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Articles

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An Empirical Examination of the Factors that Influence Television Viewership Rates in the National Football League

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Abstract

Using data from 280 nationally televised games between 2015 and 2018, this paper develops an econometric model to analyze the factors influencing television ratings for NFL games. The study examines how variables such as fan base size (measured by social media followers), game timing, team strength, rivalry status, and game excitement impact viewership. The results show that social media following is a strong predictor of viewership, with higher social media engagement correlating with more viewers. Rivalry games and high-scoring, close games also lead to increased viewership, while weaker teams and competing events negatively affect ratings. Additionally, the analysis reveals a consistent decline in NFL viewership over the study period, suggesting that changing media consumption habits, including the rise of streaming platforms, may be influencing traditional television ratings. The paper provides new insights into NFL broadcasting strategies and highlights areas for further research, particularly in addressing measurement challenges in the era of streaming.

1. Introduction

The National Football League (NFL) has become one of the most popular and profitable sports leagues in the world. However, with increasing competition from other forms of entertainment, as well as changes in viewing habits and preferences, maintaining and increasing viewership rates of NFL games has become a key challenge for the league's owners and stakeholders. Therefore, it is essential to explore the factors that influence the viewership rates of NFL games and to discuss the strategies adopted by NFL owners to increase viewership. This paper aims to examine the various factors that influence viewership rates of NFL games. The cornerstone of this study is the development of an econometric model which explains variability in viewership rates as a function of several key variables including points scored, competitiveness of the game based on point differential, social media followings, along with a host of other control variables. By understanding the factors that influence viewership rates of NFL games and the strategies adopted by the league's owners, stakeholders, and advertisers, this paper will contribute to the broader understanding of how sports leagues can continue to engage and attract viewers in a rapidly changing media landscape.

2. Television Broadcasting of NFL Games: Early History

The first televised NFL game was played on October 22, 1939, between the Brooklyn Dodgers and the Philadelphia Eagles at Ebbets Field in Brooklyn, New York.[1] The game was played in front of a small crowd of only 13,000 fans, which was typical of the era. The game was broadcast by National Broadcasting Company (NBC). The broadcast of the game was an experiment, with only a few hundred televisions in the New York City area at the time receiving the broadcast, but it was a significant event in the history of both the NFL and television. The game was also broadcast on the radio, as was typical at the time, but the television broadcast was groundbreaking, providing viewers with a new way to experience the game. The television broadcast of the game was a low-budget affair, with only one camera used to capture the action. The camera was positioned in

[1] The information related to the early history of NFL broadcasting (covering the next three pages) is based on two articles produced by Brulia (1994a) and Brulia (1994b).

a crane high above the field, and the only audio was a play-by-play announcer, who called the game from a booth on the roof of a nearby building. The quality of the broadcast was primitive by modern standards, but it was a historic event that paved the way for the NFL to become one of the most popular and lucrative sports leagues in the world. While the first televised NFL game was not a huge commercial success, it was an important step in the growth of the league. Over the next several years, more games were broadcast on television, and the NFL became a staple of American culture.

The National Football League (NFL) began regularly broadcasting its games on television in the late 1940s and early 1950s. In those early years, the league was faced with several challenges, including how to distribute its games to a wider audience and how to negotiate contracts with the major television networks. In 1948, the NFL signed a deal with ABC to broadcast its championship game, which was played between the Chicago Cardinals and the Philadelphia Eagles. The game was a huge success, and it helped to convince the NFL that television was the way of the future. Over the next few years, the NFL negotiated contracts with both NBC and CBS, and by the mid-1950s, football had become a regular fixture on Sunday afternoons. These early contracts were simple, and they typically involved the networks paying the league a flat fee for the right to broadcast its games.

However, in 1961, the NFL signed a groundbreaking deal with CBS, which saw the network agree to pay the league a percentage of its advertising revenue in addition to a flat fee. This marked a major shift in the way that television contracts were structured, and it helped to cement the NFL's position as a major player in the world of sports broadcasting. Since then, the NFL has continued to negotiate deals with the major television networks, and it has become one of the most lucrative properties in all of sports. These deals have included not only regular season games, but also the playoffs and the Super Bowl, which has become one of the most watched television events in the world.

3. Television Broadcasting of NFL Games: Modern History

Over the past forty years, the amount of revenue generated through NFL broadcasting rights has skyrocketed, and the nature of those rights has undergone significant changes. In the early 1980s, the NFL was generating around $200 million per year from its television contracts. However, in 1982, the league negotiated a landmark deal

with the major television networks that saw the value of its broadcasting rights increase significantly. The new deal was worth $2.1 billion over five years, and it marked a major turning point in the NFL's history. Since then, the value of NFL broadcasting rights has continued to grow, driven largely by the growth of cable and satellite television, as well as the rise of streaming services. In 1994, the NFL signed a deal with Fox that was worth $1.58 billion over four years, and in 1998, it signed a deal with CBS that was worth $4 billion over eight years. In 2006, the NFL negotiated a new deal with all the major television networks that was worth $3.7 billion per year, and in 2011, it signed a new deal that was worth $5.8 billion per year. The current deal, which was signed in 2020 and runs through the 2033 season, is worth a staggering $10 billion per year.

The nature of NFL broadcasting rights has also undergone significant changes over the past forty years. In addition to traditional broadcast television, the league now has agreements with cable networks like ESPN and NFL Network, as well as streaming services like Amazon Prime Video, X, and YouTube TV. These new agreements have opened new revenue streams for the league and have helped to expand its reach to new audiences. Overall, the revenue generated through NFL broadcasting rights has grown exponentially over the past forty years, and the league's ability to negotiate these deals has played a major role in its success as a business.

4. Viewership Literature: Trends, Impacts, and Measurement Issues

Measuring television viewership of NFL games, which drives the revenue streams described above, is a complex process that involves various methods and technologies. One of the most widely used methods for measuring television viewership of NFL games is the Nielsen ratings system. The Nielsen system measures the number of households that are tuned in to a given program, as well as demographic information about those viewers. This information is then used to calculate the program's rating and share, which are important metrics for broadcasters and advertisers. In recent years, the rise of digital media has led to the development of new metrics for measuring television viewership of NFL games. For example, a study by David Cotter and colleagues (2019) examined the use of digital metrics, such as website traffic and social media engagement, to

supplement traditional Nielsen ratings. The authors found that these metrics can provide valuable insights into viewer behavior and preferences, particularly among younger audiences.

Other methods, beyond broad based data collection methods, also exist for capturing NFL viewership levels. One method for measuring television viewership of NFL games is through survey research. According to a study by John Fortune and Jeffrey Shrader (2016), surveys can be used to collect information about viewer behavior and preferences, such as the reasons why viewers choose to watch certain games or the factors that influence their viewing decisions. This information can be used to inform programming and advertising strategies. Additionally, the use of advanced analytics has become increasingly important for measuring television viewership of NFL games. According to a study by Tim Bajkiewicz and colleagues (2018), advanced analytics can be used to track viewer behavior across multiple platforms, including traditional TV broadcasts, online streaming, and mobile apps. This information can provide a more comprehensive understanding of viewer behavior and preferences and can help broadcasters and advertisers to develop more targeted and effective strategies. Though these strategies are becoming increasingly important, this paper relies on traditional means of capturing the number of television viewers.

Regardless of how viewership has been measured, the National Football League (NFL) has been one of the most popular and profitable sports leagues in the United States for many years. The overall trend in NFL viewership over the last forty years has been one of growth. According to a study by John Fortune and Jeffrey Shrader (2016), the average TV rating for NFL games has increased steadily since the mid-1970s. The authors attribute this growth to several factors, including the expansion of the league, the increasing popularity of fantasy football, and the rise of digital media. While the NFL's regular season and playoff games have generally seen steady growth in viewership, the same cannot be said for the league's marquee event, the Super Bowl. According to a study by Daniel Durbin and Michael McCann (2011), Super Bowl ratings have fluctuated over the last forty years, with some years seeing significant growth and others experiencing declines. The authors attribute these fluctuations to several factors, including the quality of the teams, the competitiveness of the game, and the quality of the halftime show.

The NFL has sometimes been impacted by national events that impact viewership. For example, a study by Michael Lewis and Manish Tripathi (2016) found that the 9/11 terrorist attacks in 2001 had a significant impact on NFL viewership, with ratings declining sharply in the weeks immediately following the attacks. Similarly, the COVID-19 pandemic in 2020 led to some fluctuations in viewership, with some games being postponed or rescheduled due to outbreaks on teams.

The NFL's audience has also changed over the last forty years, with some research indicating a growing generational gap in viewership. According to a study by Alex Marland and Erin Steuter (2018), younger viewers are less likely to watch traditional TV broadcasts of NFL games and are more likely to consume content through digital and social media channels. This shift has led to some concerns among broadcasters and advertisers about the long-term viability of the NFL's traditional business model.

There is a substantial amount of academic literature that discusses and explores the factors that influence television viewership of NFL games. Burton, R. (1994) examines the factors that influence television viewership of NFL games and how this behavior can be used to increase the league's audience. The study found that factors such as the quality of the game, star players, and the importance of the game all play a role in influencing viewership. Dodd, M. D., et al. (2011) used data from the 2009 NFL season to examine the factors that influence television ratings. The study found that the quality of the game, the teams playing, and the time of day the game is aired are all important factors in driving viewership. Maxim, P. S., et al. (2011) examined the relationship between competitive balance and television ratings for NFL games. The study found that when games are more competitive, ratings tend to be higher, which suggests that viewers are more likely to watch when there is a greater chance of a close game.

Demographics are also related to NFL viewership rates. Kim, Y., et al. (2015) examine the impact of player characteristics, such as race, age, and position, as well as team performance on television ratings for NFL games. The study found that the performance of the team is the most important factor in driving viewership, while player characteristics have a more limited impact. Finally, Gan, L., et al. (2019) examine the impact of the Super Bowl on television ratings for

the NFL. The study found that the Super Bowl is a major driver of viewership for the league, with ratings increasing significantly for the championship game compared to regular season games.

5. Cooperation among NFL Owners: Strategies to Enhance Viewership

NFL owners have, working cooperatively, adopted numerous strategies to attempt to increase viewership, and hence, the value of broadcasting rights. First, the NFL has been expanding its reach internationally by hosting games in London, Mexico City, and Canada, as well as through partnerships with international broadcasters. This strategy has been shown to increase the league's global popularity, with international viewership growing by 33% from 2016 to 2018 (NFL, 2019). The NFL has also begun to successfully leverage digital media by using digital media to expand viewership rates. The league has recently partnered with major social media platforms to stream games online. Research shows that digital media has become a popular platform for watching live sports, and that social media platforms have been successful in attracting younger viewers to the NFL (Bowman, 2019). Enhancing the in-stadium experience has also proven to be a successful strategy to increase the volume of interested fans. In-stadium experience enhancements, such as improved Wi-Fi, mobile apps, and stadium upgrades, have also been adopted by NFL owners to improve viewership rates. A study by Deloitte (2018) found that 59% of NFL fans attended a game in person in 2017, and that these fans were more likely to watch games on television and consume other NFL content. Finally, the NFL has also made efforts to increase accessibility to its content by providing free access to highlights and live streams of games on its website and mobile app. Research shows that increased accessibility leads to higher viewership rates, particularly among younger viewers who are more likely to watch games on mobile devices (Shrestha & Kim, 2019). Overall, these strategies have had varying degrees of success in expanding NFL viewership rates, and the league continues to adapt to changes in media consumption patterns and audience preferences.

The NFL owners also have been able to change the rules of the game to deliver a more palatable product. As discussed, fans seem to favor high-scoring, competitive football games. With this knowledge, owners have initiated rules changes over the years to, among other

things, deliver a better product. There have been several major rule changes in the NFL over the last forty years that have had a significant impact on the number of points scored in games. In 1978, the NFL changed its pass interference rules to allow defenders to contact receivers only within the first five yards of the line of scrimmage. This rule change was made to increase offensive production, and it had the desired effect, leading to an increase in passing yards and touchdown passes (McGuire, 2016). The rule was further modified in 2004 to eliminate the five-yard buffer, which has led to even more passing yards and touchdowns in recent years (Barra, 2018). In more recent years, the NFL has made several changes to its roughing the passer rule to protect quarterbacks and increase offensive production. These changes include prohibiting defenders from landing on quarterbacks with all or most of their body weight and prohibiting defenders from hitting quarterbacks below the knee (Florio, 2019). These changes have led to more passing yards and touchdowns, as quarterbacks are now able to stay on the field longer and make more plays (McGuire, 2019).

The NFL, in 1986, began using instant replay to review certain calls on the field. This has helped to ensure that calls are made correctly and has reduced the number of missed calls that can impact the outcome of a game. Several studies have found that the use of instant replay has made games more competitive and closer (e.g. Levin & Hodson, 2007; Schreiber & Fink, 2009). The NFL also implemented the two-point conversion, which allows teams to score two points by running or passing the ball into the end zone from the 2-yard line. This 1994 rule change has made games more competitive and closer, as teams are now able to score more points and potentially tie or take the lead in late-game situations (Gross, 2018). In 2010, the NFL changed its overtime rules to allow both teams to possess the ball at least once in overtime, regardless of whether the team that receives the ball first scores a touchdown or a field goal. This change has led to more scoring in overtime, as teams are now more likely to get an opportunity to score if they don't win the coin toss (Gross, 2015). In 2015, the NFL changed its extra point rule to make it more difficult for kickers by moving the line of scrimmage for extra points from the 2-yard line to the 15-yard line. This change has led to more missed extra points and more teams going for two-point conversions, which has increased the total number of points scored in games (Kurland,

2016). Overall, the rule changes in the NFL over the last forty years have had a significant impact on the total number of points scored in games, with several changes aimed at increasing offensive production and making the game more exciting for fans.

Beyond on field rule changes, the NFL has instituted other well-known changes to promote competitive balance. In 1993, the NFL implemented a salary cap, which limited the amount of money each team could spend on player salaries. This helped to level the playing field between small-market and large-market teams and has made the league more competitive overall (Gross, 2018). Several studies have found that the salary cap has been effective in creating parity and competitive balance in the league (e.g. Humphreys & Mondello, 2007; Deutscher, 2012). In the same year, the NFL also implemented free agency, which allowed players to sign with any team after their contracts had expired. This gave players more control over their careers and provided teams with more flexibility in building their rosters. Free agency has helped to create more competition among teams for the best players and has made the league more competitive overall (Gross, 2018). Overall, the NFL has implemented several rule changes over the last forty years that have made games more competitive and closer. These changes have helped to create more parity and balance among teams and have made the game more exciting for fans.

6. Data and Methodology

This paper develops an econometric model aimed at better understanding the factors that influence television ratings for NFL games. We examine the viewership rates of 280 nationally televised games that took place between 2015 and 2018. Each of these games is broadcast in one of five potential time slots: Thursday night (NFL Network), Saturday (ESPN, CBS, Fox), Sunday afternoon (CBS, Fox), Sunday evening (NBC), and Monday evening (ESPN). Notably, Thursday and Monday evening broadcasts are available exclusively on cable networks, which may be associated with, ceteris paribus, lower viewership rates for these games. Additionally, while games scheduled on Thursday, Sunday evening, and Monday are the only broadcast games in their respective time slots, nationally televised Sunday afternoon games face competition from regionally televised games airing simultaneously.

The dependent variable—television viewers—is measured in two ways using publicly available Nielsen ratings. The first measure is the total number of viewers (in millions), and the second is the "rating," which represents the percentage of viewers who tuned into the event. To analyze these data, we utilize Ordinary Least Squares (OLS) regression, running alternative specifications to investigate how various factors, such as fan base size, competing televised events, team strength, game closeness, and total points scored, influence

Table 1: Variable Definitions

Variable	Description
Viewership	Number of viewers (millions)
Ratings	Percent of total viewers watching event
TotalSocialMedia	Number of social media followers (by team)
Spread	End game point differential
TotalPoints	End game total points scored
PtSpdRatio	Ratio of total points scored to end point differential
Monday.Game	Indicator for Monday night game
Thursday.Game	Indicator for Thursday night game
Saturday.Game	Indicator for Saturday game
Sunday.Night.Game	Indicator for Sunday night game
AvgPower	Average power ranking of teams playing
Competing.Event	Indicator for presence of competing televised event
Rivalries	Indicaator variable for rivalry game

Sources: www.nfl.com, Nielson Ratings, Odds Warehouse (purchased), NFL social media data, sportsbrief.com (rivalry data)

viewership. Specifically, two sets of models are presented. The first set (models 1a and 1b) uses ratings as the dependent variable, while the second set (models 2a and 2b) uses viewership as the dependent variable. Within each set, model 1a (or 2a) includes points scored and margin of victory as separate explanatory variables, while model 1b (or 2b) adds to those variables an interaction term (points scored/margin of victory).

Table 2: Descriptive Statistics

Variable	Mean	Std. deviation
Viewership	16.82	5.87
Ratings	9.74	3.13
TotalSocialMedia	7,339,707	2,169,274
Spread	11.32	8.60
TotalPoints	45.93	13.75
PtSpdRatio	8.43	10.33
Monday.Game	0.20	0.40
Thursday.Game	0.19	0.39
Saturday.Game	0.03	0.18
Sunday.Night.Game	0.19	0.39
AvgPower	13.03	6.38
Competing.Event	0.12	0.32
Rivalries	0.17	0.37

The goal of the analysis is to systematically assess how these variables are related to television ratings. By doing so, we aim to offer a comprehensive understanding of the dynamics behind audience engagement and quantify the relative impact of each factor on viewership. This approach not only highlights the key variables related to viewership but also provides insights into how the NFL's broadcasting strategy can be optimized to enhance audience retention and attract larger viewership.

Three novel contributions advance our understanding of NFL viewership. The first involves the variable used to capture the fan base. Previous studies often use the total population within the metropolitan statistical areas of the home and away teams to represent fan base size. However, this approach overlooks the fact that the U.S. population is highly mobile. Many NFL fans develop strong loyalties to their teams during their formative years, and these loyalties persist even as they move to different parts of the country. For example, fans from Northeastern and Midwestern states often migrate to the Southeastern and Southwestern regions of the U.S., yet continue to support their original teams. To better capture the size of a team's fan base, we use the total number of social media followers for the two

competing teams. This measure is not tied to any specific geographic location and more accurately reflects the broader fan base than does the traditional method of considering local populations.

The second contribution pertains to NFL rivalries. Some games are played between long-standing rivals, which tend to generate heightened fan interest and draw larger viewerships, regardless of fan affiliation. To account for this, we identify the top 15 NFL rivalries, as determined by a reputable sports website, and include an indicator variable for these matchups in our regression models. We expect this variable to have a positive effect on viewership.

The third contribution focuses on a unique measure of game excitement. Traditional models typically include total points scored and point differential as separate variables. However, we argue that these variables, separately, fail to fully capture viewership rates. We hypothesize that high-scoring, close games will be viewed at a greater rate than other games. For example, a game with a final score of, for example, 52-49 will likely attract more viewers due to its high levels of scoring and competitiveness. To account for this, we introduce a new variable, "PtSpdRatio," which is the ratio of total points scored to the point spread. We hypothesize that games with high scores and narrow point spreads will generate more viewership than high-scoring or close games in isolation.

7. Results

The regression analyses provide valuable insights into the factors associated with NFL television viewership, as measured by both total viewers (in millions) and ratings (percentage of viewers). Using two sets of models—one with ratings as the dependent variable (Models 1a and 1b) and the other with total viewers as the dependent variable (Models 2a and 2b)—we examine the relationships between various factors, including social media followers, game characteristics, and competition from other events, and television viewership.

Relationship between social media followers and viewership

The number of social media followers for the competing teams consistently appears as a significant predictor of both ratings and total

viewers. In all model specifications, the total social media following is positively and statistically significantly associated with viewership.

Table 3: Regression Results – Ratings
(Robust Standard Errors within Parenthesis)

	Model 1a	Model 1b
Variable	Coefficient	Coefficient
Intercept	1583***	1563***
	(215.3)	(214.5)
TotalSocialMedia	0.0268***	0.0265***
	(0.0024)	(0.0024)
Spread	-0.0299***	-0.011
	(0.129)	(0.16)
TotalPoints	0.0038	-0.0034
	(0.079)	(0.089)
PtSpdRatio		0.0282**
		(0.0145)
Monday.Game	-2.71***	-2.65***
	(0.03)	(0.0298)
Thursday.Game	-0.995***	-0.981***
	(0.35)	(0.35)
Saturday.Game	-3.97***	-3.92***
	(0.835)	(0.85)
Sunday.Night.Game	-0.042	-0.063
	(0.273)	(0.273)
AvgPower	-0.11***	-0.11***
	(0.018)	(0.018)
Competing.Event	-0.64*	-0.59*
	(0.369)	(0.367)
Rivalries	0.642***	0.633***
	(0.278)	(0.274)
Year	-0.78***	-0.77***
	(0.11)	(0.11)
Adjusted R^2	.682	.6945

Specifically, an increase of one million social media followers is associated with an increase in ratings by approximately 0.027 percentage points (Model 1) and in total viewers by 0.05 million (Model 2). These findings suggest that social media engagement may serve as a proxy for fan loyalty and national interest, extending beyond a team's geographic region.

Game timing and scheduling

The time slot during which a game is broadcast is significantly associated with viewership. Monday and Thursday night games, which are broadcast exclusively on cable networks (ESPN and NFL Network), show a clear and significant negative relationship with both ratings and total viewers. Specifically, Monday night games are associated with a decrease of approximately 2.7 percentage points in ratings (Model 1) and a decline of 4.93 million viewers (Model 2), while Thursday night games are linked to reductions of 0.99 percentage points in ratings and 1.3 million viewers. These results suggest that the exclusive cable broadcast of these games may limit their potential audience compared to games aired on broadcast networks.

Saturday games also exhibit significantly lower viewership compared to Sunday games. Saturday games, which typically occur in off-peak time slots, are associated with a decrease in ratings by 3.97 percentage points and a reduction in total viewers by 6.15 million viewers, aligning with the general preference for NFL games to air on Sundays. However, Sunday night games, which are aired on NBC, do not show a statistically significant difference in viewership compared to Sunday afternoon games, indicating that the over-the-air broadcast may counterbalance potential disadvantages of the time slot.

Rivalries and viewership

The presence of rivalry games is consistently associated with higher viewership, with a statistically significant positive coefficient in both the ratings and total viewership models. Games identified as part of the top 15 NFL rivalries are associated with an increase of 0.64 percentage points in ratings (Model 1) and an increase of 1.55 million viewers (Model 2). These findings suggest that historical rivalries are linked to larger audiences, likely due to heightened fan interest and emotional investment, regardless of team performance in each season.

Team strength and power ranking

The average power ranking of the teams playing in each game shows a significant negative relationship with viewership. It is important to note that the ranking number is inversely related to team strength—where the best team is ranked 1 and the worst team is

ranked 32. In both the ratings and total viewers models, a higher (worse) average power ranking is associated with lower viewership.

Table 4: Regression Results – Viewership
(Robust Standard Errors within Parenthesis)

	Model 2a	Model 2b
Variable	Coefficient	Coefficient
Intercept	2453*** (215.3)	2418*** (406.8)
TotalSocialMedia	0.0496*** (0.0024)	0.0488*** (0.0049)
Spread	-0.04* (0.022)	-0.0696 (0.032)
TotalPoints	0.0058 (0.0157)	-0.0068 (0.017)
PtSpdRatio		0.0499** (0.0248)
Monday.Game	-4.925*** (0.03)	-4.82*** (0.56)
Thursday.Game	-1.297* (0.79)	-1.273* (0.67)
Saturday.Game	-6.149*** (1.58)	-6.06*** (1.59)
Sunday.Night.Game	-0.155 (0.520)	-0.012 (0.52)
AvgPower	-0.216*** (0.036)	-0.228*** (0.0356)
Competing.Event	-1.16* (0.66)	-1.066* (0.6404)
Rivalries	1.55*** (0.63)	1.537*** (0.624)
Year	-1.21*** (0.20)	-1.21*** (0.20)
Adjusted R^2	0.644	0.648

In the ratings model (Model 1), the negative coefficient suggests that games involving weaker teams (higher rankings) tend to have lower viewership, possibly because such games may be perceived as less competitive or entertaining. Similarly, in the total viewers model (Model 2), the negative relationship is statistically significant, with

each one-unit increase in power ranking corresponding to a reduction in total viewers by approximately 0.22 million.

Competing events and viewership

The presence of competing televised events is also negatively associated with NFL viewership, with significant coefficients in both ratings and total viewers models. In Model 1, competing events are associated with a decrease in ratings by 0.64 percentage points, and in Model 2, competing events correspond to a reduction of approximately 1.16 million viewers. These findings suggest that when NFL games coincide with other major televised events, such as the baseball playoffs or NASCAR races, viewership tends to be lower, highlighting the potential importance of scheduling games to avoid conflicts with other high-profile broadcasts.

Game excitement: PtSpdRatio

The inclusion of the PtSpdRatio variable, which captures the ratio of total points scored to the point spread, provides additional insight into viewership patterns beyond total points or point differential. In both the ratings and total viewers models (Models 1b and 2b), PtSpdRatio is positively and statistically significantly associated with viewership. The results indicate that high-scoring, close games (those with a high PtSpdRatio) tend to have higher viewership. Specifically, for every one-unit increase in PtSpdRatio, ratings increase by approximately 0.03 percentage points, and total viewers increase by about 0.05 million. These findings suggest that competitive, high-scoring games may engage viewers more effectively.

Yearly Changes in Viewership

Both models reveal a consistent negative time trend, indicating a decline in viewership over the period from 2015 to 2018. The coefficient for the year variable suggests a decrease in ratings by approximately 0.78 percentage points (Model 1) and a reduction of 1.21 million viewers (Model 2) per year. This downward trend in viewership is notable, as it contrasts with the broader perception of the NFL's growing popularity. The decline could be influenced by various factors, including the increasing availability of streaming options that may not be fully captured by Nielsen ratings, as well as shifting media consumption habits.

8. Conclusion

The NFL has become incredibly popular over the last several decades. The value of the league and its franchises is closely tied to lucrative television contracts, which are based on anticipated television viewership at the time of negotiation. This study examines various factors associated with viewership. The three novel explanatory factors considered in this study are (a) the total number of social media followers for the two competing teams, (b) an indicator variable for games played among historic NFL rivals, and (c) an interaction term capturing the ratio of total points scored to the actual end-game point differential. An examination of the model results shows that these three variables are statistically significant and align with prior expectations.

While this research contributes to the understanding of NFL viewership patterns, additional research is necessary. Specifically, with the rise of streaming options, a key challenge for researchers is to better understand the measurement issues associated with traditional methods of tracking viewership.

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The Effect of State Corporate Income Tax Conformity Level on State Tax Revenue: Evidence from the TCJA

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Abstract

I examine the impact of state corporate income tax conformity ("conformity") on state corporate income tax revenue before and after the passage of the Tax Cuts and Jobs Act of 2017 (TCJA). I find that prior to the TCJA, states with a higher conformity level collected less corporate income tax revenue on a per quarter basis than states with a lower conformity level. In addition, I find that corporate income tax revenue increased for all states that tax corporate income, regardless of their level of conformity. However, states with higher conformity to the federal tax code experienced a smaller increase in corporate income tax revenue relative to those with lower conformity to the federal tax code. Overall, my findings indicate that a state's corporate income tax revenue is influenced by its level of conformity to the federal tax code.

1. Introduction

State corporate income tax conformity (hereafter "conformity") can be defined as state corporate tax policy that complies with federal corporate tax policy (Porter, Paxton, Arasu, and Snowden Rives, 2017). States primarily conform to the federal system of corporate taxation by adopting federal definitions of taxable income into their own tax codes (Duncan and Luna, 2007, Fox and Swain, 2007, Mason, 2013). Of the 44 states that levy a corporate income tax, 42 use a variation of federal taxable income as the starting point for computing their respective tax base (CCH State Tax Smart Charts 2024).

Prior research finds that states conform to tax base reducing federal corporate tax provisions roughly 55 percent of time (Morrow and Ricketts, 2010). Consistent with this finding, related studies also suggest that conformity to specific federal corporate tax provisions is associated with lower state corporate income tax revenue (Cornia, Edmiston, Sjoquist, and Wallace, 2005, Gupta, Moore, Gramlich, and

Hofmann, 2009). However, the Tax Cuts and Jobs Act of 2017 (TCJA) enacted numerous provisions that broadened the federal tax base and as a consequence of conformity, the tax base of corporate income taxing states (Phillips and Wlodychak, 2018, Walczak, 2019). Moreover, because the increase in states' tax base was not in conjunction with a substantial rate drop, states have applied historical corporate income tax rates to larger taxable bases, resulting in a significant increase in corporate income tax revenue (Congressional Budget Office [CBO], 2021, Laplante, Lynch, and Vernon, 2021). Taken together, the findings of prior academic research appear to be in conflict with the documented effect of recent tax policy changes.

In this study, I posit that these contradictory findings stem from prior literature's focus on conformity to individual federal corporate tax provisions as opposed to states' holistic approach to conformity. This distinction is important because conformity is more than just the starting point of the state tax base or one specific provision. It also refers to the aggregate federal provisions the state elects to accept (conform to) or reject (decouple from), and the method by which the state adopts conformity. In other words, conformity can be viewed as a sliding scale, with corporate income taxing states conforming to the federal tax code at varying levels. This understanding, in conjunction with the divergent observations of prior research and recent tax policy, prompt an important empirical question: how does a state's conformity level affect its corporate income tax revenue?

To address this question, I begin by constructing a sample of 1,936 state-quarter observations from 2013 to 2023. I select this time period because it encompasses the TCJA and allows for the impact of conformity level on a state's corporate income tax revenue to be observed both before and after a major change to federal tax policy. Consistent with prior state tax literature, I obtain state tax revenue data from the United States Census Bureau (USCB) and state tax policy data from the Commerce Clearing House (CCH) state tax database (e.g., Gupta et al., 2009, Gupta and Lynch, 2016). I then develop a conformity index score which measures a state's conformity level on a quarterly basis. To do so, I first determine whether the state conforms to 13 distinct federal tax provisions in a given quarter and whether the state adopts conformity on a rolling (continual) or static (periodic) basis. Following Hung (2001), I then apply an equal weight to each

component of the conformity index. Conformity index scores are computed such that they fall within the range [0,1], with higher (lower) scores indicating a higher (lower) conformity level per state per quarter. Lastly, I examine the effect of a state's conformity level on its corporate income tax revenue both before and after the TCJA was enacted.

Consistent with the findings of Morrow and Ricketts (2010), Cornia et al. (2005), and Gupta et al. (2009), my results indicate that prior to the TCJA, states with a higher conformity level collected $34.667 million less corporate income tax revenue per quarter than states with a lower conformity level on a per state basis. In addition, I find that corporate income tax revenue increased for all corporate income taxing states following the TCJA, regardless of conformity level. Specifically, high conforming states experienced a $138.666 million increase in quarterly tax revenue in the post-TCJA era relative to the pre-TCJA era. Thus, supporting the observations of CBO (2021) and Laplante et al. (2021). However, I also find that corporate income tax revenue increased $173.333 million less for higher conformity states relative to states with a lower conformity level. Overall, my results suggest that a state's corporate income tax revenue varies in accordance with its level of conformity to the federal tax code.

My study makes several contributions to state tax literature and state tax policy. First, it adds to prior research examining the economic consequences of state tax policy (e.g., Cornia et al., 2005, Gupta et al., 2009, Morrow and Ricketts, 2010, Fox and Luna, 2010, Gupta and Lynch, 2016, Suárez Serrato and Zidar, 2018). While prior studies in this area have concentrated on the impact of various state-specific provisions (e.g., apportionment factors, tax credits, amnesty enactments, addback provisions, etc.), they have been silent as to states' holistic approach to conformity and its potential impact. To my knowledge, my study is the first to examine the economic effect of states' conformity level. My results provide evidence that while all states conform to the federal tax code to a certain extent, variations in states' conformity level have a significant impact on states' corporate income tax revenue. Given that states use tax revenue to fund education, healthcare, transportation, and infrastructure (among other state-run programs and services), my results should be of interest to policy makers, state legislators, and individuals alike. Additionally,

my study develops a proxy for states' overarching conformity level. In doing so, it provides future researchers the ability to further explore this area of state taxation.

The remainder of this study is organized as follows. Section 2 provides background information on conformity and develops my hypothesis. Section 3 describes the data, variable measurement, and empirical design. Section 4 reports the primary empirical results. I present robustness and sensitivity tests in Section 5. Section 6 concludes.

2. Literature Review and Development of Research Question

2.1 Institutional Background and Prior Literature

The U.S. Constitution allows states to develop and manage their own tax policies (Fox and Swain, 2007). However, many states choose to align their tax codes with the federal tax system in a practice known as conformity. This means states often adopt federal definitions of corporate taxable income into their respective tax codes (Duncan and Luna, 2007, Fox and Swain, 2007, Mason, 2013). For instance, of the 44 states with a corporate income tax, 42 use a variation of federal taxable income as the starting point for computing their respective tax base (CCH State Tax Smart Charts 2024). Specifically, 23 states begin with federal taxable income before accounting for net operating losses and special deductions, while 19 states start after these adjustments (CCH State Tax Smart Charts 2024). However, conformity goes beyond determining the starting point of the state tax base. It also involves deciding which federal provisions to accept (conform to) or reject (decouple from) and determining the method by which conformity is adopted.

States typically implement tax conformity using one of three distinct methods: rolling, static, or selective. Rolling conformity involves the automatic integration of federal tax provisions into a state's tax code without any need for legislative action. In contrast, static and selective conformity methods adopt the federal tax code, or parts of it, based on a specific date. Any updates in federal tax law under these methods require legislative approval before they can take effect at the state level. Therefore, the level to which a state conforms

to the federal tax code can be viewed as a function of its various components.

Conformity's primary advantage is administrative ease (Gupta and Mills, 2003, Mason, 2013). By adopting federal corporate taxable income definitions, states can leverage the administrative and judicial infrastructure of the federal government (Luna and Watts, 2008, Mason, 2013). Additionally, conformity mitigates taxpayers' compliance burden by creating more uniform tax policies across states (Gupta and Mills, 2003). However, conformity also introduces a number of vertical externalities that may positively or negatively affect the economic well-being of the state (Fox and Swain, 2007). For instance, in addition to administrative ease, states may broaden their state tax base and simultaneously curtail interstate income shifting activity by conforming to a number of federal provisions (e.g., disallowed deduction for federal taxes paid, inclusion of Subpart F income, limitations on the deductibility of interest expense, combined reporting requirements, etc.). As such, states are able to increase corporate income tax revenue collections simply by complying with the federal tax code. Despite these benefits, conformity can also contribute to the erosion of the state tax base and revenue shortfalls. This is principally because federal policies often fail to account for state-level implications (Duncan and Luna, 2007). In many cases, the federal tax code, and changes thereto, include provisions designed to ease current economic burdens but at the expense of tax revenue. Consequently, states that conform to more generous federal provisions may suffer eroded tax bases and subsequent declines in tax revenue (Johnson, 2008). Historically, such federal provisions have largely been funded by a federal budget deficit (Duncan and Luna, 2007). This, however, is problematic for many states. According to the National Association of State Budget Officers (NASBO), 35 states are prohibited from carrying deficits into the next fiscal year (NASBO, 2022). As a result, states could be heavily constrained by their budgetary requirements and may be fiscally unable to support certain federal provisions. For example, tax revenue shortfalls, exacerbated by the COVID-19 pandemic, recently resulted in significant cuts to education, corrections, and parks across multiple states (Gillers and Banerji, 2020).

The number of factors that influence state tax policy has resulted in substantial variation among states regarding conformity (Duncan, 2005; Walczak, 2019). As stated in Walczak (2019) (p.3), "All states incorporate parts of the federal tax code into their own system of taxation, but how they do so varies widely." Such variation provides a rich setting for empirical research concerning the implications of conformity at the state level. However, prior research concerning differences in state corporate tax policy has largely focused on the state-level economic consequences of apportionment rules and corporate statutory tax rates. For example, a number of studies investigate the impact of state apportionment factors and sourcing rules on local economies (Wasylenko, 1997, Lightner, 1999, Goolsbee and Maydew, 2000, Gupta and Hofmann, 2003, Edmiston and Arze del Granado, 2006, Gupta et al., 2009, Davis and Hageman, 2014). Similarly, studies also examine the effect that states' corporate statutory tax rate has on subsequent tax revenue collections (Klassen and Shackelford, 1998, Cornia et al., 2005, Fox and Luna, 2010, Suárez Serrato and Zidar, 2018).

Of the aforementioned studies, several examine the impact of individual tax provisions on state corporate income tax revenue and the structure of the state tax base (Cornia et al., 2005, Gupta et al., 2009; Suárez Serrato and Zidar, 2018). In their comprehensive study examining the impact of multiple provisions on state corporate income tax revenue, Gupta et al. (2009) include two provisions specific to conformity: the allowance of net operating loss (NOL) carrybacks, and the deductibility of federal income taxes on state tax returns. Using state-level aggregate data, the authors find states that do not allow NOLs to be carried back and applied to prior years are associated with higher corporate income tax revenue, and states that allow a deduction for federal income tax expense are associated with lower corporate income tax revenue collections. Relatedly, Cornia et al. (2005) document a negative association between the deductibility of federal tax expense and state corporate income tax revenue. In addition, Cornia et al. (2005) find that various depreciation allowances among states are also associated with a decline in state corporate income tax revenue. More recently, Suárez Serrato and Zidar (2018) investigate the effect of state corporate tax structure on revenue and economic development. In their study, Suárez Serrato and Zidar (2018) document a narrowing of the state tax base over time.

Moreover, the authors observe that provisions affecting the state tax base have risen in importance relative to tax rates in determining state corporate income tax revenue.

While these studies provide valuable insight concerning the impact of specific state tax provisions, they do not approach their analyses from the perspective of conformity and states' conformity level. This may be problematic because individual provisions can result in divergent tax revenues streams (Gupta et al., 2009, Cornia et al., 2015, Suárez Serrato and Zidar, 2018) and only represent specific facets of a broader, more complex methodology of state tax conformity.

Recent federal tax legislation has significantly affected the state tax environment, highlighting the link between federal and state tax codes and bringing renewed attention to prior state tax literature. The passage of the TCJA (P.L. 115-97) marked the largest federal tax reform since 1986. At the federal level, the TCJA reduced the statutory corporate tax rate from 35 percent to 21 percent, eliminated the alternative minimum tax (AMT), moved the U.S. toward a quasi-territorial tax system, and introduced several new international provisions. Collectively, the major provisions of the TCJA were estimated to broaden the federal corporate tax base by 19.1 percent (Phillips and Wlodychak, 2018). Moreover, as a consequence of conformity statutes, those same federal provisions were also estimated to broaden the average state tax base by 12 percent (Phillips and Wlodychak, 2018). Assuming no change in state tax rate, the expanded state tax base was initially projected to generate a 12 percent increase in future state tax collections (Phillips and Wlodychak, 2018). In actuality, the increase in revenue was even more substantial. According to the UCSB, in 2016, the last complete calendar year prior to the enactment of the TCJA, net corporate income taxes collected by states totaled $46.13 billion. As of 2019, that total had grown to $60.38 billion, a 31 percent increase in the span of three years.

These results are largely contrary to the observations documented in prior literature. I conjecture that the observed differences are a product of prior literature's focus on individual federal corporate tax provisions. As previously discussed, conformity can be viewed as a function of its various components, with states conforming to the federal tax code at varying levels. As such, focusing on singular

provisions is likely to paint an incomplete picture of conformity's economic impact. In this study, I expand on the works of Cornia et al. (2005), Gupta et al. (2009), and Suárez Serrato and Zidar, (2018) by developing a comprehensive state-quarter conformity index score with the goal of measuring states' holistic approach to conformity and its implications for state corporate income tax revenue before and after a major change in federal tax policy.

2.2 Research Question

Conformity primarily influences state corporate income tax revenue through its effect on the state tax base. Most states begin the computation of their tax base by conforming to a variation of federal taxable income followed by state-specific adjustments. These adjustments largely reflect states' decision to conform to or decouple from specific provisions contained in the federal tax code, and in doing so determine which tax items are included or excluded from the state tax base. Additionally, states can specify that firms conform with federal filing requirements by imposing a mandatory combined filing requirement. Under combined reporting, firms effectively disregard the existence and location of their affiliates and report on a combined basis as a unitary entity, increasing firm exposure to state-level taxation (Fox and Luna, 2010). Thus, the tax base of a state is largely dictated by the level to which the state tax code conforms to the federal tax system. Intuitively, as the corporate income tax base of a state expands and contracts, so too does its corporate income tax revenue. All else equal, a broader state tax base should result in more corporate income tax revenue, and a narrower state tax base should result in less corporate income tax revenue.

Given the ability of state-specific adjustments and filing requirements to expand and contract the tax base of a state, combined with the divergent observations of prior research and recent tax policy, it is unclear ex ante how varying conformity levels influence the corporate income tax revenue of states. This notion leads to my primary research question, formally stated as follows:

RQ: How does a state's conformity level affect its corporate income tax revenue?

3. Data and Methodology

3.1 Conformity Index Score

Because my goal is to measure states' holistic approach to conformity, I compute states' conformity level by determining whether each state conforms to several federal tax provisions in a given year as well as its current method of adoption. I refer to the numeric value assigned to states' conformity level as the conformity index score. Specifically, the index score is comprised of 13 distinct federal tax provisions and whether a state adopts a rolling conformity policy. Provisions included in the conformity profile are chosen based on conversations with three state and local tax partners from two different Big 4 accounting firms. Each partner was asked to provide a list of federal tax provisions that significantly affect state tax policy. The provisions included in the index score are those provided by the three state and local tax partners. As such, the components selected should represent the prevailing provisions that comprise states' conformity level. As previously discussed, states adopt conformity under one of three categories: rolling, static ("fixed date"), and selective. The most common of these is rolling conformity, with 23 states adopting the policy (Johnson, 2025). Under rolling conformity, changes made to the federal tax code are adopted by the state tax legislature on a rolling basis. Because rolling conformity represents the timeliest of the conformity policies, it can be viewed as states' desire to rely on the federal tax regime. Moreover, Johnson (2025) observes that rolling conformity plays a significant role in the sensitivity of state corporate income tax revenue and changes in federal policy and therefore represents an important component of the conformity index score.

The procedure for calculating the conformity index score follows Hung (2001) and applies an equal weight to each component of the index. Conformity index scores are computed so that they fall between [0,1]. A higher (lower) score indicates that state complied with more (fewer) federal provisions during a specific quarter. A provision is assigned a weight of one if state treatment fully conforms with federal treatment. For example, for each quarter of 2020, Colorado is assigned a weight of one for bonus depreciation as it conforms with the federal provision which allows a 100 percent deduction for the adjusted basis of qualified property; however, New York is assigned a weight of zero because it specifically decouples from the federal bonus depreciation

provision. There are, however, a number of federal provisions that states effectively conform to but then slightly adjust. A common example of this is the dividends received deduction (DRD). Tennessee, for instance, has a tax base starting point of federal taxable income before NOLs and special deductions (DRD). Therefore, Tennessee technically does not conform to federal DRD treatment. However, Tennessee does allow a deduction for dividends received from 80 percent or more owned corporations, consistent with a portion of the federal DRD rules. In such cases, a provision is assigned a weight of 0.50 as it neither fully conforms to nor fully decouples from the federal tax code. A list of the provisions included in the index, their assigned ratings, and weights are presented in Table 1. The average conformity index score for each state is reported in Table 2. The highest average conformity index score is 0.963 (Alaska) and the lowest average conformity index score is 0.151 (Arkansas). Thus, confirming that substantial variation in conformity exists among corporate income taxing states.

Table 1: Conformity Index Score

Federal Provision	Rating	Weight
Bonus Depreciation IRC §168(k)	1 = Conforms 0 = Decouples	1/13
Asset Expensing IRC §179	1 = Conforms 0.5 = Modified 0 = Decouples	1/13
Dividends Received Deduction (DRD) IRC §243	1 = Conforms 0.5 = Modified 0 = Decouples	1/13
Interest Expense Limitation IRC §163(j)	1 = Conforms 0 = Decouples	1/13
DPAD under IRC §199	1 = Conforms 0 = Decouples	1/13
GILTI under IRC §951A	1 = Conforms 0.5 = Modified 0 = Decouples	1/13
FDII under IRC §250	1 = Conforms 0.5 = Modified 0 = Decouples	1/13
Repatriation Transition Tax IRC §965	1 = Conforms 0 = Decouples	1/13
Participation Exemption DRD IRC §245A	1 = Conforms 0 = Decouples	1/13
Net Operating Loss Carryforwards IRC §172	1 = Conforms 0 = Decouples	1/13
Net Operating Loss Carrybacks IRC §172	1 = Conforms 0 = Decouples	1/13
Net Operating Loss Limitation IRC §172	1 = Conforms 0 = Decouples	1/13
Rolling Conformity	1 = Automatic Adoption 0 = Other	1/13

Note: Table 1 displays the federal tax provisions included in the conformity index score their assigned ratings, and their corresponding weight. The procedure for calculating the conformity index score follows Hung (2001), applying an equal weight to each component of the index.

Table 2: Average Conformity Index Score by State

State	Conformity Score	State	Conformity Score	State	Conformity Score
Alabama	0.532	Louisiana	0.509	Ohio	N/A
Alaska	0.963	Maine	0.619	Oklahoma	0.923
Arizona	0.476	Maryland	0.638	Oregon	0.524
Arkansas	0.151	Massachusetts	0.468	Pennsylvania	0.491
California	0.210	Michigan	N/A	Rhode Island	0.509
Colorado	0.839	Minnesota	0.188	South Carolina	0.513
Connecticut	0.358	Mississippi	0.411	South Dakota	N/A
Delaware	0.912	Missouri	0.764	Tennessee	0.382
Florida	0.605	Montana	0.725	Texas	N/A
Georgia	0.479	Nebraska	0.821	Utah	0.601
Hawaii	0.312	New Hampshire	0.179	Vermont	0.657
Idaho	0.651	Nevada	N/A	Virginia	0.724
Illinois	0.505	New Jersey	0.391	Washington	N/A
Indiana	0.468	New Mexico	0.784	West Virginia	0.872
Iowa	0.623	New York	0.421	Wisconsin	0.290
Kansas	0.762	North Carolina	0.284	Wyoming	N/A
Kentucky	0.321	North Dakota	0.657		

Note: Table 2 displays the average conformity index score for each state during the sample period 2013-2023. States that do not levy a corporate income tax are listed as N/A.

3.2 Sample Selection

My study covers 2013 to 2023. I chose this time frame because it includes the TCJA and enables the examination of how varying levels of conformity affect a state's corporate income tax revenue both before and after significant changes to the federal tax code. Consistent with prior literature, I exclude Nevada, Ohio, South Dakota, Texas, Washington, and Wyoming, as these states do not levy a corporate income tax (Gupta et al., 2009, Gupta & Lynch, 2016). My final sample is 1,936 state-quarter observations. Sample selection criteria are outlined in Table 3.

Table 3: Sample Selection

Sample Selection Criteria	Observations
State-quarters for the period 2013-2023	2,200
Less:	
Non-corporate income taxing states (NV, OH, SD, TX, WA, and WY)	(264)
Total State-Quarter Observations	1,936
Distinct States	44

Note: Table 3 outlines the sample selection process for this study.

3.3. Empirical Design

To examine how state corporate income tax revenue is affected by varying levels of conformity pre- and post TCJA enactment, I estimate the following equation using ordinary least squares (OLS) regression with standard errors clustered by state:

$$SCIT/GSP = \beta_0 + \beta_1 HighCIS + \beta_2 Post + \beta_3 HighCIS * Post + \beta_4 FCIT/GDP + \beta_5 TaxRate + \beta_n Controls + \varepsilon \quad (1)$$

The dependent variable is *SCIT/GSP* and represents quarterly state corporate income tax revenue scaled by quarterly estimates of annual gross state product. *HighCIS* is an indicator variable that represents whether a state's average conformity index score (*ConformityIndexScore*) is above the median (0.5357), and zero otherwise. As such, states with a high-conformity level are those with a *HighCIS* value is set equal to one. A negative and significant coefficient on *HighCIS* would suggest that states with a high conformity level in the pre-TCJA period collected less corporate income tax revenue relative to their peers with a lower conformity level. The variable *Post* is an indicator variable set equal to one for all post-TCJA quarters (2018-2023), and zero for all pre-TCJA quarters (2013-2017). A positive and significant coefficient on *Post* would indicate that states with a lower conformity level collected more corporate income tax revenue in the post-TCJA period relative to the pre-TCJA period. The interaction term *HighCIS* Post* represents the change between pre-TCJA and post-TCJA corporate income tax revenue for high conformity level states relative to lower conformity level states. A negative and significant coefficient on *HighCIS* Post* would suggest that corporate income tax revenue changed less between periods for states with a high conformity level relative to their lower conforming peers. I convert the continuous variable *CIS* into a categorical variable to facilitate the model's interpretation given the use of the *Post* categorical variable and the interaction term *HighCIS* Post*. In addition, my model includes several control variables designed to address endogeneity and omitted variable bias concerns. *FCIT/GDP* is federal corporate income tax revenue scaled by quarterly estimates of annual gross domestic product. I include the variable *TaxRate*, which is the highest statutory corporate tax rate of a state divided by the federal statutory corporate tax rate, to control for the influence of state and federal tax rates. Additionally, I include

variables shown by prior literature to affect state corporate income tax revenue (e.g., Cornia et al., 2005, Gupta et al., 2009, Gupta & Lynch, 2016). Specifically, I control for state sales apportionment factor (*SAF*), provisions disallowing related-party transactions (*Addback*), tax amnesty enactments (*Amnesty*), and state unemployment (*Unemployment*).

The data used in my study is from publicly available sources. Tax conformity decisions and policy variables are obtained from CCH and state revenue department websites. I gather state tax revenue from the Quarterly (Annual) Summary of State and Local Tax Revenue published by the USCB. In line with previous research, I acquire tax amnesty information from the Federation of Tax Administrators (Gupta & Lynch, 2016, Shevlin, Thornock, & Williams, 2017). Additionally, I collect federal tax revenue, gross state product, gross domestic product, and state unemployment data from the Bureau of Economic Analysis (BEA).

4. Empirical Results

Descriptive statistics are presented in Table 4. On average, states conform to 54.7 percent of the federal tax provisions included in the conformity score index. The mean state quarterly tax revenue is $406 million, representing 0.11 percent of the quarterly estimated gross state product. Similarly, the quarterly average federal tax revenue is $293,203 million, which represents 1.42 percent of quarterly estimated gross domestic product. The mean sales factor is 75.05 percent which is consistent with the documented increase of sales apportionment over time (Davis and Hageman, 2014). On average, 45.45 percent of states disallow intangible-related expenses paid to related parties in other states. Corporate income tax amnesty programs are in effect for 2.07 percent of all quarters present in the sample, on average. Across all corporate income taxing states, the mean unemployment rate is 4.70 percent.

Table 4: Descriptive Statistics

Variable	N	Mean	SD	p(25)	Median	p(75)
ConformityIndexScore	1,936	0.5473	0.2299	0.4167	0.5357	0.7500
SCIT/GSP	1,936	0.0011	0.0008	0.0005	0.0009	0.0014
HighCIS	1,936	0.5000	0.5001	0.0000	0.5000	1.0000
FCIT/GDP	1,936	0.0142	0.0033	0.0113	0.0144	0.0174
TaxRate	1,936	0.2710	0.0945	0.2000	0.2513	0.3333
SAF	1,936	0.7505	0.2858	0.5000	1.0000	1.0000
Addback	1,936	0.4545	0.4981	0.0000	0.0000	1.0000
Amnesty	1,936	0.0207	0.1423	0.0000	0.0000	0.0000
Unemployment	1,936	0.0470	0.0175	0.0340	0.0420	0.0565

Note: Table 4 presents descriptive statistics for the samples used in this study. All variables are defined in the Appendix.

Table 5 tabulates the results of my primary test. Column (1) presents the estimation of the base model, and Column (2) reports the estimation of the expanded model. Consistent with the findings of prior literature (e.g., Cornia et al., 2005, Gupta et al., 2009, Suárez Serrato and Zidar, 2018), the coefficient on *HighCIS*, is negative and significant in both Columns (1) and (2), based on one-tailed tests (p-value < 0.05). These results indicate that, on average, states with a higher conformity level collected 0.01 percent less corporate income tax revenue than states with lower conformity levels prior to the passage of the TCJA. Interpreted at the mean value of gross state product ($346,665 million), this translates to $34.667 million less in tax revenue per quarter for high conformity level states Considering the mean quarterly state tax revenue in my sample is $406 million, this is the equivalent of a nine percent discrepancy. Based on the summation of the coefficients on *HighCIS* and *HighCIS* Post*, this trend continues into the post TCJA period. Specifically, states with a higher conformity level collected 0.05 percent less corporate income tax revenue than their lower conformity counterparts. Translated at the mean value of gross state product, this equates to $173.333 million less tax revenue per quarter among high conformers. Taken together, the gap in tax revenue between high conformity level states and low conformity level states increased by $138.667 million following the passage of the TCJA. Isolating high conformity states, the summation of *Post* and *HighCIS* Post* indicates that while states with a high conformity level collected comparatively less corporate income tax revenue, their overall collections increased following the TCJA. In

particular, corporate income tax revenue increased by 0.04 percent. This is the equivalent of a $138.666 million increase in quarterly tax revenue in the post-TCJA era. Interpreted at the mean quarterly state tax revenue of my sample ($406 million), this is the equivalent of a 34 percent increase in quarterly tax collections. Collectively, my results suggest that conformity is not associated with a universal decline in corporate income tax revenue, but rather a state tax policy that can affect tax revenues to varying degrees given a state's level of adherence to the federal tax code.

Table 5: The Effect of State Conformity Level on Corporate Income Tax Revenue

	(1)	(2)
	SCIT/GSP	*SCIT/GSP*
HighCIS	-0.0002 **	-0.0001 **
	(-2.18)	(-2.18)
Post	0.0007 ***	0.0006 ***
	(5.74)	(5.37)
HighCIS Post*	-0.0002 **	-0.0002 **
	(-1.81)	(-1.80)
FCIT/GDP	0.0993 ***	0.0949 ***
	(13.89)	(13.13)
TaxRate	0.0032 ***	0.0034 ***
	(4.68)	(4.79)
SAF		-0.0001
		(-0.55)
Addback		-0.0000
		(-0.12)
Amnesty		-0.0001 **
		(-1.70)
Unemployment		-0.0078 ***
		(-5.00)
Constant	-0.0014 ***	-0.0010 **
	(-7.04)	(-2.63)
Observations	1,936	1,936
R-squared	0.2893	0.3156
Fixed Effects	None	None
Cluster	State	State

Note: Table 5 presents the results of estimating my primary equation. All variables are defined in the Appendix. Robust t-statistics are presented in parentheses. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, based on one-tailed tests.

5. Additional Tests and Empirical Results

I do not include state or year fixed effects in my primary analyses. As noted by Gupta et al. (2009), using state fixed effects is problematic in a setting that includes state tax policy variables. State tax policies are highly static, causing state tax policy variables to be fully or

partially subsumed by state fixed effects. As a result, state tax policy variables may be omitted or become less informative with the inclusion of state fixed effects. Similarly, I do not include time (quarter or year) fixed effects, as time indicator variables would remove the effects of macroeconomic variation across time that I wish to explain. Despite the econometric concerns, I acknowledge that it is a limitation to my study.

To address this issue, I rely on regional diffusion theory. According to regional diffusion theory, states tend to adopt policies and characteristics from nearby or similar states (Berry and Berry, 1999). Consistent with this theory, prior literature has found that states are able to influence the tax policy of neighboring states (Omer and Shelley, 2004, Hageman and Robb, 2011). Thus, the inclusion of divisional fixed effects would address many of the concerns associated with a lack of state fixed effects, while still allowing enough variation for the variables to avoid being subsumed by their inclusion. Accordingly, I update my primary equation to include divisional fixed effects based on states' geographic location. Following the USCB, I divide the country into nine distinct divisions: New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, and Pacific.

Table 6 presents the results of reestimating my primary equation with the inclusion of divisional fixed effects. As before, Column (1) presents the estimation of the base model, and Column (2) reports the estimation of the expanded model. While there is a moderate increase in the R-squared value, many of the results remain the same as those presented in Table 5, indicating that my primary results are robust to the inclusion of divisional fixed effects.

Table 6: The Effect of State Conformity Level on Corporate Income Tax Revenue – Divisional Fixed Effects

	(1)		(2)	
	SCIT/GSP		*SCIT/GSP*	
HighCIS	-0.0002	*	-0.0002	**
	(-1.45)		(-1.74)	
Post	0.0007	***	0.0006	***
	(5.63)		(5.26)	
HighCIS Post*	-0.0002	**	-0.0002	**
	(-1.80)		(-1.78)	
FCIT/GDP	0.0993	***	0.0949	***
	(13.80)		(13.18)	
TaxRate	0.0032	***	0.0034	***
	(4.41)		(5.05)	
SAF			-0.0001	
			(-0.86)	
Addback			-0.0000	
			(-0.67)	
Amnesty			-0.0002	**
			(-2.11)	
Unemployment			-0.0077	***
			(-4.97)	
Constant	-0.0014	***	-0.0009	***
	(-6.75)		(-2.57)	
Observations	1,936		1,936	
R-squared	0.3234		0.3492	
Fixed Effects	Divisional		Divisional	
Cluster	State		State	

Notes: Table 6 presents the results of estimating my primary equation. All variables are defined in the Appendix. Robust t-statistics are presented in parentheses. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, based on one-tailed tests.

6. Conclusion

My study explores the impact of conformity level on state tax revenue. Specifically, I leverage the passage of the TCJA to examine the association between high levels of conformity and corporate income tax collections before and after a major change in federal tax policy. Overall, my results suggest that higher conformity levels are associated with less corporate income tax revenue compared to states with a lower conformity level. This result is consistent with what has been documented in prior literature. In addition, I find that corporate income tax collections among high conformity states increased following the TCJA's enactment, but to a lesser extent than lower conformity states.

Viewed collectively, my findings indicate that conformity is not strictly associated with a decline in corporate income tax revenue. Tax collections can increase as a product of a high conformity level; however, states wishing to maximize corporate income tax revenue, may wish to be more selective in determining which federal tax policies they incorporate into their respective tax code. Because state-run programs and services (e.g., education, healthcare, transportation, and infrastructure) are largely funded by tax collections, my findings should be of interest to the beneficiaries of those programs and services, as well as policy makers and state legislators.

In addition, my study contributes to the literature by expanding state tax research concerning conformity. Specifically, I develop a quarter-year conformity index score that is designed to measure a state's level of conformity to the federal tax code. I limit my study to the impact of conformity level on state corporate income taxes; however, future researchers could use my conformity index score to examine further empirical questions at the state level. In addition, I add to the stream of literature that examines the economic impact of state tax policy (e.g., Cornia et al., 2005, Gupta et al., 2009, Morrow and Ricketts, 2010, Fox and Luna 2010, Gupta and Lynch, 2016, Suárez Serrato and Zidar, 2018).

Nevertheless, my study is subject to several limitations. First, my state-quarter conformity index score is a proxy. I include prominent federal tax provisions following the guidance of subject matter experts; however, I recognize that my measure cannot account for every aspect of states' conformity level. Moreover, each provision included in the proxy is assigned the same weight because discerning the actual difference in revenue impact and the corresponding weight to be assigned to each provision is not feasible given the available data. This is an acknowledged limitation of the measure, and the inferences derived from it. Second, I cannot completely dismiss endogeneity or omitted variable bias concerns. I recognize that state conformity issues are decisions made by state legislatures. I employ several additional controls and econometric techniques to help address these concerns, but I cannot fully rule them out.

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Appendix

Variable	Definition
ConformityIndexScore	State-quarter conformity index score computed in accordance with Section 3.1.
SCIT/GSP	State corporate tax revenue scaled by gross state product for state *i* in time *t*.
HighCIS	Indicator variable set equal to one for observations whose average *ConformityIndexScore* is above the median, zero otherwise.
Post	Indicator variable set equal to one for all quarters occurring after the passage of the TCJA (2018-2023), zero otherwise.
FCIT/GDP	Federal corporate tax revenue scaled by gross domestic product in time *t*.
TaxRate	The highest state statutory corporate tax rate scaled by the federal statutory corporate tax rate for state *i* in time *t*.
SAF	The sales apportionment factor for state *i* in time *t*.
Addback	Indicator variable set equal to one if the state has an addback requirement for related-party intangible expenses in time *t*, zero otherwise.
Amnesty	Indicator variable set equal to one if a state corporate income tax amnesty program was in effect in time *t*, zero otherwise.
Unemployment	The unemployment percentage for state *i* in time *t*.

Using Backward Curriculum Design and a Coherent Curriculum Approach to Drive Undergraduate Accounting Curriculum

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Abstract

In this study, we demonstrate how a combination of backward curriculum design and coherent curriculum approaches can integrate a desired learning goal throughout an undergraduate accounting program. We began by examining four accounting certification exams to develop a list of common internal control and cybersecurity learning goals. After selecting a desired learning goal, we used a backward curriculum design to identify the knowledge and skills that students need to master and to determine appropriate assurance of learning measures. Finally, the coherent curriculum approach is used to identify cybersecurity-related learning activities that can be incorporated throughout the accounting curriculum to create multiple touchpoints. This approach could help integrate any learning goal in the accounting program, instead of taking a single-course approach.

1. Introduction

The accounting profession has challenged academic programs to update their curricula to address industry needs (Gallagher, 2021; Nordhoff, 2021). However, accounting programs may feel that determining the diverse needs of the accounting profession is a strenuous task (Dow, Jacknis, & Watson, 2021). Employers' needs can differ based on certification preferences, industry, size, and location. Accounting programs' curriculum decisions are further complicated by variations in accounting students' career interests and the need to comply with accreditation standards (Lamberton & Raschke, 2023). Evolving professional needs have prompted studies that demonstrate ways to integrate hot topics like data analytics and technology into the accounting curriculum. This study proposes using

backward curriculum design and coherent curriculum approaches to integrate prioritized content throughout the academic program.

Our study pairs the backward curriculum design model with coherent curriculum processing to integrate important content and context throughout the accounting program. Backward curriculum design is an educational development approach where desired learning outcomes and goals are considered prior to learning and assessment activities (Wiggins & McTighe, 1998). Course activities are driven by stakeholders' (i.e., students and employers) needs and standards rather than teacher preferences and textbooks. Towhidi and Pridmore (2023) used the backward curriculum design model to develop a course that was based on competencies from the National Institute of Standards and Technology Cybersecurity Framework (NIST) and the National Institute for Cybersecurity Education (NICE) Strategic Plan and that aligned industry needs with information security curriculum. Lamberton and Raschke (2023) used backward curriculum design to demonstrate how technology can be integrated into non-accounting information systems (AIS) courses. We propose a curriculum development model that will increase content without developing a new course like Towhidi and Pridmore (2023) or considering a single course like Lamberton and Raschke (2023). Coherent curriculum design is an educational development approach where faculty collaborate to integrate relevant content purposefully and strategically throughout an academic program rather than in a single course (Warr, Driskell, Langran, Mouza, & Schmidt-Crawford, 2023). Our prototype uses the sequential nature of accounting degree completion plans to expand students' exposure to content like internal controls and cybersecurity and to improve learning retention.

A growing body of curriculum development research suggests integrating more content using preexisting courses. However, many articles have focused on one course rather than implementing a program-wide perspective. Warr et al. (2023) recommended integrating technology into sequenced academic programs to increase learning opportunities that reinforce content, identify instructional timings, and allow situational practice. Pairing backward curriculum design with the coherent curriculum approach will allow accounting programs to increase learning activities in multiple, preexisting courses.

For our demonstration, we selected the internal controls and cybersecurity learning goal from the Association to Advance

Collegiate Schools of Business' (AACSB) accounting program accreditation standard A4 as the topic for integration. Knowledge and skills related to internal controls and cybersecurity are important to accounting graduates for two reasons. First, sponsoring agencies for multiple accounting-related certifications have increased internal control and cybersecurity topics in their exam preparation and study guides. This indicates that the certification exams will contain more internal control and cybersecurity questions. Second, accounting graduates should be prepared to support the implementation of internal controls, participate in attestation engagements, and prepare financial statements in compliance with relevant laws, regulations, and standards guiding their employers.

Study materials from multiple accounting certifications (Certified Government Financial Management (CGFM), Certified Internal Auditor (CIA), Certified Management Accountant (CMA), and Certified Public Accountant (CPA)) functioned as surrogates for knowledge standards to identify cross-sectional learning goals. Our examination yielded six internal control, IT control, and cybersecurity subtopics that overlap across the examinations: roles, frameworks and standards, risk assessment, risk mitigation, auditing, and disclosure and reporting. In addition, forty-one potential learning goals related to the subtopics were developed. Twenty-one learning goals were consistent across the four certifications. Aligning the accounting curriculum with multiple certifications improves flexibility and allows for curriculum redesign without additional courses.

To complete our demonstration of backward curriculum design, we limited our consideration to one learning goal within the risk mitigation subtopic. The sequenced nature of the accounting program was invaluable in helping to identify non-traditional courses where internal control and cybersecurity content can be included. We developed a demonstration prototype confirming that internal control and cybersecurity learning activities can be integrated into accounting courses besides AIS and auditing.

Our study contributes to accounting curriculum development research by showing the compatibility of backward curriculum design with a coherent curriculum approach for content integration. Regardless of accreditation status, small and large accounting programs may consider these approaches for developing and redesigning their accounting curricula. Accounting programs can address unmet student needs without adding courses for cross-

examined topics such as internal controls and cybersecurity. Furthermore, a backward curriculum design approach can provide evidence of the accounting program's efforts to address accreditation requirements (Lamberton & Raschke, 2023).

In the following section, we present our literature review and hypotheses. Then, we provide insights into the methodology followed by the results. Finally, we summarize our conclusions.

2. Literature Review and Hypotheses

2.1 Importance of Internal Controls and Cybersecurity

Accounting graduates are likely to be given responsibilities that require knowledge and skills related to internal controls, regardless of their career path. Internal controls are important to all organizations regardless of industry, reporting requirements, or structure (Committee of Sponsoring Organizations of the Treadway Commission (COSO), 2017). Effective internal controls can help organizations operate more efficiently and improve their ability to adapt to business risks. The Sarbanes-Oxley Act of 2002 (SOX Act) elevated the relevance of internal controls in corporate governance, financial reporting, and auditing. Section 404a of the SOX Act requires corporate management to assess and report on the effectiveness of internal controls over financial reporting (U.S. Congress, 2002b). Auditors must opine on the effectiveness of internal controls over financial reporting as part of an integrated financial statement audit (U.S. Congress, 2002b; PCAOB, 2024a). The relevance of internal controls to various accounting career paths suggests that internal controls should be elevated to core accounting content and more fully integrated into the accounting curriculum.

Internal control standards like the COSO's *Internal Control – Integrated Framework* guide corporate management, internal auditors, and external auditors on best practices related to developing and assessing the effectiveness of internal controls (COSO, 2017). Cybersecurity is embedded within Principle 11 of the Control Activities component, which recommends that organizations implement internal controls over technology. Cybersecurity-infused accounting curriculum can help graduates understand their roles and responsibilities to use, assess, and protect data and information systems (Meyer, 2021; Boss, Gray, & Janvrin, 2022). The increasing trend in data breaches supports the idea that accounting majors should

acquire cybersecurity knowledge and skills irrespective of their intended career paths.

2.2 Curriculum and Certification Exam Alignment

The backward curriculum design model and the coherent curriculum approach recommend using available standards to determine knowledge needs and desired competencies (Wiggins & McTighe, 2005; Warr et al., 2023). Accounting certification content materials are excellent resources for identifying knowledge and skills that potential employers desire and accounting students need. Employers value professional certifications and licenses because they verify employment candidates' relevant accounting knowledge (Rose & Sorge, 2023). Professional certifications and licenses signal whether candidates have the skills and knowledge employers need. Using certification exam content to drive the accounting curriculum is consistent with current practice (Kulesza, Shahid, & Chang, 2023). Certification and career path options are embedded throughout accounting programs based on the core accounting-related content. Therefore, accounting students understand that they need to obtain a certification in order to be marketable and fulfill their long-term career goals as professionals. In addition, certification exam pass rates can provide external validation of a program's quality. When using pass rates for validation, it is important to ensure that students are prepared for certification exams.

The motivation for this study is to provide accounting educators with a curriculum development approach that could enhance program flexibility and adaptability in a constantly changing professional environment. We used the internal controls and cybersecurity learning objective from the AACSB accounting standards as the topic of interest. AIS and auditing courses primarily address internal control and cybersecurity learning goals (NASBA & AICPA, 2021). Content overlap across multiple certification exams should support curriculum development that focuses on the accounting program rather than on individual courses.

2.3 *Application of Backward Curriculum Design in Business Education*

Prior studies have demonstrated that backward curriculum design is appropriate for integrating learning goals that meet industry needs. Towhidi and Pridmore (2023) used this approach to develop a course

based on competencies from the NICE and NIST standards. Like accounting, the information security curriculum concentrates on the knowledge required to obtain professional certifications. However, the Towhidi and Pridmore (2023) study recommended expanding curriculum content by creating a new course rather than using existing courses throughout the program.

Lamberton and Raschke (2023) suggested a backward curriculum design for integrating technology in non-AIS courses and identifying students' IT knowledge needs. Their study provides an example of using backward curriculum design to integrate data analytics tools and Excel in cost accounting and to address AACSB accreditation concerns. This study extends the Lamberton and Raschke (2023) study by applying a coherent curriculum design approach with backward curriculum design to increase learning opportunities across multiple courses. A coherent curriculum design encourages content exposure during multiple courses to increase student learning (Warr et al., 2023).

2.4 Backward Curriculum Design, Stage 1 and Coherent Curriculum Approach, Element 1

An advantage of the backward curriculum design and coherent curriculum approaches is that both methods drive curriculum development based on the needs of the relevant stakeholders (Martin, Moorcroft, & Johnson, 2019; Warr et al., 2023). Kelting-Gibson (2005) examined the differences in student performance based on whether the instructor applied backward curriculum design. Education students using backward curriculum design outperformed students using a traditional method of curriculum design in developing learning goals, identifying relevant resources, and linking learning activities and resources to learning goals. This study demonstrates how accounting programs could improve student readiness for accounting and auditing careers using a more comprehensive curriculum development approach.

The backward curriculum design approach, as described by Wiggins and McTighe (2005), encompasses three stages. Figure 1 provides the template that corresponds to the backward curriculum design approach and facilitates the documentation of curriculum decisions by stage. The primary purpose of Stage 1 is to ascertain the most relevant learning goals and desired results for an academic program (Wiggins & McTighe, 2005; Lamberton & Raschke, 2023).

It addresses questions related to what students need to "know, understand, and be able to do" (Wiggins & McTighe, 2005, p. 17).

Figure 1: Understanding by Design Template 2.0

Stage 1 Desired Results		
ESTABLISHED GOALS <type here>	***Transfer***	
	Students will be able to use their learning to independently… <type here>	
	Meaning	
	UNDERSTANDINGS *Students will understand that…* <type here>	ESSENTIAL QUESTIONS <type here>
	Acquisition	
	Students will know… <type here>	*Students will be skilled at…* <type here>
Stage 2 - Evidence		
Evaluative Criteria	**Assessment Evidence**	
<type here>	PERFORMANCE TASK(S): <type here>	
<type here>	OTHER EVIDENCE: <type here>	
Stage 3 – Learning Plan		
Summary of Key Learning Events and Instruction <type here>		

Figure 1: This template is the suggested format for documenting the curriculum plan based on the three stages of the backward curriculum development approach. The template can be found at https://jaymctighe.com/downloads/UbD_Template_2.docx.

Stage 1 focuses on developing learning goals and curriculum expectations based on relevant standards. We use document content analysis to identify the Stage 1 internal control and cybersecurity subtopics and related learning goals across four accounting certifications (CGFM, CIA, CMA, and CPA) and address the following research question:

RQ1: What internal control and cybersecurity knowledge and skills are accounting students expected to acquire before graduation based on the content of the four certification exams?

Document content analysis is a qualitative research method involving systematic analysis of documents like books, syllabi, newspaper articles, and reports (Bowen, 2009; Morgan, 2022). An advantage of document content analysis is that researchers "look for explicit meaning in the data" (Morgan, 2022, p. 65). In addition, document

content analysis is a more practical approach to cross-sectional research, like examining the consistencies and differences between four accounting certification examinations.

Document content analysis combines content and thematic analysis (Morgan, 2022). The content analysis process involves classifying information gleaned from the documents into categories, whereas thematic analysis revisits the documents to discover similar themes and ideas. Our document content analysis approach is reflexive and used to identify the Stage 1 subtopics and learning goals that are consistent across the certification exams. Reflexive document content analysis emphasizes that researcher bias and subjectivity are advantages rather than concerns (Morgan, 2022).[1] It is anticipated that more content will be identified from the certification exam study guides and resources than can be addressed. Therefore, only one learning goal is prioritized in Stages 2 and 3 of the demonstration.

2.5 *Backward Curriculum Design, Stage 2*

During Stage 2, assessment evidence like quizzes, tests, and journals that are useful for measuring student learning is considered (Wiggins & McTighe, 2005). While this approach may seem "backwards," it assures that the assessment evidence is established before the learning activities. Internal control and cybersecurity are the major topics that we want to integrate. The course sequencing determines which courses should be used for instruction and practice and which should be used for assessment. Conventional wisdom dictates that internal control or cybersecurity assessments should remain in AIS and auditing, which are typically upper-level courses. Assessment methods for measuring student learning will be contemplated for the demonstration using one overlapping subtopic and learning goal identified during Stage 1. The following research question will be addressed by the Stage 2 procedures:

RQ2: What assessments could be used to provide evidence of student achievement for one internal control and cybersecurity major subtopic and one learning goal that is selected as a priority?

[1] The authors' diverse professional and academic work histories aided in our assessment and interpretation of the documents' contents.

2.6 Backward Curriculum Design, Stage 3 and Coherent Curriculum Approach

During Stage 3, course content and activities are developed to increase students' attainment of the desired knowledge and skills (Wiggins & McTighe, 2005). The learning plan should focus on helping students understand where the topic is going and what is expected of them. The backward curriculum design approach is constrained to one course as presented by Wiggins and McTighe (2005). Conversely, the coherent curriculum approach necessitates carefully deliberating prioritized content for inclusion in all relevant courses and their sequencing to ensure multiple "touchpoints" throughout the program (Warr et al., 2023). This study aims to demonstrate how accounting programs can comprehensively integrate prioritized learning goals using existing courses. Therefore, the coherent curriculum approach is more appropriate for Stage 3 than the recommendation of Wiggins and McTighe (2005).

An advantage of the coherent curriculum approach is that it induces continuous collaboration among stakeholders and establishes core values across the program (Warr et al., 2023). Faculty interactions provide meaningful and interrelated content to enhance student understanding. Increasing student exposure to content facilitates deeper learning and understanding (Schwieger & Ladwig, 2016). In addition, responsibility for critical core content like internal controls or cybersecurity is distributed to multiple accounting faculty, including those teaching lower-level courses (Anderson, 2013). Students are better prepared for the advanced content in upper-level courses because of exposure to foundational knowledge earlier in the program. In addition, the faculty interactions help develop a unified vision for relevant core content (Warr et al., 2023). However, the academic program must develop its core values, have faculty willing to participate and share their knowledge with others, and recognize the potential costs and pitfalls that could undermine an integrated curriculum approach (Anderson, 2013).

Warr et al. (2023) recommend a coherent curriculum approach for integrating technology across an educator preparation program. The coherent curriculum approach comprises four elements, including the previously discussed content element. The process element of this approach pinpoints courses in which additional instruction can be incorporated and requires the consideration of course sequencing. Course prerequisites naturally sequence accounting degree

completion plans, which supports the idea that the coherent curriculum approach is appropriate for learning goal integration throughout a program. Active learning activities and content application assignments are encouraged for the situated practice element. The purpose of the practice element is to provide students with a chance to model and practice applying their knowledge and skills. Real-world applications that will prepare accounting students for the assessment courses and the future work environment should be prominently included in the curriculum. During the Stage 3 segment of the demonstration, we will address the following research question:

RQ3: In which accounting courses can additional internal control and cybersecurity content be integrated for the selected major subtopic and learning goal?

3. Methodology

3.1 Certification Selection

The primary purpose of this study is to provide an example of using backward curriculum design and a coherent curriculum approach to assess and redesign academic programs that address multiple accounting certifications (CGFM, CIA, CMA, and CPA). Our selection of the four certifications is based on our judgment and the recency of the exam content updates. The CIA, CMA, and CPA designations are selected because they are the three leading accounting certifications for internal audit, managerial accounting, and public accounting and auditing, respectively (Brody, Li, & Zhou, 2016). The CGFM certification represents governmental accounting and auditing, which are viable employment options for accounting students. In addition, the exam content of all four certifications has been updated since 2022, ensuring that it is relevant and current.

3.2 Stage 1 Procedures

For our overall learning topic, we selected internal control and cybersecurity from the appropriate content listing for undergraduate accounting education in Standard A4. Backward curriculum design and document content analysis were used to synthesize the internal control and cybersecurity major subtopics and learning goals from the examination materials of the four certification exams. The content materials and the related certification sponsors' suggested study

materials served as proxies for the accounting profession's internal control and cybersecurity needs and values.

To demonstrate Stage 1, certification exam content documents were obtained, including the 2024 CGFM Exam Content Outline, CGFM Exam Study References, 2024 Part 1 CIA Exam Syllabus, 2024 CIA Exam Part 2 Syllabus, CIA Exam Part 3 Syllabus, CIA Exam Resources, 2024 CMA Learning Outcome Statements, and the 2022 Uniform CPA Examination Blueprints (AGA, 2024a; AGA, 2024b; IMA, 2024; THEIAA, 2024a; THEIAA, 2024b; THEIAA, 2024c; THEIAA, 2024d; AICPA, 2022). During this stage, both authors individually and collaboratively assessed the examination content documents to identify potential internal control and cybersecurity topics.[2] In addition, the authors obtained the free and readily available resources suggested by the certification sponsors to develop further the learning goals and themes related to the major topics. In the Stage 1 analysis, we intentionally avoided examining preparation courses that candidates could purchase directly. Table 1 presents the additional resources that were reviewed.

Table 1: Other Resources Subject to Document Content Analysis

Title	Reference	Exam			
		CGFM	CIA	CMA	CPA
CGFM Study References	AGA (2024b)	X			
COSO Internal Control – Integrated Framework: Framework and Appendices	COSO (2013a)	X	X	X	X
COSO Internal Control – Integrated Framework: Illustrative Tools for Assessing Effectiveness of a System of Internal Control	COSO (2013b)	X	X	X	X
COSO Internal Control – Integrated Framework: Executive Summary	COSO (2013c)	X	X	X	X
Compliance Risk Management: Applying the COSO ERM Framework	HCCA & SCCE (2020)	X	X		
Managing Cybersecurity Risk in a Digital Age	Galligan, Herrygers, & Rau (2019)		X		X

[2] Although there is a significant overlap between general internal controls and enterprise risk management, we focused on general internal controls consistent with the undergraduate learning goal in the AACSB accounting accreditation standards.

Title	Reference	Exam			
		CGFM	CIA	CMA	CPA
Government Accounting Office's (GAO) Standards for Internal Control for the Federal Government (Green Book)	GAO (2014)	X			
Government Auditing Standards (Yellow Book)	GAO (2024)	X			X
NIST SP 800-66 (Revision 2), Implementing the Health Insurance Portability and Accountability Act (HIPAA) Security Rule	Marron (2024)				X
Revised Guideline for Electronic Authentication of Users (supersedes OMB Memorandum M-04-04, E-Authentication Guidance for Federal Agencies)	NIST (2011)	X			
NIST Privacy Framework: A Tool for Improving Privacy Through Enterprise Risk Management, Version 1.0	NIST (2020a)				X
NIST Special Publication 800-53, Security and Privacy Controls for Information Systems and Organizations (Revision 5)	NIST (2020b)	X			X
NIST CSF 2.0	NIST (2024)	X	X		X
OMB Memorandum M-03-22, OMB Guidance for Implementing the Privacy Provisions of the E-Government Act of 2002	OMB (2003)	X			
OMB Circular A-123, Management's Responsibility for Internal Control	OMB (2004)	X			
OMB Bulletin No. 07-04, Audit Requirements for Federal Financial Statements	OMB (2007)	X			
OMB Circular A-130, Managing Information as a Strategic Resource	OMB (2016)	X			
OMB Memorandum 17-12, Preparing for and Reporting to a Breach of Personally Identifiable Information	OMB (2017)	X			
Auditing Standard (AS) AS 2201, An Audit of Internal Control Over Financial Reporting That Is Integrated with An Audit of Financial Statements	PCAOB (2024a)			X	X
AS 2101, Audit Planning	PCAOB (2024b)				X

Title	Reference	Exam			
		CGFM	CIA	CMA	CPA
AS 3105, Departures from Unqualified Opinions and Other Reporting Circumstances	PCAOB (2024c)				X
AS 2601, Consideration of an Entity's Use of a Service Organization	PCOAB (2024d)				X
AS 2110, Identifying and Assessing Risks of Material Misstatement	PCAOB (2024e)				X
AS 6115, Reporting on Whether a Previously Reported Material Weakness Continues to Exist	PCAOB (2024f)				X
AS 3101, The Auditor's Report on an Audit of Financial Statements When the Auditor Expresses an Unqualified Opinion	PCAOB (2024g)				X
PCI Security Standards Council Data Security Standard	PCI Security Standards Council (2024)		X		X
The IIA's Three Lines Model: An update of the Three Lines of Defense	THEIAA (2020)		X		
Internal Audit Competency Framework	THEIAA (2022)		X		
CIA Exam Preparation and Practices Resources webpage	THEIAA (2024d)		X		
Cybersecurity Topical Requirement	THEIAA (2024e)		X		
Global Internal Audit Standards	THEIAA (2024f)		X		
Federal Managers Integrity Act of 1982	U.S. Congress (1982)	X			
Public Law 101-576, Chief Financial Officers Act of 1990	U.S. Congress (1990)	X			
Public Law 107-347, E-Government Act, Section 208	U.S. Congress (2002a)	X			
Sarbanes-Oxley Act of 2002 as amended	U.S. Congress (2002b)	X		X	
Federal Information System Modernization Act of 2023	U.S. Congress (2023)	X			

Table 1 presents the additional resources examined for cybersecurity-related content. The resources are included as study references within the CPA examination content materials or on examination resource websites. Most resources are free and publicly available or already included in the author's possession.

3.3 Stages 2 and 3 Procedures

Accounting educators should find approaches that will integrate more IT-related content, like cybersecurity, while still addressing core competencies (Yeaton, 2021). The implemented learning activities

should be impactful yet undisruptive to core accounting content. Accounting researchers and professional organizations have been developing learning materials and activities that could be useful in addressing internal control and cybersecurity learning goals. Therefore, our search targeted educational materials written for accounting educators to address Stages 2 and 3.

Qasim and Kharbat (2020) recommended classifying undergraduate accounting courses into introductory, intermediate, and advanced levels. We developed a sample undergraduate accounting course completion model to help visualize the sequencing of potential courses. Figure 2 lists the courses considered for Stages 2 and 3. Unlike information security specialists, accounting students must understand risk mitigation in the context of various roles with differing responsibilities. Visualization of the accounting course sequence aided in identifying opportunities for integrating important topics into multiple courses and using varying perspectives.

Figure 2: Undergraduate Accounting Courses for Stages 2 and 3

Introductory-Level Courses			
Introduction to Financial Accounting		**Introduction to Managerial Accounting**	
Intermediate-Level Courses			
Intermediate Accounting	**Accounting Applications**	**Individual Tax Accounting**	**Cost Accounting**
Advanced-Level Courses			
Advanced Accounting	**Auditing**	**Governmental Accounting**	**Accounting Information Systems**

Figure 2 depicts the courses considered during stages 2 and 3 to address RQ2 and RQ3. Internal Controls and Cybersecurity are primarily covered in the Auditing and AIS courses. The study's goal is to integrate cybersecurity into the remaining eight courses that are not shaded.

4. Results

4.1 RQ1: Overlapping Internal Control and Cybersecurity Content

In Stage 1, we identified the knowledge and skill requirements that overlap between the CGFM, CIA, CMA, and CPA examination content materials related to the internal control and cybersecurity learning goal from the AACSB accounting accreditation standards. We also considered IT controls because of their interrelationship with general internal controls and cybersecurity. The consolidation of internal controls and cybersecurity within the AACSB accounting accreditation standards prompted a simultaneous review during Stage 1. Six overlapping subtopics and 41 learning goals were identified as

the internal control and cybersecurity knowledge skills that potential employers value and accounting students need to meet their certification and career goals. A brief description of the six overlapping subtopics and classification of the 41 learning goals for the subtopics are presented below.

Subtopic 1: Cybersecurity Roles and Responsibilities

Accounting programs should develop accounting curricula that facilitate the "development of a deep understanding of managerial and organizational contexts for areas of specialization in accounting" (AACSB, 2024, p. 19). Therefore, accounting graduates must be able to differentiate between the appropriateness of various roles and responsibilities related to general internal controls, IT controls, and cybersecurity concerns. Table 2 identifies the learning goals for Cybersecurity Roles and Responsibilities. Cybersecurity Roles and Responsibilities distinguish accounting-related job functions, such as governance, internal audits, and external audits. In addition, students should understand the roles of standard-setters like the Public Company Accounting Oversight Board (PCAOB), the Committee of Sponsoring Organizations of the Treadway Commission (COSO), and NIST.

Table 2: Learning Goals: Cybersecurity Roles and Responsibilities

Cybersecurity Roles and Responsibilities (Subtopic 1)					
LG	Knowledge	Exam			
		CGFM	**CIA**	**CMA**	**CPA**
1	Differentiate the appropriateness of roles (management, internal audit, external audit, and consulting) and responsibilities when designing the entity's information system and security control activities to achieve objectives and respond to risk.	X	X	X	X
2	Differentiate the appropriateness of roles during an engagement.	X	X	X	X
3	Differentiate the appropriateness of roles when assessing the effectiveness of internal controls.	X			X
4	Differentiate the appropriateness of roles when implementing control activities to ensure that the organization's objectives are met and threats are addressed.	X	X	X	X
5	Understand the roles of regulators and standard setters in providing standards and guidance on internal controls and information systems controls.	X		X	X

Table 2 depicts the knowledge learning goals related to the Cybersecurity Roles subtopic identified during our examination of the content outlines and other sources recommended by the certification sponsoring organizations.

Subtopic 2: Cybersecurity Frameworks and Standards

Table 3 shows the content analysis results related to Cybersecurity Frameworks and Standards, which address technical guidance concerning internal controls, IT controls, and cybersecurity issues. Standards and regulations serve as the foundation for safeguarding technological assets and developing strategies against cyber threats (Abrahams et al., 2024). COSO's *Internal Control – Integrated Framework* is the only reference listed in each of the four certification exams' content documents.

Table 3: Learning Goals: Cybersecurity Frameworks and Standards

Cybersecurity Frameworks and Standards (Subtopic 2)					
LO	Knowledge	Exam			
		CGFM	**CIA**	**CMA**	**CPA**
6	Understand information systems controls relevant for assessing security risk and responding to identified threats to information security.	X	X	X	X
7	Understand the frameworks and the implementation guidelines relevant to internal control activities.	X	X	X	X
8	Understand the auditing standards related to internal controls.	X	X	X	X
9	Understand the relevant frameworks and implementation guidelines for examining the effectiveness of information privacy controls.	X	X	X	X
10	Understand the relevant frameworks and the implementation guidelines for examining the effectiveness of information security controls and management.	X	X	X	X

Table 3 depicts the knowledge learning goals related to Cybersecurity Frameworks and Standards identified during our examination of the content outlines and other sources recommended by the certification sponsoring organizations.

Subtopic 3: Cybersecurity Risk Assessment

Table 4 presents the results of our reflexive content analysis related to Cybersecurity Risk Assessment. The topic primarily addresses the knowledge and skills that graduates need to assess internal controls, IT controls, and cybersecurity threats.

Table 4: Learning Goals: Cybersecurity Risk Assessment

Cybersecurity Risk Assessment (Subtopic 3)					
LO	Knowledge	Exam			
		CGFM	**CIA**	**CMA**	**CPA**
11	Understand how to assess IT controls to the extent necessary to address the entity's objectives.	X	X	X	X
12	Understand how to assess internal controls to the extent necessary to address the entity's objectives.	X	X	X	X
13	Understand how to assess management's risk identification and governance processes related to IT internal controls.		X		X
14	Understand how to assess management's risk identification and governance processes related to internal controls.	X	X	X	X
15	Understand how to consider IT controls, including security management, to address audit objectives.	X	X		X
16	Understand how to consider SOC 1 reports to address audit objectives.				X
17	Understand how to evaluate security threats to IT from both internal and external sources.	X	X	X	X
18	Understands the process of conducting and reporting on privacy impact assessments.	X			

Table 4 depicts the Cybersecurity Risk Assessment learning goals identified during our examination of the content outlines and other sources recommended by the certification sponsoring organizations.

Subtopic 4: Cybersecurity Risk Mitigation

Cybersecurity Risk Mitigation delineates the aptitude required to address internal control weaknesses, data security threats, and risks. Students should possess a basic understanding of threats, such as hacking, piracy, tampering, and ransomware attacks, along with mitigation strategies like encryption, access controls, and firewalls (THEIIA, 2024c; IMA, 2024). Table 5 presents the learning goals.

Table 5: Learning Goals: Cybersecurity Risk Mitigation

Cybersecurity Risk Mitigation (Subtopic 4)					
LO	Knowledge	Exam			
		CGFM	**CIA**	**CMA**	**CPA**
19	Understand how to select the appropriate technical guidance based on the risk assessment.	X	X		X
20	Understand how to use the internal control risk assessment to identify mitigation strategies.	X	X	X	X
21	Understand mitigation strategies for providing information security protections based on risks and threats.	X	X	X	X

22	Understand how to develop a corrective action plan based on audit findings.	X	X	X	X
23	Understand strategies to mitigate risks identified in the privacy impact assessment.	X			

Table 5 depicts the Cybersecurity Risk Mitigation learning goals identified during our examination of the content outlines and other sources recommended by the certification sponsoring organizations.

Subtopic 5: Cybersecurity Auditing

Cybersecurity Auditing, which is presented in Table 6, is related to auditing standards that address internal controls, including IT controls and cybersecurity. All four certification exams contain content on auditors' responsibility to understand internal controls to meet audit objectives.

Table 6: Learning Goals: Cybersecurity Auditing

Cybersecurity Auditing (Subtopic 5)					
LO	Knowledge	Exam			
		CGFM	**CIA**	**CMA**	**CPA**
24	Understand how to consider service organization control (SOC) engagements for internal control management, assessment, and auditing.	X			X
25	Understand auditors' requirements to assess significant internal controls to the extent necessary to address the audit objectives.	X	X	X	X
26	Understand auditors' requirement to consider internal control deficiencies within the context of the audit objectives.	X	X	X	X
27	Understand auditors' requirements to obtain a sufficient understanding of information systems controls, including security management, to assess audit risk and plan the audit within the context of the audit objectives.	X	X		X
28	Understand auditors' responsibility to evaluate cybersecurity control processes.	X	X		X
29	Understand auditors' responsibility to evaluate management's use of information technology frameworks.		X		X
30	Understand planning, audit, and reporting procedures for SOC engagements.				X
31	Understand auditors' responsibility to evaluate the entity's risk management processes related to cybersecurity.		X		X
32	Understand how to identify sensitive information during a government audit.	X			X

33	Understand the differences between attestation and review engagements.	X	X	X	X

Table 6 depicts the learning goals related to the Cybersecurity Auditing subtopic identified during our examination of the content outlines and other sources recommended by the certification sponsoring organizations.

Subtopic 6: Cybersecurity Disclosure and Reporting

Cybersecurity Disclosure and Reporting learning goals cover topics related to management's responsibility to report on the effectiveness of internal controls, including IT security and cybersecurity. From the auditors' perspective, the content covers the knowledge and skills required to report on management's assertions and the results of engagements. Auditors should be able to modify opinions and reports when internal control deficiencies are noted. Table 7 presents the results of the document content analysis.

Table 7: Learning Goals: Cybersecurity Disclosure and Reporting

Cybersecurity Disclosure and Reporting (Subtopic 6)					
LO	Knowledge	Exam			
		CGFM	**CIA**	**CMA**	**CPA**
34	Understand auditors' responsibility to attest and report on management's assessment of the effectiveness of internal controls.	X	X	X	X
35	Understand how to modify opinions and reports on the effectiveness of internal controls based on the audit results.	X	X	X	X
36	Understand how to modify opinions and reports when information systems control deficiencies have been identified.	X			X
37	Understand management's responsibility to report on its assessment of the effectiveness of internal controls.	X	X	X	X
38	Understand management's responsibility to report on the effectiveness of information security controls.	X	X		
39	Understand management's responsibility to report security breaches.	X	X		
40	Understand the contents of an incident response plan.		X		X
41	Understand the requirements for publicizing the results of privacy impact assessments.	X			

Table 7 depicts the learning goals related to the Cybersecurity Disclosure and Reporting identified during our examination of the content outlines and other sources recommended by the certification sponsoring organizations.

4.1 RQ2 and RQ3: Sample Learning Activities and Resources

As anticipated, the RQ1 results contain more overlapping content than can be covered. In addition, some of the internal control and cybersecurity learning goals may be covered in the existing courses, including AIS and auditing. Regardless, programs should only make small curriculum changes based on the highest priority of unmet student needs (Lamberton & Raschke, 2023). Otherwise, the accounting faculty and students could be overwhelmed. To complete our demonstration, we selected Learning Goal 21 under the Risk Mitigation subtopic related to understanding strategies for information security protections.

Table 8 presents our proposal for integrating the selected learning goal into the accounting curriculum to address RQ2 and RQ3. For our demonstration, learning activities and assessment activities were selected that would provide evidence of students' understanding of risk-based mitigation strategies for protecting data and information systems. Three desired knowledge acquisitions (KA) were identified:

1. Students will know how to select and apply the appropriate risk management standards and frameworks for mitigation strategies.
2. Students will know the types of risks and threats to information systems and data.
3. Students will be skilled at selecting the appropriate risk mitigation strategies to address risks and threats to information systems and data.

For brevity, we discuss RQ2 and RQ3 related to Stages 2 and 3, respectively, using these three knowledge acquisition areas and the sample accounting curriculum program depicted in Figure 2.

Table 8: Demonstration of Backward Curriculum Design and Coherent Curriculum Approach

Stage 1 Desired Results: Understand mitigation strategies for providing information security protections based on risks and threats	
ESTABLISHED GOALS Standard A4: "Curriculum is appropriate to professional expectations and requirements …"	***Transfer*** *Students will be able to use their learning to independently:* • Identify risks and threats to information systems and data. • Develop mitigation strategies that provide information systems and data security protection based on identified risks and threats.
	Meaning

<table>
<tr><td rowspan="4">(AACSB, 2024, p. 16).

The accounting learning experiences address the following content at the undergraduate degree level.
• Internal controls and security.
(AACSB, 2024, 17).</td><td>Understandings
Students will understand:
• How to identify and differentiate common risks and threats to information systems and data.
• How to apply relevant standards and frameworks (NIST) for the development of appropriate mitigation strategies to address risks and threats to information systems and data.</td><td>Essential Questions
• What are the most relevant standards and frameworks related to information systems and data security?
• Why are information systems controls and cybersecurity important to accountants?
• What mitigation strategies can be used to address the information risks and threats faced by the company?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Declarative knowledge
Students will know:
• How to select and apply the appropriate risk management standards and frameworks for mitigation strategies.
• The types of risks and threats to information systems and data.</td><td>Procedural knowledge
Students will be skilled at:
• Selecting the appropriate risk mitigation strategies to address risks and threats to information systems and data.</td></tr>
<tr><td colspan="3">Stage 2 - Evidence</td></tr>
<tr><td>Evaluative Criteria</td><td colspan="2">Assessment Evidence</td></tr>
<tr><td>Criteria must be customized based on the accounting program's learning goals and accreditation needs.</td><td colspan="2">PERFORMANCE TASK(S):
<u>Student Presentation</u>
Students turned teachers (AICPA & CIMA, NA)

<u>Gamification</u>
DOD CyberProtect video game: https://dl.dod.cyber.mil/wp-content/uploads/trn/online/cyber-awareness-challenge/index.html; (Hayes, O'Brien, & Vician, 2019).</td></tr>
<tr><td>Criteria are set on a case-by-case basis to ensure that they help students master their learning goal.</td><td colspan="2">OTHER EVIDENCE:
Digital Badges
Cybersecurity Best Practices.
By using real-world examples, proven industry practices, and emerging cybersecurity concepts, learners will emerge with a better understanding of cybersecurity as a whole and how they can leverage these to protect themselves and their organization.
https://www.coursera.org/learn/cybersecurity-best-practices#modules
Training is free, but it costs $49 to receive the certificate.

IBM: Cybersecurity Basics
Earn the Badge: Cybersecurity Basics
https://www.ibm.com/training/badge/cybersecurity-basics
Training is free, but it costs $149 to get the badge.

Homework, Quizzes, and Exams</td></tr>
<tr><td colspan="3">Stage 3 – Learning Plan</td></tr>
</table>

Where in the program	Learning Activity
Accounting club "game night"	**Gamification** DOD cyber game: https://dl.dod.cyber.mil/wp-content/uploads/trn/online/cyber-awareness-challenge/index.html; (Hayes et al., 2019).
Accounting club speaker	**Speakers and Current Professional Presentations** An information security specialist from a public accounting firm will discuss information security risks, threats, and mitigation strategies.
Accounting Applications Course	**Digital Badges** *Certification: Microsoft Certified: Security, Compliance, and Identity Fundamentals.* https://learn.microsoft.com/en-us/credentials/certifications/security-compliance-and-identity-fundamentals/?practice-assessment-type=certification Training is free, but it costs $99 to take the exam.
Advanced Accounting	**Case Study** *Case 6: Cybersecurity and the Core Financial Accounting 10-K Project* (Boss et al., 2022).
Cost Accounting	**Case Study** *Case 4: Calculate Cybersecurity Breach Costs Guidance* (Boss et al., 2022). *Case 5: Classify and Measure Cybersecurity Breach Cost Guidance* (Boss et al., 2022).
Government Accounting	**Instructional Content** *Cybersecurity and Information Technology: Federal Agencies Need to Strengthen Efforts to Address High-Risk Areas* (Harris, 2021) This is a report that contains information that could be incorporated into a government accounting course. Website with link to report: https://www.gao.gov/products/gao-21-105325 Direct website to report: https://www.gao.gov/assets/gao-21-105325.pdf
Intermediate Accounting or Accounting Applications Course	**Instructional Content** *NSA's Top Ten Cybersecurity Mitigation Strategies* Brief discussion of top ten mitigation strategies (National Security Agency, 2018) Website: csi-nsas-top10-cybersecurity-mitigation-strategies.pdf
Intermediate Accounting or Accounting Applications Course	**Instructional Content** *Describe the basic concepts of cybersecurity.* Find out how you can protect yourself and your organization against cyber threats and cyberattacks and explore cybersecurity concepts in this Learning Path. Free from the Security hub on Microsoft Learn. Website: https://learn.microsoft.com/en-us/training/paths/describe-basic-concepts-of-cybersecurity/
Introduction to Financial Accounting	**Gamification** *Amazon Cybersecurity Awareness Training.* This is a free game. Website: https://learnsecurity.amazon.com/en/index.html
Introduction to Managerial Accounting	**Case Study** *Case 4: Calculate Cybersecurity Breach Costs Guidance* (Boss et al., 2022).

	Case 5: Classify and Measure Cybersecurity Breach Cost Guidance (Boss et al., 2022).
Tax Accounting	**Case Study** *Case 3: Tax Preparers Protecting Personally Identifiable Information* (Boss et al., 2022)

RQ2: Stage 2 Assessment Activities

For Stage 2 of our backward curriculum design (RQ2), we assumed that the assessments for the selected learning goal would remain in the AIS and auditing courses. Four curriculum approaches were identified that could provide evidence that students attain knowledge and understanding related to all three KAs. The assessment assignments for our demonstration include gaming, a student presentation, digital badge opportunities, and standard testing options.

Gamification and digital badge attainment are activity-based learning activities that provide evidence that students are skilled at applying their declarative knowledge (KA1 and KA2) to identify appropriate risk mitigation strategies (KA3). An advantage of using activity-based learning activities is that students are provided with an opportunity to apply their critical thinking skills to cybersecurity scenarios (Frydenberg & Lorenz, 2020). Several information security curriculum studies recommend using digital badges and affordable online training because they can signal qualifications and skills that employers value (Marquardson & Elnoshokaty, 2020; Pike, Brown, West, & Zentner, 2020). Web-based learning activities like CyberProtect and digital badges are viable options for traditional courses and for online delivery methods that were retained following the COVID-19 pandemic. However, some certifications also require relevant work experience and might be too time-consuming for students to complete during a single course. Student presentations, homework, quizzes, and tests can be easily adapted to cover the three KAs.

RQ3: Stage 3 Learning Activities

RQ3 asks whether additional learning materials related to our selected learning goal could be presented in accounting courses other than AIS or auditing. We identified at least one risk mitigation touchpoint to increase the relevant instruction in the eight remaining courses and during the accounting club meetings. In addition, the learning activities collectively address the three KAs.

Accounting club meetings could be used for gaming and competitions or as opportunities for information security presentations from current professionals. Gamification options like the DOD CyberProtect video game are learning activities that address all three KAs. However, speaker presentations will mostly be limited to content related to KA1 and KA2. Accounting organizations and faculty are developing a growing body of cybersecurity-related learning activities. For example, Boss et al. (2022) presented several case studies that could be used in advanced accounting, cost accounting, the introduction to managerial accounting, and tax accounting courses. The content in the case studies identified will expose students to knowledge related to KA1 and KA2. Case studies help students understand the importance of cybersecurity and how to mitigate risks (Mentzer, Frydenberg, & Yates, 2020; Schwieger & Ladwig, 2022). In addition, we were able to locate accounting-related instructional content that would allow students to learn about cybersecurity in an accounting context and that would address KA1 and KA2. Finally, digital badge attainment is included in lower-level courses to help provide students with foundational knowledge. Using a program-level approach motivated us to consider the sequencing and content of each course for more comprehensive integration across the accounting curriculum.

5. Conclusion

This study uses the backward curriculum design and coherent curriculum approaches to demonstrate how accounting programs can expand and realign learning opportunities to address desired learning goals, employer needs, certification exam content, and accreditation standards. Our analyses of the examination content for four accounting certifications revealed overlapping subtopics and learning goals related to internal control and cybersecurity, an undergraduate learning outcome identified from the AACSB accounting accreditation standards. Stage 1 results from the backward curriculum design process provided insights that helped in the application of the coherent curriculum approach during Stage 3. This has resulted in multiple learning opportunities throughout the accounting curriculum for the selected learning goal. Incorporating multiple touchpoints throughout the curriculum helps to reinforce the importance of these

topics and increases students' contextual understanding (Warr et al., 2023). In stage 2, the primary learning assessments for internal control and cybersecurity remained in the AIS and auditing courses.

The following are limitations of the study. The consistent content and learning goals were based on four certification exams. While new graduates commonly take at least one of these four exams, many additional accounting certification exams are available which may require different knowledge to complete successfully. Additionally, some accounting programs may not provide support for multiple certification exams. As stakeholders, students have no direct input into the educational opportunities at their school; however, their career goals do have an indirect impact on the material covered by their school. As a result, our results may not be generalizable to all accounting programs.

Curriculum integration efforts can be disruptive and costly to implement, especially if there are faculty training needs (Athavale, Davis, & Myring, 2008). In addition, this approach may take multiple semesters to implement and perfect. Despite these disadvantages, backward curriculum design and coherent curriculum approaches can be applied to help accounting programs integrate any desired learning goal throughout the program instead of simply treating the learning goal as an add-on to a single course. Warr et al. (2023) state that "curriculum development cannot be a single event; the curriculum must be constantly evaluated based on candidate outcomes, and curriculum designers must adapt to new changes." This is particularly true in accounting because of the frequent changes in accounting standards and the technology employed by the industry.

Despite these disadvantages, simultaneously applying backward curriculum design and the coherent curriculum approach could have significant implications related to the accounting program's quality. By implementing a combination of backward curriculum design and coherent curriculum approaches, accounting programs can meet accreditation standards, ensure that the program curriculum is current, and provide students with opportunities to develop the knowledge and skills necessary to pass certification exams and excel in their careers.

Ideas for future research include examining the curricular needs of other certification exams or applying the method to additional learning goals. A longitudinal study that measures the benefits over time could be conducted. The backwards curriculum

design and coherent curriculum approach could also be applied to other disciplines with multiple certifications and career goals.

To summarize, positive implications of this study include that the combination of backwards curriculum design and coherent curriculum can help develop a stronger and more current curriculum that provides students with the foundation needed to pass certification exams and be better prepared to address the changing future of accounting. The approach also supports continuous improvement initiatives required by AACSB. Potential drawbacks include the high cost of implementing the new curriculum and the need for additional faculty training.

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