142.86%
Big Ten	3,148.15	3,827.16	-21.57%
Big Twelve	3,271.61	4,876.54	-49.06%
PAC 12	2,777.78	2,345.68	15.56%
SEC	1,728.40	5,061.73	-192.86%
Power Five Mean	2,703.70	4,481.48	-65.75%
Group of Five			
Big East/Amer Athletic	1,951.30	1,934.16	0.88%
Conference USA	1,851.85	2,098.77	-13.33%
Mid-American	2,098.77	2,098.77	0.00%
Mountain West	2,839.51	2,345.68	17.39%
Sun Belt	2,695.47	2,345.68	12.98%
Western Athletic	2,994.79		
Group of Five Mean	2,405.28	2,164.61	10.01%
Combined Mean	2,540.93	3,323.05	-30.78%

The PAC-12 was the only conference among the Power Five that became more competitive among the teams that won conference championships (15.56% increase). The ACC (-142.86%) and the SEC (-192.86%) appear to have become the least competitive in terms of championships, with only three teams from each conference winning their conferences during the CFP period.[15] This trend may highlight a further need to evaluate the differences between the SEC, ACC, and

[15] The ACC was the least competitive due to Clemson winning seven of the nine championships, while Alabama dominated the SEC with six of the nine.

the other Power Five conferences during the 2014-2022 time period.[16] The Group of Five shows more competition in three conferences, one remaining at the same level, and one decreasing.

Furthermore, the Power Five became significantly less competitive (a 65.75% increase in the HHI) with the change to the playoff system, while the Group of Five became slightly more competitive (a decrease in their HHI/increase in competition by 10%). Based on the data, not only is the Power Five becoming less competitive, but there is also a significant divergence between the Power Five (what could be considered the major conferences) and the Group of Five (considerably, the smaller conferences). However, in total, this translates to approximately a 30% decrease in overall competition, taking intraconference play from an HHI of 2,540.928 to 3,323.045. This exhibits a market trending toward monopoly, heavily weighted toward the Power Five.

One difference between the Power Five and the Group of Five that should be noted is the change in the composition of conference teams. Four of the Group of Five conferences have significant shifts in membership, including conference realignments and incoming teams from the Football Championship Subdivision (FCS) during the periods examined, while the Power Five remained relatively consistent.[17]

2.4.2 Interconference Results

Measuring interconference competition is more difficult. The RAI cannot be used to evaluate the interconference effects since postseason teams do not play the same teams or conferences each

[16] During 2023, USC, UCLA, Oregon, and Washington agreed to move to the Big Ten starting in 2024. Additionally, Colorado, Utah, Arizona, and Arizona State are planning to move to the Big Twelve in 2024. This leaves Stanford, California, Oregon State, and Washington State in the former PAC Twelve conference. The results of which are still to be decided as of this writing.

[17] A topic for future research could examine whether a changing schedule of teams makes competitive balance more or less difficult.

year, and different teams are invited to bowl games based on their win-loss records. Therefore, we must rely solely on the HHI to measure competitiveness. For this assessment, we will use bowl games and playoff games. The teams selected for bowl and playoff appearances are assumed to be the best of their respective conferences. The games are generally played at neutral sites and generally consist of two teams from different conferences, so these should be fair representations of the competition between conferences. To calculate the HHI for interconference play, we treat the Power Five and Group of Five as conferences. Then, we take the number of bowls won by each group and treat them as conference championships. Admittedly, this is an imprecise measure of interconference competition. However, it does recognize the successes of each group of conferences over other conferences as well as the distribution of wins by each conference within the group.

A few distinctions must be noted before examining the results. If only the BCS bowl games and the College Football Playoff games were used, there would be significantly more games played under the BCS rules than during the CFP (44 during the BCS compared with 27 in the CFP; however, this is still only a maximum of 73 observations). Also, during the CFP period, only one Group of Five conference team made it into the playoffs: the 2021-2022 Cincinnati Bearcats of the American Athletic Conference.[18] Therefore, we decided to expand the postseason play to the entire slate of bowl games. This expands the total number of observations to 622, which is only about half of the observations used for the regular season games over eighteen years but still much greater than 71 observations. Two downsides to this dataset are that, first, the HHI does not consider the total number of teams from a conference invited to a bowl game, only the number of wins from a conference. So, a good conference could send seven teams to

[18] Cincinnati lost to the Alabama Crimson Tide in the first round of the playoffs and therefore did not earn a win in the calculation. Notre Dame also made the CFP in 2018 and 2020, but lost both games as well.

bowl games, but if only one team wins, there is no benefit to the conference from the other six team appearances. Second, although it is interconference play, it is not necessarily *intergroup* play. It is just as likely that two Group of Five teams or two Power Five teams play each other as it is for a Group of Five to play a Power Five. Therefore, in this calculation, we are measuring each bowl victory as a championship because the competition is between two different conferences. Additionally, we will count each win in the College Football Playoff, whether first or second round, as a victory for that conference.[19]

Table 2.4 nearby reports the HHI for each year divided between the Power Five and Group of Five Conferences. As can be seen from the table, the mean BCS HHI for each group is very close (2248.143 vs. 2272.372), however, during the CFP period, the HHI shows that competition decreased among both groups, and the Power Five decreased more so than the Group of Five (roughly a 4% decline for the Group of Five and about a 12% decline for the Power Five).

2.4.3 Difference-in-Differences Estimation

Difference-in-differences (DiD) estimation requires parallel trends in the pre-treatment period. As shown in Figure 2.3, for the first five years of the period examined, the trend of the mean RAI for the Power Five and Group of Five conferences was not parallel. However, starting in 2010 and continuing until the treatment in 2014, the lines parallel each other remarkably. One possible explanation for this early divergence may relate to conference realignments driven by programs seeking to enhance revenues (Hoffer and Pincin 2015). During the four-year period 2010-2013, every conference either added or lost at least one member school. This realignment process was a

[19] During the CFP period, Georgia and Alabama played each other for the national championship in both the 2017-2018 season and the 2021-22 season. Since both teams are members of the SEC, these two games will be dropped from the HHI calculation.

natural outcome of schools recognizing that a different conference was more appropriate for their program in the earlier years (2005-2009).[20]

Table 2.4: Examining HHI Competitiveness Between Group of Five and Power Five During the Transition from BCS to CFP

	Group of Five (2005-2013)	**Power Five (2005-2013)**
BCS Period		
2005	2,500	2,132.96
2006	2,346.94	2,283.95
2007	2,561.98	2,335.60
2008	2,485.21	2,350
2009	1,938.78	2,243.77
2010	1,718.75	2,179.93
2011	2,346.94	2,400
2012	1,734.69	2,200
2013	2,600	2,325.14
BCS Mean	2,248.14	2,272.37
	Group of Five (2014-2022)	**Power Five (2014-2022)**
CFP Period		
2014	2,361.11	2,256
2015	2,142.86	2,290.81
2016	2,653.06	2,416
2017	2,265.63	2,396.69
2018	2,307.69	2,118.06
2019	2,041.52	2,562.36
2020	3,086.42	3,688.89
2021	2,132.96	2,797.78
2022	2,041.52	2,314.05
CFP Mean	2,336.98	2,537.85
Overall Mean	**2,292.56**	**2405.111**
Change Over Periods	**-3.95%**	**-11.68%**

[20] Future research can investigate this.

Figure 2.3: RAI Parallel Trends, 2005-2022

2.4.4 Intraconference Estimation

The RAI and HHI are used for the intraconference Difference-in-Difference estimation. The four groups are the control (Group of Five), treatment Groups (Power Five), pre-period (2005-2013), and post-period (2014-2022). The results from the estimation, with positive values reflecting a negative impact on competition, are similar to the statistical output from the tables, as reflected in Table 2.5.

Table 2.5: Difference-in-Differences Results for RAI and Log HHI, 2005-2022

	RAI (1)	Log HHI (2)
Intercept (B0)	1.569***	7.767***
	(0.035)	(0.103)
Treatment (B1)	-0.060	0.111
	(0.051)	(0.152)
Post-Treatment (B2)	-0.019	-0.090
	(0.051)	(0.152)
Diff in Diff (B3)	0.066	0.568**
	(0.074)	(0.220)
Note:	*p<0.1; **p<0.05; ***p<0.01	

Looking at the Intercept (β_0) for the RAI estimation, we see the mean of the pre-treatment control group as 1.569, which is highly statistically significant. While this is not meaningful, it does provide an adequate baseline to start the discussion. The value of the treatment group (β_1), is -0.060, and the pre-period value for the treatment group is 1.509 (1.569 – 0.060). So, during the BCS period, the Power Five was slightly more competitive than the Group of Five. β_2, the value of the post-treatment control group is -0.019, which means that transitioning to the CFP period slightly improved the competitive balance for the Group of Five conferences to an average of 1.55 (1.569 – 0.019). Lastly, our causal effect, β_3, is 0.066, which means that the mean of the treatment group in the post-period is 1.55, which is essentially the same as the control group and is not statistically significant.

For the estimation of the HHI, first, the log of the HHI values is taken since it is an index and doesn't have any significant meaning. Taking the log transforms the index values into more meaningful values for estimation. Following the same pattern, β_0 is the starting point for the

control pre-period average at 7.767, and β_1 is the pre-period start for the treatment group at 7.878 (7.767 + 0.111). Again, the post-treatment period saw a slight increase in competition for the control group of -0.090, giving a post-treatment mean of 7.677 for the Group of Five. Finally, the treatment group had a statistically significant decrease in competition of 0.568, leading to a post-treatment mean of 8.356 (7.767 + 0.111 – 0.090 + 0.568). This estimation is consistent with Table 2.3 and suggests that the advent of the College Football Playoff reduced the overall competition within the Power Five, while slightly increasing competition within the Group of Five. The change to the playoff system likely incentivized the Power Five to disregard any benefit of competitive balance within the conference, knowing that a conference win essentially earned (or at least approximately an 80% probability) a playoff berth.

The reason for the differences in the two models most likely stems from the methods used to calculate competitive balance. Since the ratio method utilizes the winning percentage of teams, many teams within a conference can have the same record, which would tend to moderate the significance of the ratio. Whereas HHI tends to punctuate the *one* team that wins the conference. Multiple teams influence the ratio each year, while the HHI is influenced only by the conference champion, and in the pre-treatment period, there were more shared conference titles than in the post-treatment era. While there is value in the RAI method, especially when looking at intraconference competitiveness, more emphasis should be put on the HHI result than the RAI when looking at the overall competitive balance of major college football.

2.4.5 Interconference Estimation

Using the same Difference-in-Differences estimation model for the *intraconference* statistics, the HHI totals for the *interconference* values in the previous estimation are logged. Following the same format as the earlier models, the pre-treatment results for the control group are 7.706, and

7.728 (7.706 + 0.022) for the treated group. The post-treatment result for the control is 7.748 (7.706 + 0.042), and the treatment group is 7.826 (7.706 + 0.022 + 0.0420 + 0.056). Keeping in mind that increases in these values signify an increase in market concentration (a reduction in competition), the pre- to post-treatment periods show a very slight decrease in competition among both groups overall. Based on the estimation, both groups became less competitive, with the Power Five exerting more market concentration than the Group of Five. Outside of the pre-treatment control value, none of the results are statistically significant, suggesting that the change in postseason play did not appear to adjust the interconference competitive balance.

Table 2.6: Difference-in-Differences Results for Log HHI, 2005-2022

	Log HHI
Intercept (B0)	7.706***
	(0.046)
Treatment (B1)	0.022
	(0.065)
Post-Treatment (B2)	0.042
	(0.065)
Diff in Diff (B3)	0.056
	(0.091)
Note:	*p<0.1; **p<0.05; ***p<0.01

A final observation on the estimation models above is that the change in postseason play in college football appears to have increased the *intra*conference competition levels but did not significantly affect the *inter*conference competition. In other words, the possibility of four seeds in the playoffs incentivized colleges to compete more strongly for their respective conference championships to attempt to earn one of the top four slots. But stronger competition *within* a

conference does not appear to improve the probability of victory against other conferences. To elucidate this disparity, future research needs to be done to examine the structural differences between the two major groups of major college football. Possible research topics might include recruiting, coaching, funding, geography, and length of school programs.

2.5 Conclusion

This paper analyzed the competitive balance in the Power Five and Group of Five conferences over the BCS and CFP periods from 2005-2022, using conference game results for intraconference competitions and bowl and playoff games for interconference competitions. Standard measures from the sports economics literature were used to measure competitive balance, the ratio of actual to ideal standard deviations and the Herfindahl-Hirschman Index. The results from the data suggest that market concentration increased (competition decreased) between the two major groups of college football conferences following the transition from BCS to CFP, more so in the Power Five than the Group of Five. Assuming that the purpose of the change from the BCS to the CFP was to promote competitive balance, the data shows the transition had the opposite effect. Based on these research findings, more competitive conferences win fewer national championships and bowl games. A possible interpretation is that the payoff for colleges to win interconference bowl games and national championships exceeds that of maintaining competitive balance within the conferences.

This research also highlights the opportunity for additional studies, such as the structure and management of the NCAA to incentivize conferences, the metrics used to measure competition, and the selection method by which teams enter into either bowl or playoff games.[21]

[21] In 2024, two major events have occurred. First, the NCAA has agreed to expand the current playoff system to include twelve teams, and secondly, for the first time, an undefeated conference champion was refused a seed to the national playoffs, while two one-loss conference champions were seeded above them (Florida State). This highlights the continuing struggle of rankings to determine the championship field.

Although this paper focuses on college football, it may also have implications for the literature on cartel behavior, especially the ability of cartels to manage firms within the cartel while maintaining competitive markets.

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Chapter Three

Does Capitalism Drive Wealth Concentration?

Does capitalism drive wealth concentration? It is commonly assumed that capitalism is a primary driver of wealth concentration. We use state ownership of the economy from the Varieties of Democracy Project and the Wealth Share of the Top 1% from the World Inequality Database to examine the relationship between capitalism and wealth concentration. Robustness checks using the Economic Freedom of the World Index and the net worth and number of billionaires from the Forbes' Billionaires List are also performed. Our results fail to find that capitalism is a primary determinant of wealth concentration.

3.1 Introduction

Does capitalism drive wealth concentration? Prominent historical and modern political economists have posited a relationship between capitalism and wealth concentration. This tendency led these scholars to advocate for radical policy prescriptions to prevent excessive wealth concentration, which they often saw as a threat to democracy since it would translate into political power.

One of the first political economists to posit that capitalism was a primary determinant of wealth concentration was Karl Marx. Marx (1848[2019], 33) argued that capitalism would result in the "concentration of capital and land in a few hands…" Market socialists such as Oskar Lange and Abba Lerner built upon these concerns, arguing that industrial concentration also posed a threat to democracy (Benzecry, Reinarts, and Smith 2024a).

The most notable modern proponent of this position is Piketty (2014). Piketty argues that as long as the return on capital exceeds economic growth, capitalism will lead to an increased concentration of wealth. Piketty advocates for progressive taxation, at a specific rate of 80%, to counter this natural tendency of capitalism. A growing literature, however, questions Piketty's theory for excluding human capital, assuming that depreciating capital is replaced, for inappropriate savings assumptions and for empirical problems (Acemoglu and Robinson 2014; Delsol, Lecaussin, and Martin 2017; Krusell and Smith Jr., 2015; Magness 2019; Magness and Murphy 2014; Manish and Miller 2020; Mechling, Miller, and Konecny 2016; McCloskey 2014; Rognlie 2015; Sutch 2017).

This paper contributes to this literature by examining the historical relationship between capitalism and wealth concentration. We use State Ownership of Economy data from the Varieties of Democracy Project and Top 1% Wealth Shares data from the World Inequality

Database in our primary specification for 27 countries[1] from 2000 to 2019. In robustness checks, we utilize Fraser's Economic Freedom of the World Index and the Forbes' Billionaires' List for the same countries and time period.

Based on our research we find that there is no statistically significant relationship between capitalism and wealth concentration. Additionally, using a variety of measurements for our dependent and independent variables, our models do not show a consistent relationship between wealth concentration and capitalism. This leads us to believe that the relationship is much more complex than simply "capitalism causes wealth concentration", or that there is another more significant missing catalyst.

Section 3.2 describes our data, provides summary statistics, and provides our empirical model. Section 3.3 reports our primary results. Section 3.4 provides our robustness checks. Section 3.5 concludes.

3.2 Data and Empirical Methods

Our primary measure of capitalism is State Ownership of Economy (v2clstown_osp) from the Varieties of Democracy Project (Coppedge et al. 2024; Pemstein et al. 2024). This data ranges from 0 to 4, with a score of 0 representing a country with complete state ownership or control of the means of production and 4 representing a country with complete private ownership of the means of production. This corresponds to the traditional economic definition of capitalism and socialism (Benzecry, Jensen, and Smith 2024; Benzecry, Reinarts, and Smith 2024b). Our primary measure of wealth concentration is the World Inequality Database's Top 1% Wealth Shares.

[1] The list of countries is provided in Appendix 1.

For our robustness checks, we utilize a broader measure of capitalism, Fraser Institute's Economic Freedom of the World Index (Gwartney, Lawson, and Murphy 2023). We also substitute an alternative measure of wealth concentration from the Forbes Annual Richest World's Billionaire List. We limit our comparisons for the main specification and the robustness checks to the countries in which billionaires are residents.[2]

We use a range of controls from two data sources, Gross Domestic Product, population, and human capital from the Penn World Tables (Feenstra, Inklaar, and Timmer, 2015) and Urbanization, and Natural Resource Rents from Our World in Data, a project of the Global Change Data Lab in conjunction with the University of Oxford. To minimize the effects of country differences, we have taken the natural log of both GDP and population. This corresponds to the index for human capital, as well as percentages used for urban populations and natural resource rents. These controls should provide instruments that indicate the overall vibrancy of a nation's economy.

Table 3.1 presents the descriptive statistics for our research. We see that the average percentage of wealth held by the top percentile is about 26.982% of a nation's total wealth. We take the log for the number and net worth of billionaires.[3] The average state ownership of the economy is 3.202, and the Economic Freedom Index is 7.87, both would indicate a relatively free economy.

[2] Our argument for the current selection of countries is that if we are analyzing the relationship between wealth concentration and capitalism, one would expect extreme wealth to be a result of that concentration. The selection is also limited to the countries that provide complete information for our control variables. As such, we believe this provides a better, more consistent comparison of worldwide wealth concentration among capitalist economies.

[3] The real average number of billionaires in each country over the time frame is 28 billionaires, and their associated net worth is about $114.6 billion. The distribution of billionaires indicates that there is significant variation of the number and net worth of billionaires. It is right skewed due to a few countries having several residents who are very wealthy (United States - 618), while other countries may have only a few (Portugal -1, Belgium – 3). We therefore take the log of these values in order to attain a normal distribution of billionaires in our sample.

Table 3.1: Descriptive Statistics

VARIABLES	Mean	Std. Dev.	Median	Notes
Top 1% Wealth Share (%)	26.829	8.402	24.665	From the World Inequality Database
LN (Number of Billionaires)	2.133	79.558	2.079	
LN (Net Worth of Billionaires)	3.314	351.991	3.339	In billions, USD
State Ownership of the Economy	3.202	.271	3.155	From the Varieties of Democracy Project
Economic Freedom Index	7.837	.492	7.9	
LN (GDP)	13.709	1.137	13.64	2017 USD
LN (Population)	3.153	1.186	2.971	
Human Capital index	3.254	.402	3.355	
Urbanization	78.753	9.868	80.189	Urban Population (% Total Population)
Resource Rents	1.494	2.649	.328	Total natural resource rents (% of GDP)

Table 3.2 provides a correlation matrix for our variables under review. As would be expected, there are strong correlations between the number of billionaires and the net worth of billionaires, and between GDP and population to State Ownership of the Economy. The table also shows that State Ownership of the Economy and the Economic Freedom Index are only slightly correlated (0.285). Additionally, the Economic Freedom Index is negatively correlated to the Top 1% Wealth Share (-0.351) and both GDP and Population are negatively correlated with the Economic Freedom Index. Although Human Capital Index is strongly correlated with the Economic Freedom Index. The differing correlations between State Ownership of the Economy and the Economic Freedom Index highlights the complexity of measuring “capitalism” in an economy.

Table 3.2: Matrix of Correlations

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Top 1% Wealth Share (%)	1.000									
(2) LN (Number of Billionaires)	0.193	1.000								
(3) LN (Net Worth of Billionaires)	0.228	0.961	1.000							
(4) State Ownership	0.012	0.466	0.465	1.000						
(5) Economic Freedom Index	-0.351	0.152	0.174	0.285	1.000					
(6) LN (GDP)	0.078	0.772	0.744	0.564	-0.041	1.000				
(7) LN (Population)	0.262	0.662	0.639	0.509	-0.242	0.952	1.000			
(8) Human Capital index	-0.346	0.343	0.328	0.195	0.629	0.131	-0.074	1.000		
(9) Urbanization	-0.060	0.068	0.081	0.014	0.206	0.031	-0.002	0.351	1.000	
(10) Resource Rents	0.387	-0.139	-0.118	-0.262	0.021	-0.184	-0.116	-0.006	0.132	1.000

Our hypothesis proposes that capitalism is not the preeminent force causing wealth concentration around the world. Therefore, to estimate the specification, we use a primary model

$$Concentration_{i,t} = \alpha + \beta_1 Capitalism_{i,t} + \beta_2 Controls_{i,t} + \gamma + \tau + \epsilon_{i,t}$$

where "Concentration" is our outcome (dependent) variable, which corresponds to the percentage of wealth held by the top 1% in each country (*i*) and each year (*t*). The intercept, α, with β_1 as the coefficient of the measurement of capitalism (as measured by the V-Dem index for the State Ownership of the Economy) by country and year. the coefficient of a slate of controls (β_2), is comprised of economic and social measures of developed societies. Fixed effects for country and year are signified by γ and τ, respectively. The assumption by Piketty et al is that as the measure of capitalism increases wealth concentration should increase correspondingly. Our hypothesis is the opposite, as capitalism increases, wealth concentration does not necessarily occur.

3.3 Primary Results

Table 3.3 illustrates the results for our primary specification: the relationship between the percentage of the top 1% of the wealthiest individuals as it relates to state ownership of the economy. Our complete model shows that for a 1-point increase in the State Ownership index, the percentage wealth of the top 1% would increase by 2.136. Our controls show modest positive relationships, such as LN (GDP) at 0.737, LN (Pop) at 1.195, and Resource Rents at 0.191. The major differences were Human Capital (5.729) and Urbanization, the only negative relationship at -0.273. It is interesting to note that the Human Capital Index appears to have a stronger relationship, by almost a factor of 3, with the top 1% wealth share than state ownership of the economy. However, none of the results from this model are statistically significant.

Table 3.3: Top 1% Wealth Share and State Ownership of the Economy

VARIABLES	(1)	(2)	(3)	(4)
State Ownership	.917	.916	1.803	2.136
	(2.123)	(1.779)	(1.796)	(1.945)
LN (GDP)		1.823	1.375	.737
		(2.54)	(2.671)	(2.849)
LN (Population)		1.12	-.196	1.195
		(6.398)	(6.254)	(6.76)
Human Capital index			4.888	5.729
			(3.855)	(4.107)
Urbanization			-.268	-.273
			(.162)	(.164)
Resource Rents				.191
				(.121)
Constant	23.893***	-4.625	8.038	8.715
	(6.798)	(24.073)	(26.397)	(26.022)
Observations	488	488	488	488
R-squared	.002	.052	.093	.11

Standard errors are in parentheses, clustered by country. All equations contain country and year fixed effects.

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

Based on these results, we believe this model disproves the common assertion that capitalism is the root cause of wealth concentration. Since the model does not show any statistical significance in the relationship between capitalism and wealth concentration, combined with the relatively low R^2 value, the argument is that most likely there are variables that are omitted from this model that play a more significant role in the determination of wealth concentration, or at least that it is not *solely* capitalism. But if the model shows anything of value, it is that Human Capital should be considered more closely in future research as it appears to have a slightly stronger relationship.

3.4 Robustness Checks

3.4.1 Proxy for Dependent Variable

Tables 4 and 5 present our results from our first robustness check. For these models we replace the top 1% Wealth percentage for our dependent variable with the log of billionaire net worth

and the log of the number of billionaires attained from the Forbes Billionaire List. We have two regressions, the first estimates the relationship between the wealth of billionaires and the State Ownership of the Economy, and the second does the same except using the number of billionaires in each country. The purpose of these models is to exchange a percentage of a nations' wealth, with the estimated wealth of the nations' wealthiest citizens. This should provide a clearer picture of what concentrated wealth would look like given a certain outcome. Table 3.4 shows that for a 1 unit increase in economic freedom, there would be an associated 0.028% decrease in billionaire wealth. This is extremely small, but has the only negative relationship of all variables tested. As in the primary model, the robustness model indicates that an increase in the Human Capital Index implies a stronger relationship with wealth concentration (2.727), while population is as strong (2.68%). Surprisingly, GDP is lower than Human Capital or population, but is still a positive value at 1.7%. Urbanization and Resource Rents provide negligible increases at 0.063 and 0.059, respectively. While this model has an R^2 value of 0.658, none of the values are statistically significant.

Table 5 provides essentially the same relationships with slightly different values. The main independent variable (State Ownership) remains negative at -0.234%. Population (2.67%) and Human Capital Index (2.446) continue to be the strongest relationships. GDP provides a 1.146% increase. As in the previous model, Urbanization and Resource Rents have negligible effects. Still, there are no statistically significant values in the regression with a relatively high R^2 value at 0.625.

These models confirm our primary hypothesis that there is no statistically significant evidence that the level of capitalism affects the concentration of wealth or the wealth and number

of existing billionaires. As in our primary specification, no variables show any statistically significant relationship to imply a causation of wealth contribution by a more capitalist economy.

Table 3.4: Billionaire Net Worth and State Ownership of the Economy

VARIABLES	(1)	(2)	(3)	(4)
State Ownership	-.208	-.225	-.131	-.028
	(1.264)	(.578)	(.721)	(.699)
LN (GDP)		2.983***	1.897*	1.7
		(.849)	(.953)	(1.018)
LN (Population)		3.754	2.25	2.68
		(2.287)	(3.071)	(3.25)
Human Capital index			2.467	2.727
			(2.293)	(2.246)
Urbanization			.065	.063
			(.057)	(.058)
Resource Rents				.059
				(.041)
Constant	3.98	-48.691***	-42.497***	-42.287***
	(4.049)	(6.898)	(9.043)	(8.824)
Observations	488	488	488	488
R-squared	0	.609	.652	.658

Standard errors are in parentheses, clustered by country. All equations contain country and year fixed effects.

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

Table 3.5: Number of Billionaires and State Ownership of the Economy

VARIABLES	(1)	(2)	(3)	(4)
State Ownership	-.329	-.352	-.222	-.234
	(1.064)	(.529)	(.637)	(.617)
LN (GDP)		2.126***	1.123	1.146
		(.644)	(.714)	(.779)
LN (Population)		4.144**	2.719	2.67
		(1.994)	(2.784)	(2.985)
Human Capital index			2.476	2.446
			(2.092)	(2.09)
Urbanization			.045	.045
			(.046)	(.046)
Resource Rents				-.007
				(.04)
Constant	3.185	-38.957***	-32.719***	-32.743***
	(3.409)	(5.076)	(6.721)	(6.754)
Observations	488	488	488	488
R-squared	.002	.577	.625	.625

Standard errors are in parentheses, clustered by country. All equations contain country and year fixed effects.

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

3.4.2 Proxy for Independent Variable

We make one additional estimation in Table 3.6, which provides our last robustness check. When we replace the State Ownership of the Economy with a proxy, the Economic Freedom Index the results are similar to our previous regressions. The main independent variable estimates that a 1 unit increase in the Economic Freedom Index, the wealth held by the top 1% of the population would decrease. The single difference to this model is that the value for Resource Rents is significant at the 0.1 level (0.181). As in previous regressions, the Human Capital Index has the largest coefficient (5.233). Lastly, the R^2 value drops significantly from the other robust models' values to 0.108.

Table 3.6: Top 1% and Economic Freedom Index

VARIABLES	(1)	(2)	(3)	(4)
Summary	-.055	-1.027	-1.18	-1.297
	(1.508)	(1.291)	(1.106)	(1.086)
LN (GDP)		2.295	1.931	1.388
		(2.329)	(2.447)	(2.576)
LN (Population)		.314	-.969	.304
		(6.544)	(6.469)	(6.935)
Human Capital index			4.528	5.233
			(3.413)	(3.495)
Urbanization			-.248	-.248
			(.154)	(.155)
Resource Rents				.181*
				(.1)
Constant	27.26**	2.426	17.423	19.264
	(11.815)	(26.401)	(28.32)	(27.586)
Observations	488	488	488	488
R-squared	0	.056	.093	.108

Standard errors are in parentheses, clustered by country. All equations contain country and year fixed effects.

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

3.5 Conclusion

Based on our estimates, we conclude that there is not a statistically significant relationship between wealth concentration and capitalism. While none of our models show any statistical significance of the relationship between wealth concentration and capitalism, the models show that capitalism fails to be *the* driving force behind wealth concentration that many would claim it to be. Capitalism may allow for easier wealth creation, but whether it causes wealth *concentration* does not appear to be a reasonable assumption. This research points out the likelihood that there is another variable yet to be determined that may shed more light on the subject of wealth concentration.

Additional work in this area could extend this research toward a greater understanding of the concentration of wealth. An area that could be researched further is the relationship of human capital to wealth creation as well as wealth concentration. Another area of extension would be to

examine the composition and derivation of the wealth of the top 1%. An understanding of how it was generated and what it consists of might provide a better understanding of the disparity among populations.

In conclusion, we selected a pool of countries with at least one billionaire resident and relatively stable, capitalist economies. We then estimated the relationship between the wealth of the top 1% of residents to the level of capitalism in their countries and used robustness checks to test our hypothesis. Our research shows that there is currently no statistically significant evidence to prove a relationship between wealth concentration and capitalism. And if there is a relationship, it tends to be slightly more negative than positive.

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APPENDIX B - Table of Countries included in the Sample

1. Australia
2. Austria
3. Belgium
4. Canada
5. Chile
6. Czechia
7. Denmark
8. Finland
9. France
10. Germany
11. Ireland
12. Israel
13. Italy
14. Japan
15. Mexico
16. Netherlands
17. New Zealand
18. Norway
19. Poland
20. Portugal
21. South Korea
22. Spain
23. Sweden
24. Switzerland
25. Turkey
26. United Kingdom
27. United States