An Empirical Analysis on Certified Public Accountants (CPA) Exam Passage Rates in Texas

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Studying noncurricular features alongside existing curriculum elements provides valuable information for improving professional programs that prepare future business leaders (Barilla, 2008). We use a large sample of aggregated CPA exam passage rate data from 12 Texas public universities over a ten-year period to analyze CPA exam passage rates. We then investigate the interactions across sample years, number of examinees, degree types, and exam sections. Our findings provide curriculum developers and schedulers with considerable insights into the delegation of teaching responsibilities owed to examinees and employers who increasingly expect the rewards of prompt CPA certification.

Keywords: CPA exam, passage rates, time-trend, degree type, exam section, number of participants

INTRODUCTION

Analyzing a comprehensive dataset of CPA passage rates over a ten-year period, governed by the same examination and licensure regulations can provide valuable performance measures for accounting curriculum strategists. The primary aim of this study is to identify non-curricular factors that influence CPA passage rates, enabling accounting educators to better prepare students for successful careers (Simeone, 2018). As we strive to improve CPA exam passage rates and prepare students for employment, we actively seek feedback from various stakeholders, including regulators, practitioners, licensing agencies, and learners. These groups regularly review academic accounting programs to identify undergraduate and graduate curricula deficiencies. By comparing learners' performance at different degree levels and exam sections, we attempt to identify the most pressing needs and highlight key differences in performance profiles among undergraduate, post-baccalaureate, and graduate student populations. This study also aims to contribute to the optimal adoption processes for addressing the "CPA Evolution Exam", which is viewed

as a solution to curriculum shortfalls. Like early adopters, we plan to implement several strategic and balanced curriculum adjustments in 2024 (Bakarich, Burke, Castonguay & Polimeni, 2021).

To take the Texas CPA exam, candidates must have 150 credit hours (or 225 quarter hours) and either a bachelor's or master's degree and pass a background check and fingerprinting. Additionally, they must complete 30 semester hours of upper-level accounting courses from a board-recognized college or university. Within the required 150 credit hours of coursework, the Texas State Board of Public Accountancy (TSBPA) mandates 24 semester hours of upper-level related business courses, two semester hours of accounting or business communications, and three semester hours of TSBPA-approved ethics courses. As CPA exam passage rates are strong indicators of academic success, curriculum strategists continuously monitor the association between academic achievements, curriculum variations, and CPA exam passage rates (Mittelstaedt and Morris, 2017). This study offers practical insights to accounting curriculum strategists by analyzing the relationship between CPA exam passage rates, degree type, specific exam sections, time trends over a decade, and the number of concurrent exam participants.

This paper is structured as follows. Section 2 summarizes the extant literature on U.S. CPA exam Section 3 outlines our research design and methodology. Section 4 reports empirical results. We draw our conclusion in Section 5.

RELATED LITERATURE

The Extant Literature

Over several decades, accounting scholars have delved into a plethora of factors influencing CPA exam passage rates. In the following table, we summarize their key findings, which shed light on the factors that can help or hinder candidates in their request to become CPAs.

1. Essay question elimination (Flintall, 1987) Essays provide assessment of the diagnostic, analytical & judgment abilities of candidates.
2. Role of a master degree in accounting (Boone et al., 2006) A graduate degree in accounting improves CPA exam passage rates and scores.
3. Separate AACSB accounting accreditation (Barilla & Jackson, 2008; Lindquist & Smith, 2013; Bunker et al., 2014; Watters, 2016) Mixed results on the role of a separate accounting accreditation in the CPA exam passage rates.
4. Online accounting degree (Bunker & Harris, 2014; Morgan & Ihrke, 2013) Both the number of CPA exam takers and passage rates are lower for online learners.
5. Learners' motivations and career goals (Bline et al.,2016) Expressed goals to become a CPA positively impact CPA exam passage rates.
6. Faculty attributes (Bline et al., 2016; Emerson & Smith, 2018) Research productivity by accounting faculty positively related to CPA exam scores.
7. Traditional and career learners (Franklin & Myers, 2016) Mentoring plays a critical role for these type of learners during the licensure process.
8. Circadian rhythms of learners (Tapis et al., 2016) Daily timing of peak mental performance was recommended.
9. Institutional factors and accounting characteristics (Nagle et al., 2018) AACSB accreditation status and CPA faculty members positively affect CPA exam scores.
10. Program timing (Eames et al., 2018) The timing of programs (summer, weekends) has no effect on CPA exam scores.
11. Technology agility and upskilling (Tapis et al., 2020; Bakarich et al., 2021) Hybridization is manifest requiring partnering with other professional organizations.

12. CPA exam preparation courses (Shin et al., 2020; Franklin & Myers, 2016) Noncredit CPA exam review courses provide marginal effect on the exam passage rates.
13. School funding (Cordis & Muzatko, 2021) No indications of an association between higher education spending per capita and CPA exam passage rates.

RESEARCH DESIGN & METHODOLOGY

Data Collection & Sample Description

We obtained academic institution level data of CPA exam passage rates from twelve Texas universities from the Texas State Board of Public Accountancy's website (https://www.tsbpa.texas.gov/php/fpl/unvcandcnt.php, public reports, July 2, 2019). Our study focuses on exams taken between January 2008 and June 2019. However, we excluded 2019 data when analyzing yearly performance since it only covers the year's first half. The database includes each examinee's performance by exam content section (i.e., Auditing and Attestation, Business Environment and Concepts, Financial Accounting and Reporting, and Regulation). Our full sample consisted of 1,728 observations on school-year-section-degree combinations, which were reduced to 1,429 when we restricted our analyses to full-year data.

Variable Definitions

We defined the following variables for our analysis:

- *Sample period*: The sample data was divided into two periods to evaluate the role of time trends in the CPA passage rates. The first period covers 2008 to 2013 and the second period covers 2014 to 2018.
- *Advanced degree holders*: CPA exam candidates who hold a graduate degree, such as a master's degree in business administration (MBA) with a concentration in accounting, a master's degree in accounting (MPAC) or a Ph.D.
- *Baccalaureate (undergraduate) degree holders*: CPA exam candidates who hold a bachelor's degree as their first and usually only higher education degree in accounting.
- *Post-baccalaureate studies*: CPA exam candidates who returned to study accounting as a concentration after having attained a degree in a non-accounting subject to qualify to sit for the CPA exam.
- *AUD section*: The number of participants who took the Auditing and Attestation exam section.
- *BEC section*: The number of participants who took the Business Environment and Concepts exam section.
- *FAR section*: The number of participants who took the Financial Accounting and Reporting exam section.
- *REG section*: The number of participants who took the Regulation exam section.

Table 1 provides definitions for each dependent and independent variable in our models.

TABLE 1
THE NAME AND DESCRIPTION OF VARIABLES

	Variable Names	Description
Dependent variable		
	CPAPASS	CPA exam passage rates at the individual academic institution level, by specific year, degree, and section
Independent variables		
Continuous Variables		
	NUMB	Number of CPA exam candidates sitting for the specified section of the CPA exam during the given time trend
Dummy Variables (yes = 1, no = 0)		
	SP	takes a value of 1 if the Candidate took the CPA exam in the second period (2014 – 2019) of study.
	DEGREE	takes a value of 1 if Candidate holds a graduate degree or is a post-baccalaureate student.
	ES	takes a value of 1 if Candidate takes a section other than the AUD section
Interacting Variables		
	ADVDSP	interaction variable between advanced degree and the sample period, the coefficient of it reports the difference of passage rates for the advanced degree candidates compared to that of the undergraduate accounting degree candidates in the 2nd sample period.
	PDSP	interaction variable between post-baccalaureate degree and the sample period, the coefficient of it reports the difference of passage rates for the post-baccalaureate degree holders compared to that of the undergraduate accounting degree candidates in the second sample period.
	BECSP	interaction variable between BEC exam section and the sample period, the coefficient of it reports the difference of passage rates for the candidates of BEC section compared to that of the AUD section candidates in the 2nd sample period.
	FARSP	interaction variable between FAR exam section and the sample period, the coefficient of it reports the difference of passage rates for the candidates of FAR section compared to that of the AUD section candidates in the 2nd sample period.
	REGSP	interaction variable between REG exam section and the sample period, the coefficient of it reports the difference of passage rates for the candidates of REG section compared to that of the AUD section candidates in the 2nd sample period.

REGRESSION MODELS

To better examine the impact and interplay of degree type, exam section, sample periods and the number of participants on CPA passage rates, we began by estimating the following regression model:

$$CPAPASS_{ijt} = a_0 + b_1 SP_{ij} + b_2 NUMB_{ijt} + b_3 DEGREE_{ijt} + b_4 ES_{ijt} + e_{ijt} \quad (1)$$

Our primary empirical specification is based on equation (1). However, we expand this model by incorporating interaction terms between time period and degree types and exam sections. The interaction terms consist of two elements. Specifically, we modified equation (1) to capture these additional variables.

$$CPAPASS_{ijt} = a_0 + b_1 SP_{ij} + b_2 NUMB_{ijt} + b_3 DEGREE_{ijt} + b_4 ES_{ijt} + b_5 ADV_{ijt} * SP_{ij} + b_6 POSTBAC_{ijt} * SP_{ij} + b_7 BEC_{ijt} * SP_{ij} + b_8 FAR_{ijt} * SP_{ij} + b_9 REG_{ijt} * SP_{ij} + e_{ijt} \quad (2)$$

Our full empirical models incorporate all the interaction variables between sample period, number of participants, degree, and exam sections. However, we found that our primary results remain qualitatively stable and consistent, allowing us to omit the specification of our full models due to expository concerns.

To compare passage rates, we established a set of bases consisting of the first sample period, candidates with undergraduate accounting degrees, and the AUD section. Our specification use these bases to calculate the difference between each independent variable and the base, as represented by the coefficients in our empirical results.

Furthermore, we expanded equation (2) by including interaction terms of the sample period, degree, and exam sections. We do not present these findings here for clarity and brevity, but we are happy to provide them upon request.

EMPIRICAL RESULTS

Overall Effects of Sample Period, Degree Type, and Exam Section on CPA Passage Rates - Equation 1

TABLE 2
THE EFFECT OF THE SAMPLE PERIOD, NUMBER OF PARTICIPANTS, DEGREE, AND EXAM SECTION ON THE CPA PASSAGE RATES (N=1,429 WINSORIZATION AT 1 % LEVEL)

Independent Variable	*Parameter Estimate*	*Standard Error*	*t-value*	*Pr >|t|*
Intercept	-5.14391	1.12036	-4.59	<0.001
Sample Period	2.33481***	0.75355	3.10	0.0020
Number of Participants	0.59667***	0.00639	93.43	<0.0001
Degree	-0.05751	0.46681	-0.12	0.9020
Exam sections	0.09888	0.33534	0.29	0.7681
Adjusted R^2	0.86			
Coefficient F-test	2184.46***			

$CPAPASS_{ijt} = a_0 + b_1 SP_{ij} + b_2 NUMB_{ijt} + b_3 DEGREE_{ijt} + b_4 ES_{ijt} + e_{ijt}$
***, **, * denotes significance at 0.01, 0.05, and 0.10 levels, respectively.
Table 2 reports the effect of the sample period, number of participants, degree, and exam section on the CPA passage rates using the 10- year sample we compiled from https://www.tsbpa.texas.gov/php/fpl/unvcandcnt.php on July 2, 2019.

Table 2 shows the coefficient of the Sample Period has a positive sign at a significance level above 0.01, suggesting the passage rates are significantly higher during the second sample period than that of the first sample period. The improved performance likely stems from 1) examinees' increasing appreciation of the CPA designation's importance, spurring educators' and students' revised efforts in the second sample period; 2) learning process facilitation and information sharing of through technological advances; 3) more aggressiveness of the CPA preparation service. In addition, the number of exam participants positively relates to the passage rates.

We then utilize equation (2) and modified models based on it to investigate the main variables and their interaction effects. We report the following results:

Results of Interaction Effects Between the Sample Period, Degree Type, and Exam Section (Equation 2 & Modified Models)

TABLE 3
EFFECT OF THE SAMPLE PERIOD, NUMBER OF PARTICIPANTS, DEGREE, AND EXAM SECTION ON THE CPA PASSAGE RATES (N=1,429 WINSORIZATION AT 1 % LEVEL)

Independent Variable	Parameter Estimate	Standard Error	t-value	Pr >|t|
Intercept	-7.79789	1.40976	-5.53	<0.0001
Sample Period	2.75279*	1.53221	-1.80	0.0726
Number of Participants	0.59719***	0.00628	95.02	<0.0001
Degree	1.80383***	0.63206	2.85	0.0044
Exam Sections	0.42325	0.45565	0.93	0.3531
ADVSP	4.35738***	1.44594	3.01	0.0026
PDSP	12.10635***	1.42949	8.47	<.0001
BECSP	1.56171	1.56685	1.00	0.3191
FARSP	-1.31738	1.75629	-0.75	0.4533
REGSP	-1.31437	2.01760	-0.65	0.5149
Adjusted R^2	0.87			
Coefficient F-test	1028.98***			

$CPAPASS_{ijt} = a_0 + b_1 SP_{ij} + b_2 NUMB_{ijt} + b_3 DEGREE_{ijt} + b_4 ES_{ijt} + b_5 ADV_{ijt} * SP_{ij} + b_6 POSTBAC_{ijt} * SP_{ij} + b_7 BEC_{ijt} * SP_{ij} + b_8 FAR_{ijt} * SP_{ij} + b_9 REG_{ijt} * SP_{ij} + e_{ijt}$

. ***, **, * denotes significance at 0.01, 0.05, and 0.10 levels, respectively.

Table 3 reports the effect of the sample period, number of participants, degree, and exam section on the CPA passage rates using the 10- year sample we compiled from https://www.tsbpa.texas.gov/php/fpl/unvcandcnt.php on July 2, 2019.

Table 3 shows that the inclusion of interaction effects between the type of degrees and exam sections results in slightly higher passage rates during the second sample period than the first. Furthermore, the number of participants is positively associated with passage rates. Importantly, the role of degree type in the CPA exam passage rates becomes more apparent when considering interaction effects. Specifically, candidates holding an advanced degree or post-baccalaureate studies performed significantly better than those with only an undergraduate accounting degree, as evidenced by the positive and significant coefficients of ADVSP and PDSP. Moreover, none of the coefficients of BECP, FARSP, and REGSP are statistically significant, indicating that passage rates in these sections are similar to that of the AUD section.

However, given the limitations of linear specifications, we expand our dataset investigation by utilizing non-parametric methods such as t-tests and visualization techniques. We present our findings in the following section.

The Effect of Time on CPA Passage Rates

FIGURE 1A
THE EARLY NUMBER OF EXAM PARTICIPANTS BETWEEN 2008 AND 2018

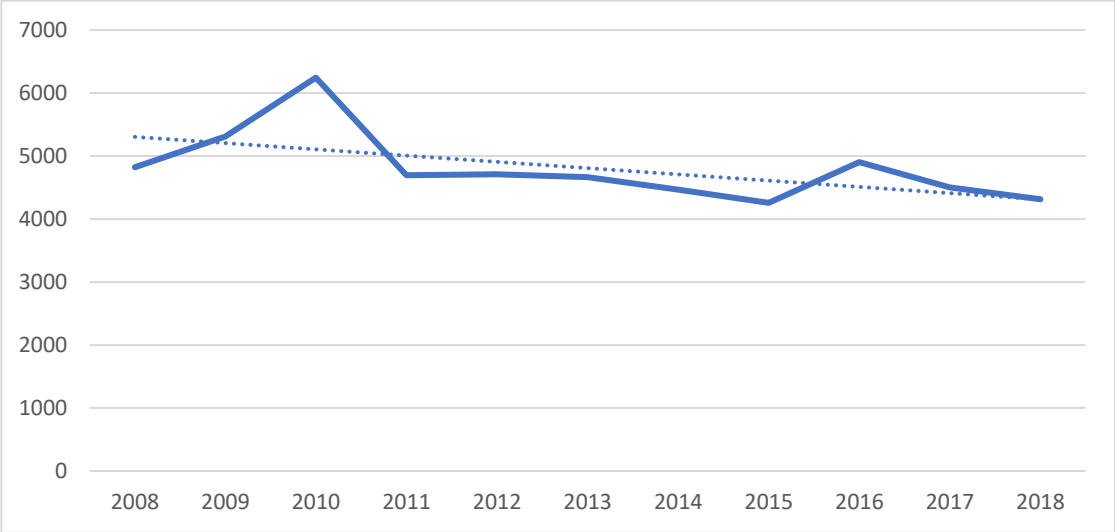
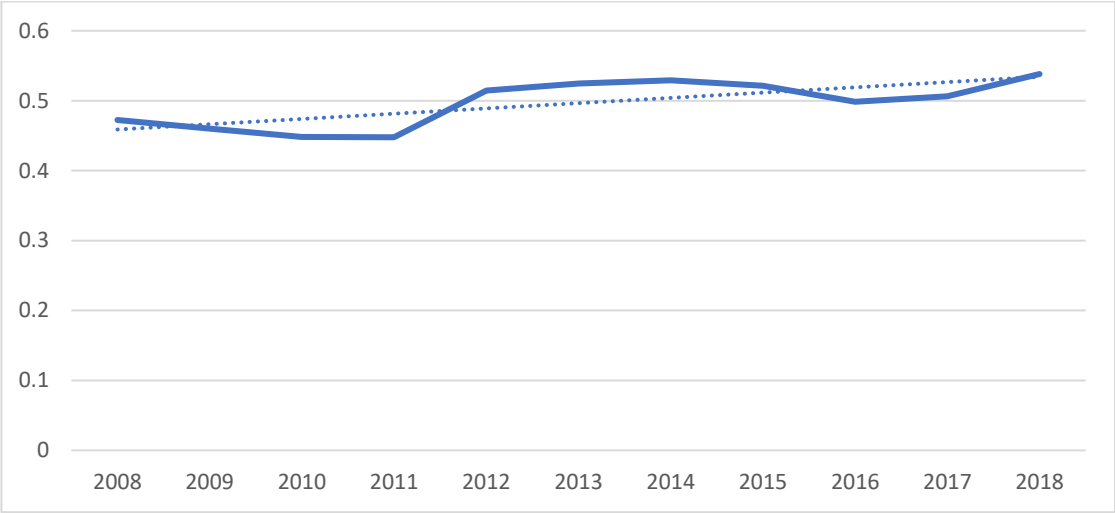


Figure 1a illustrates a modest decline in the number of CPA exam candidates over time, with a 5.5% reduction from the firm sample period (2009-2013) to the second sample period (2014-2018). Our untabulated results support this finding, with 621 participants in the first sample period and 587 participants in the second period.

FIGURE 1B
THE CPA EXAM PASSAGE RATES BETWEEN 2008 AND 2018



However, Figure 1b indicates that the CPA exam passage rates have exhibited a slightly upward trend over the sample period.

FIGURE 1C
THE CPA EXAM PASSAGE RATES BY SECTION BETWEEN 2008 AND 2018

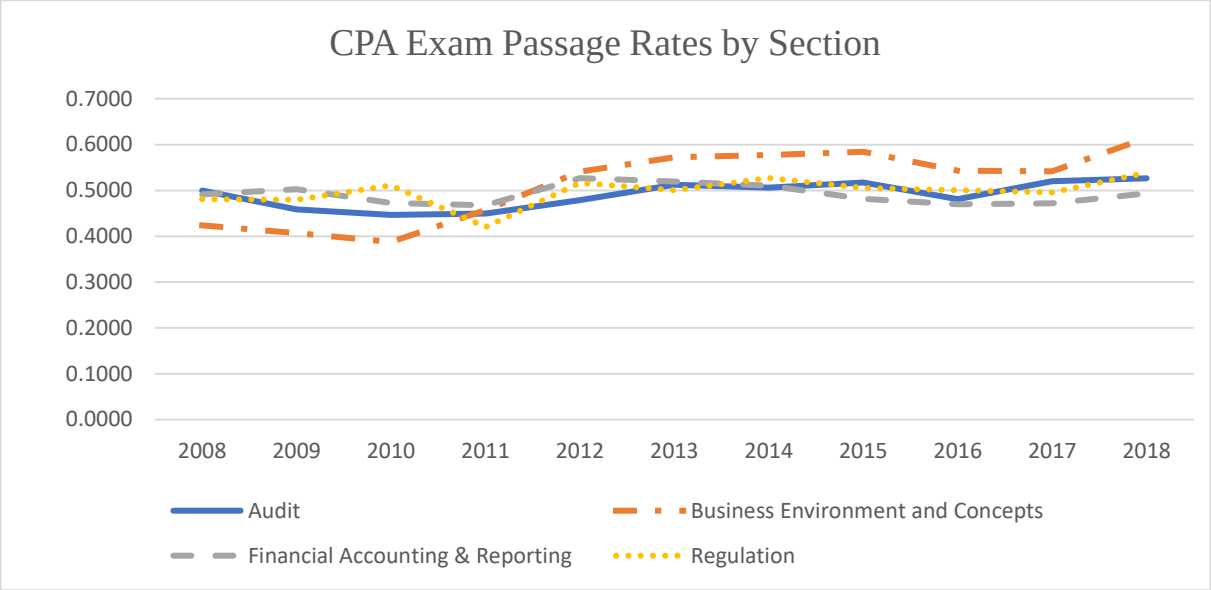


Figure 1c displays the CPA exam passage rates by section. Table 4 compares the section passage rates over two sample periods. It reveals that the passage rates for the Financial Accounting and Reporting (FAR) section remained stable. Starting in 2011, the Business Environmental and Concepts (BEC) section had the highest passage rates, followed by Regulation (REG), FAR, and Audit (AUD). A t-test indicated that the difference in passage rates between BEC and AUD was significant at the 1% confidence level. However, the results from 2012 and after marked a turning point for all four sections. T-test results indicated that the passage rates for the BEC section improved significantly over time, while those for the FAR section decreased significantly over the years. Finally, the passage rates for the REG section decreased slightly but not significantly during the sample period.

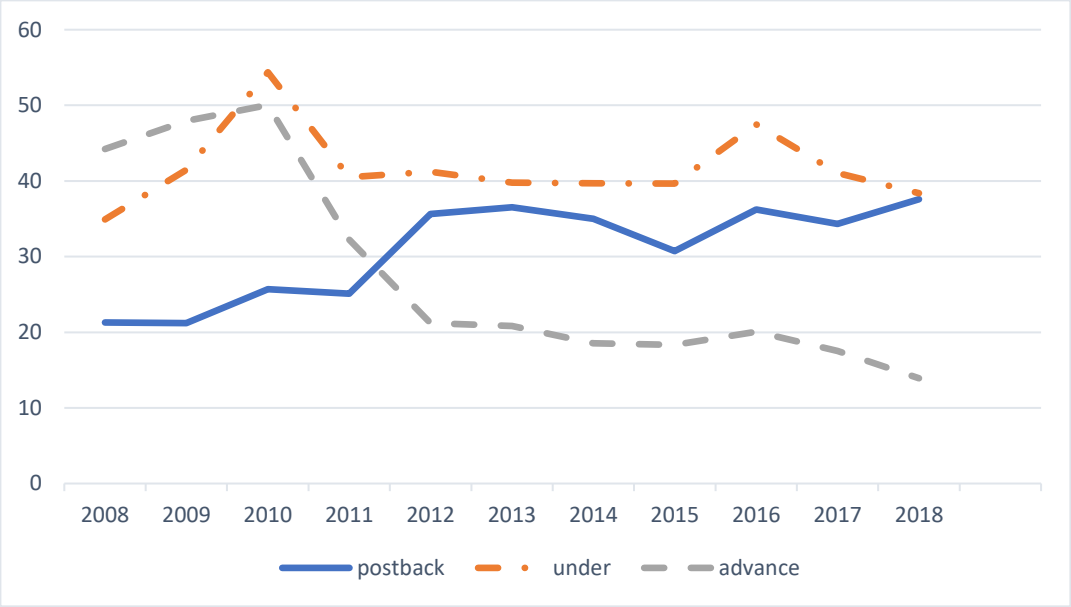
TABLE 4
TEST OF DIFFERENCE IN MEANS FOR FIGURE 1C
(N=1,429 WINSORIZATION AT 1 % LEVEL)

Variable	The First Period Passage Rates	The Second Period Passage Rates	DIFF in Mean (1-2)	T value
	MEAN	MEAN		
AUD	0.4177	0.4198	-0.00211	-0.09
BEC	0.3959	0.4700	-0.07410	-2.62***
FAR	0.4322	0.3795	0.0528	1.97**
REG	0.4284	0.3907	0.0378	1.50

***, **, * denotes significance at 0.01, 0.05, and 0.10 levels, respectively.
Table 4 compares the section passage rates during the first sample period with that of the second sample period using the 10- year sample we compiled from https://www.tsbpa.texas.gov/php/fpl/unvcandcnt.php on July 2, 2019.

The Effect of Degree on CPA Passage Rates

FIGURE 2A
THE NUMBER OF PARTICIPANTS BROKEN DOWN BY DEGREE TYPES BETWEEN 2008 AND 2018



According to Figure 2a, post-baccalaureate students have grown interest to take the CPA exam over time. However, during the financial recession in 2010-2011, undergraduate and advanced degree candidates experienced a drop in interest. This trend has raised concerns about the need for post-baccalaureate career path advising.

FIGURE 2B
THE PERCENTAGE OF PARTICIPANTS BROKEN DOWN BY DEGREE TYPES BETWEEN 2008 AND 2018

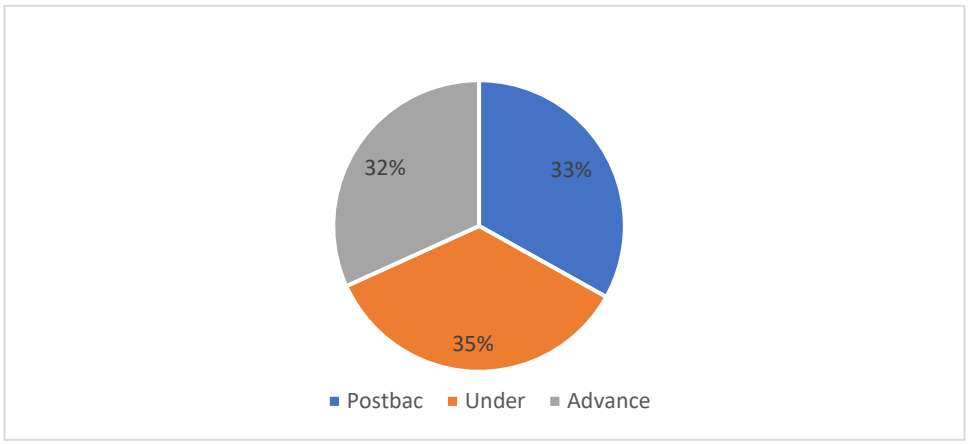


Figure 2b reveals the distribution of individuals interested in sitting for the CPA exam, the largest group is undergraduate candidates, representing the majority of the population at 35%. Post-baccalaureate candidates come second, comprising 33% of the total, followed by advanced degree holders at 32%.

Overall, undergraduate candidates show the highest interest in pursuing the CPA credential, with a notably larger share than the other groups.

FIGURE 2C
THE CPA EXAM PASSAGE RATES BROKEN DOWN BY DEGREE TYPES BETWEEN 2008 AND 2018

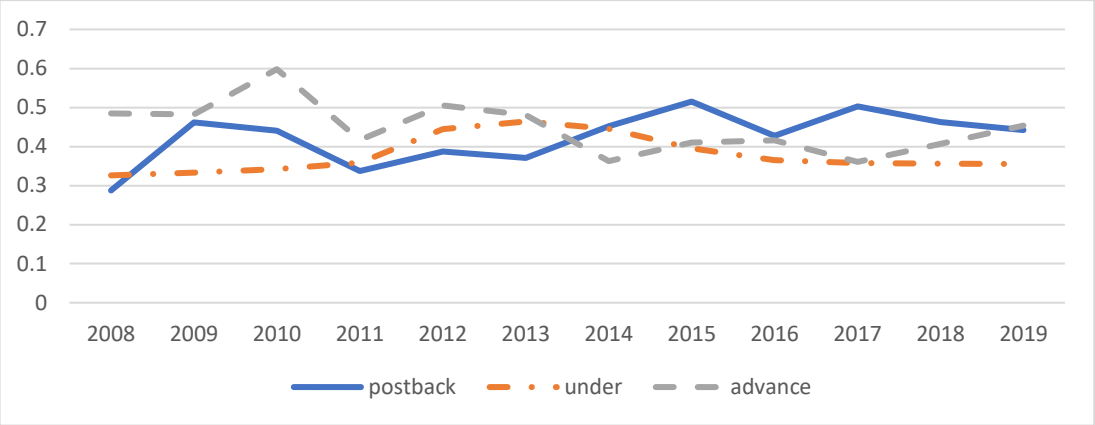


Figure 2c highlights the passage rates for different degree types on the CPA exam. The orange line represents the performance of undergraduate candidates, which consistently falls below the other groups. In contrast, post-baccalaureate and advanced degree holders demonstrate higher passage rates, as shown by the green and blue lines, respectively. Overall, the data suggests that individuals with post-baccalaureate or advanced degrees are more likely to pass the CPA exam than those with only an undergraduate degree.

FIGURE 2D
THE CPA EXAM PASSAGE RATES BROKEN DOWN BY DEGREE TYPES AND SECTIONS BETWEEN 2008 AND 2019

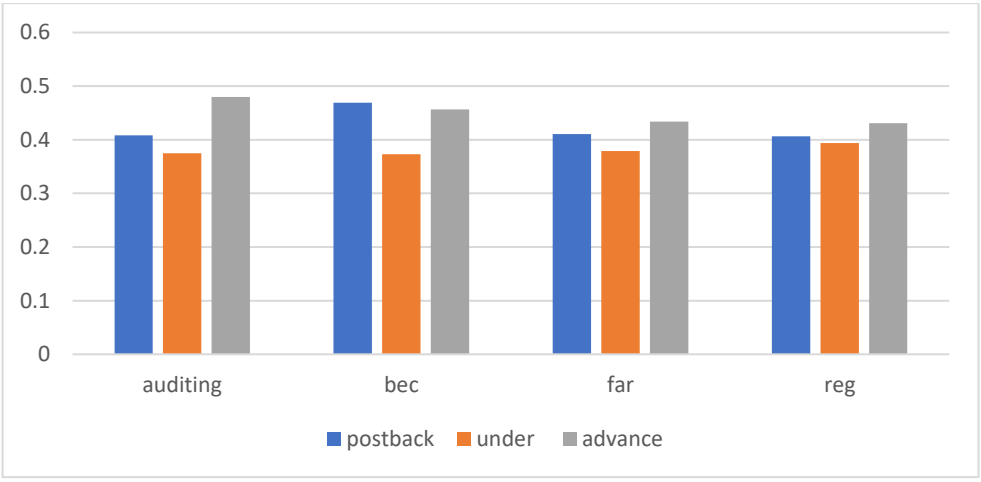


Figure 2d compares CPA exam section passage rates for different degree types. Table 5 compares passage rates between different examinees' degree type. Advanced degree candidates outperformed other groups in three of the four sections (i.e., AUD, FAR, and REG), except for the BEC section. Post-baccalaureate candidates generally performed better than undergraduate degree holders, with their highest passage rates observed during the second sample period (the untabulated data is available upon request).T-

tests results in Table 5 confirm what we have observed from Figure 2d. Additionally, it shows no statistical difference in passage rates between advanced degree and post-baccalaureate candidates.

TABLE 5
TEST OF DIFFERENCE IN MEANS FOR FIGURE 2D
(N=1,429 WINSORIZATION AT 1 % LEVEL)

Types of Degrees	Mean (1)	Mean (2)	DIFF in Mean (1-2)	T value
Undergraduate vs. Advanced Degree	0.3822	0.4499	-0.0677	-4.48***
Undergraduate vs. Post-baccalaureate	0.3822	0.4219	-0.0397	-2.62***
Advanced vs. Post-baccalaureate	0.4499	0.4219	-0.0280	-1.56

***, **, * denotes significance at 0.01, 0.05, and 0.10 levels, respectively.
Table 5 compares the passage rates between undergraduate vs advanced degree examinees, undergraduate vs. post-baccalaureate examinees, and advanced-degree vs. post-baccalaureate examinees using the 10- year sample we compiled from https://www.tsbpa.texas.gov/php/fpl/unvcandcnt.php on July 2, 2019.

The Passage Rates of Each Exam Section

We further analyzed CPA exam passage rates for each exam section over the sample period.

FIGURE 3A
THE CPA EXAM PASSAGE RATES OF AUD SECTION BETWEEN 2008 AND 2018

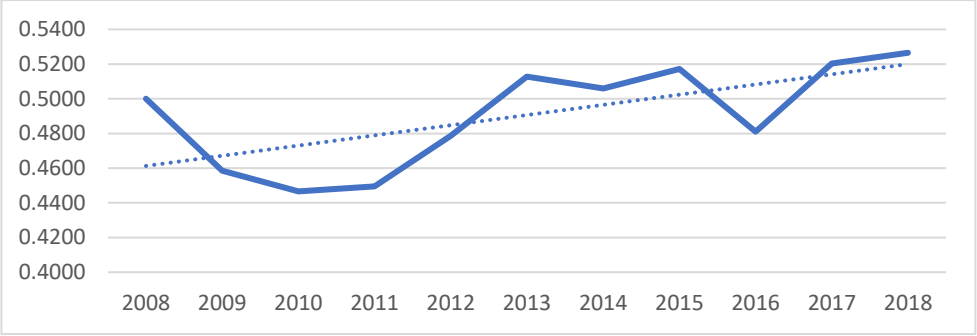


Figure 3a displays an overall uptrend in the passage rates for the AUD section. During the second sample period, advanced degree holders taking the AUD section performed slightly better than undergraduate degree holders. Similarly, post-baccalaureate degree holders outperformed undergraduate degree holders during the second period, with a statistically significant difference in performance.

FIGURE 3B
THE CPA EXAM PASSAGE RATES OF BEC SECTION BETWEEN 2008 AND 2018

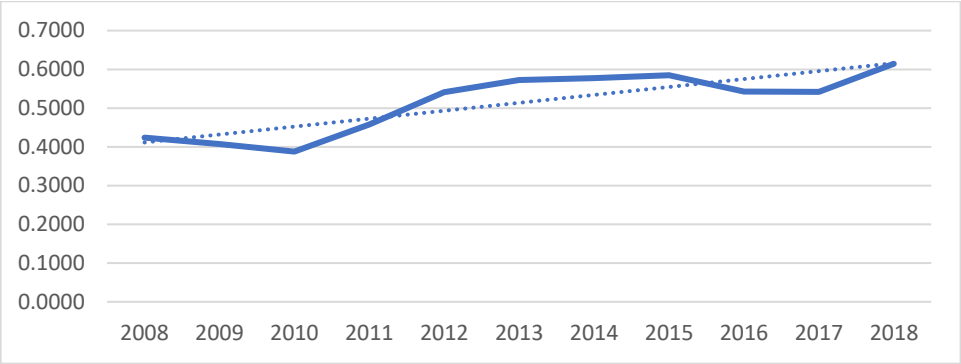


Figure 3b presents the analysis of BEC section, indicating an overall upward trend in passage rates over time. Specifically, the figure shows that the percentage of candidates passing the BEC section has steadily increased during most of the sample period.

FIGURE 3C
THE CPA EXAM PASSAGE RATES OF FAR SECTION BETWEEN 2008 AND 2018

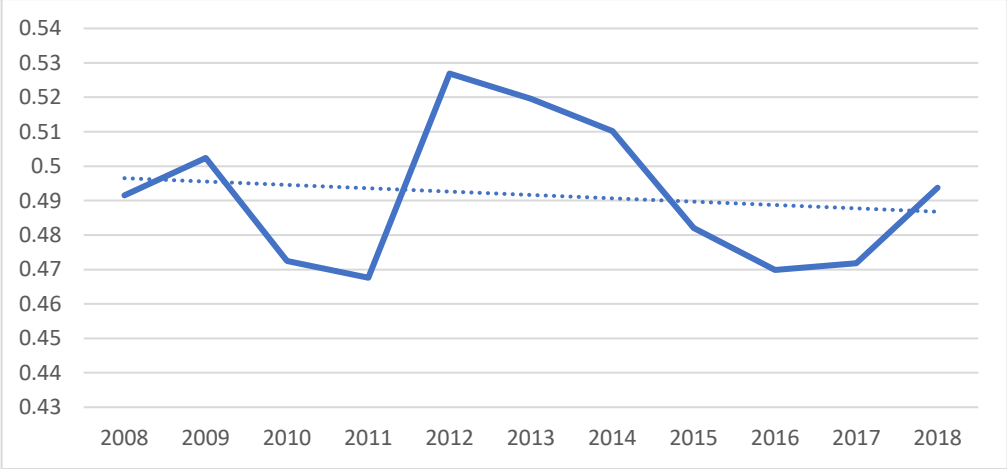


Figure 3c displays our analysis of the FAR section, indicating a decrease in passage rates over time. Specifically, the figure shows that after a brief increase in passage rates between 2011and 2013, the percentage of candidates passing the FAR section has declined most during our sample period.

FIGURE 3D
THE CPA EXAM PASSAGE RATES OF REG SECTION BETWEEN 2008 AND 2018

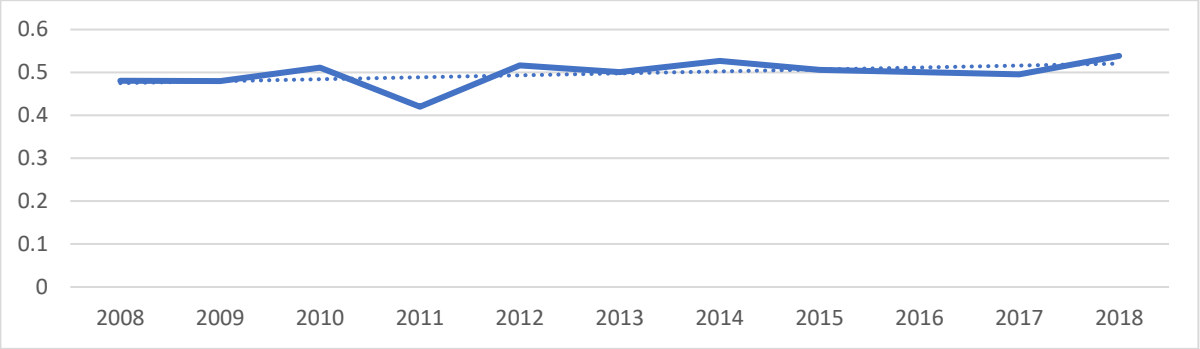


Figure 3d highlights our analysis of the REG section, illustrating a stable passage rate over time. Specifically, the figure shows that 50% of candidates pass the REG section and the percentage remains consistent over the two sample periods.

CONCLUDING REMARKS

This study uses localized data from the State of Texas to model CPA exam passage rates among different demographic groups. Overall, the passage rates of the CPA exam in the second sample period were higher than those of the first period, and the number of participants positively related to the passage rates. Our findings also show that while undergraduate candidates make up the majority of examinees, advanced degree and post-baccalaureate candidates have significantly higher passage rates. These results suggest that longer study time and deeper understanding (i.e. master's or Ph.D degrees in accounting) as well as non-curricular factors, such as maturity, determination (i.e., post-baccalaureate) and study habits, play a role in examinees' success. Additional field experience studies or professional mentorship programs may also benefit undergraduate accounting students in Texas. Furthermore, our results suggest that current accounting programs may need curriculum reforms to address underperformance and improve the quality of accounting education, especially in the areas of auditing, and financial accounting and reporting.

With the upcoming launch of the CPA Evolution exam in January 2024, candidates and educators face the challenge of transitioning to the new exam format. In light of this, our study on CPA passage rates during the last decade is both timely and important. By studying CPA passage rates and comparing performance across candidate groups, we hope to provide valuable insights into the performance of candidates taking the exam, identify knowledge gaps where candidates are struggling and where educational programs may be falling short, and assist in polish exam preparation strategies.

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