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## Occupational Licensing and Minority Participation in Professional Labor Markets

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### ABSTRACT

We examine the staggered adoption of additional educational requirements (“150-hour rule”) for Certified Public Accountants (“CPAs”) to understand the effects of occupational licensing on minority participation in professional labor markets. The 150-hour rule increased the educational requirement for CPAs from 120 to 150 credit hours, effectively adding a fifth year of study. We find a 13% greater entry decline following the requirement’s enactment for minority than nonminority CPA candidates. Our analyses of parental income and financial aid availability point to a socioeconomic status channel

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[Correction added on 13 March 2024, after online publication: A few sentences have been modified on pages 4 and 25 in the article.]

explaining the differential entry declines. Studying exam passing patterns, professional misconduct, and job postings we find a deterioration, or at best, no change in CPA quality following enactment.

**JEL codes:** J24, J44, K2, L51, M40, M41, M42

**Keywords:** occupational licensing; labor markets; CPAs; diversity and inclusion; regulatory capture; accounting quality

## 1. Introduction

Professional employers are increasingly mentioning diversity, equity, and inclusion objectives in their hiring practices and overall strategies (McKinsey [2020], WorldAtWork [2021], Choi et al. [2023]). However, minorities continue to be underrepresented in many high-paying occupations (Bureau of Labor Statistics [2021]). Such disparities attract significant public attention and call for research to understand their sources. In this paper, we investigate one commonly mentioned source: entry barriers associated with occupational licensing (House Committee on Education and the Workforce [2016], Nunn [2016]).

Licensing in many professions involves costly general education requirements. For example, those seeking to enter accounting, law, or medicine in the United States must first obtain a four-year undergraduate degree, with only limited conditions around specific courses taken.<sup>1</sup> Even if such education requirements are developed and enforced in a race-neutral way, they can have disparate effects depending on individuals' ability to afford college and forego income.

Although the United States provides educational aid in several forms, various caps and restrictions can still affect higher education enrollment at the margin (Dynarski [2003], Avery and Turner [2012]). Private borrowing and personal wealth then come into play. Borrowing against human capital is notoriously difficult (Becker [1962]), and many parents access private loans or take out second mortgages on behalf of their financially dependent children (Sun and Yannelis [2016]). Thus, given the nature of income and wealth inequality in the United States (Loury [2009], Bayer and Charles [2018], Chetty et al. [2020]), general education requirements can disproportionately reduce minority participation in licensed occupations.

An alternative view is that licensing can increase minority participation if it helps mitigate information asymmetries in credence good markets (Blair and Chung [2021]), for example, by providing a signaling device (Spence [1973]). As Law and Marks [2009] explain: "If uncertainty about worker quality gives rise to statistical discrimination over observable characteristics

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<sup>1</sup> Accountants generally obtain a business degree and complete just 30 credit hours of specific accounting coursework. Matriculating law school students are equally likely to have a degree in psychology, economics, or history (LSAC [2018]); English majors can enroll in medical school as long as they have passed a few science classes.

like sex or race, then licensing regulation that serves as an imprimatur of quality can increase the presence of minority workers in regulated occupations.” Law and Marks [2009] study U.S. Census data from 1870 to 1960 and find support for this view, though their findings have spurred controversy (Klein, Powell, and Vorotnikov [2012], Law and Marks [2012]). The Alliance for Responsible Professional Licensing, sponsored by professional associations of accountants, architects, and engineers, argues that “licensure creates a set of institutional mechanisms that enhance entry into a profession, particularly for historically disadvantaged groups” (p. 15, ARPL [2021]).

A key empirical difficulty surrounding this debate is that licensing requirements tend to be sticky, and few settings allow researchers to observe licensed individuals. To address this, we investigate the Certified Public Accountant (“CPA”) setting. State Boards of Accountancy maintain public databases of all CPAs and their license status. And every U.S. state has adopted, in a staggered pattern over the past 35 years, the “150-hour rule,” which requires the equivalent of a fifth year of general education (i.e., accounting courses are typically not required) at an accredited college or university. Obtaining funding for a fifth year can be difficult, and this burden as well as and the foregone income may disproportionately dissuade lower income students.<sup>2</sup>

We begin by identifying the race and gender of each CPA using that person’s name and Bayesian prediction algorithms trained on U.S. Census and Social Security Administration data.<sup>3</sup> These techniques assign a probability that each first name–last name pairing is associated with each race and gender, allowing us to classify CPAs as minority (Black and Hispanic) or nonminority (Asian and White) and male or female. Our classification scheme follows the standard in the inequality literature (Card and Krueger [2005], Campbell and Kaufman [2006], Fischer [2007]) and is based on historical wealth and income differences across groups (Social Security Administration [2023]). Although there is noise in these techniques, we take comfort in the significant distribution overlap between our sample and the American Institute of Certified Public Accountants’ (AICPA) member survey (ARPL [2021]).

Our primary objective is to evaluate the effect of the 150-hour rule on minority CPA entry. Our main tests model the number of individuals obtaining their CPA license each state-year in a generalized difference-in-differences design that controls for state and year fixed effects and

<sup>2</sup>In their theoretical analysis of the 150-hour rule, Lee, Liu, and Wang [1999] state: “The prediction (5) that some less wealthy post-rule CPA candidates who would otherwise enter the market will not do so under the Rule is consistent with the ALEC [American Legislative Exchange Council]’s claim that the number of minorities and lower income students entering the profession would decrease with the additional requirement” (p. 205).

<sup>3</sup>For other examples, see Ambekar et al. [2009], Imai and Khanna [2016], Karimi et al. [2016], Ellahie, Tahoun, and Tuna [2017], Dimmock, Gerken, and Graham [2018], Sood and Laohaprapanon [2018], Idan and Feigenbaum [2019], Card et al. [2020], Chernenko and Scharfstein [2022], Howell et al. [2021], and Egan, Matvos, and Seru [2022].

state-specific trends. Although we find an overall decline in entry similar to Jacob and Murray [2006] and Barrios [2022], the decline is uneven across groups. Specifically, there is a 26% decline for minority CPAs versus a significantly smaller 14% decline for nonminority CPAs. We then repeat our main tests within state-year, such that we compare the change in entry by minority and nonminority groups within the same state and year. Doing so abstracts away from the motives behind adoption and controls for time-varying common shocks affecting entry into the CPA profession in the state that year. We find a 13% greater drop in minority than nonminority entry following enactment.

We conduct a battery of robustness analyses to verify this finding. When we study minority CPA entry in event time, we find no preperiod difference between adopting and nonadopting states. We also explore neighboring state adoption and CPA mobility provisions, and find no indication that differences in avoidance behavior (e.g., relocating to another state to avoid the rule) explain our findings. Last, when we study accounting masters program graduation patterns using self-identified race data, we find a sizable postenactment drop in the share of minority graduates. Overall, our main findings are best explained by the 150-hour rule and not by confounding events, states' adoption motives, avoidance, or measurement error in our name assignment algorithm.

We then investigate the channel behind the differential entry decline. Our evidence best supports explanations rooted in socioeconomic differences across demographic groups. First, we find no statistical entry decline for Asians, whose average income and wealth are comparatively high. Second, following enactment, CPAs increasingly come from universities whose students have high parental income. Third, cross-sectional tests show that entry declines are concentrated in states offering the least financial aid. Moreover, the parental income and aid patterns are evident in both minority and nonminority subsamples, indicating that financing constraints influence how and for whom the 150-hour rule affects entry. Finally, our exhaustive review of media coverage of the rule and licensing restrictions in general reveals a recurring dialogue around socioeconomic barriers, and few references to other explanations for a disproportionate minority entry decline.

Next, we study how the 150-hour rule affects CPA tenure in the profession. We find the postrule cohort tenure increase is five months greater for minorities. The incremental difference accords with the signaling mechanism proposed in the literature (Law and Marks [2009], Blair and Chung [2021]).<sup>4</sup> However, this effect is far smaller and less robust than the 26% entry decline documented in our main results, suggesting that, although licenses may serve as a useful signal for some, the signal can be prohibitively costly.

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<sup>4</sup> Our assumption is that absent salary data, one can infer a license's value by measuring how long individuals remain in the profession.

Our final tests investigate potential benefits of the 150-hour rule by examining the quality and labor market perceptions of licensed CPAs. Although proponents often justify licensing on the grounds that it improves professional quality, theory offers competing predictions (Akerlof [1970], Stigler [1971], Leland [1979], Shapiro [1986]), and empirical investigation has been hindered by the lack of granular data on professional traits and behavior. Using university-level data on CPA exam performance, we study how the 150-hour rule affects the quality of the CPA pool (e.g., Larsen et al. [2020], Barrios [2022]). Passing the CPA exam involves achieving a score of 75 or above on four individual sections, and overall pass rates are rather low (below one-third in recent years). We evaluate the quality of the CPA pool based on how many individuals pass the exam on the first (high-quality) or subsequent (medium-quality) attempt each sitting.<sup>5</sup> After the 150-hour rule, the number of high-quality CPAs significantly declines, and the number of medium-quality CPAs significantly increases. Notably, the decline in high-quality CPAs is driven by candidates from universities with a larger share of minority students and less financial aid.

We then gather individual-level data on disciplinary actions involving CPAs (e.g., Vetter [2022]). Over their career, roughly 0.5% of CPAs face discipline for incidents and violations reported by their state. We conduct a textual analysis of disciplinary action descriptions to shed light on how the 150-hour rule affected various aspects of CPA behavior. Comparing the pre- and post-150-hour rule cohorts, we find no difference in the frequency of either administrative violations (e.g., failure to complete continuing professional education [CPE] requirements or pay dues) or more serious offenses including tax fraud, negligence in preparing financial statements, theft of funds or documents, or engaging in discreditable acts.

Last, we examine data from Atalay et al. [2020] containing over 8 million job postings from the *Boston Globe*, *New York Times*, and *Wall Street Journal* to investigate whether the 150-hour rule influenced employers' perceptions of CPA quality. We find no association between enactment and either the number of postings for accountants or employers' preference for candidates with the extra year of study. The 150-hour rule's implementation is pertinent to understanding our (null or worse) quality and labor market perception results: Most states did not require specific accounting or even business courses, leaving candidates free to choose the coursework they pursue to complete the extra 30 credit hours. Overall, our analyses of exam passing patterns, discipline records, and job postings find scant evidence of CPA quality benefits associated with the 150-hour rule.

Public accounting firms and other CPA employers are increasingly mentioning diversity and inclusion objectives in their hiring practices and overall strategies. Our contribution is to illustrate how the 150-hour rule

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<sup>5</sup> Those who fail the exam (low quality) do not affect the pool quality since passing is necessary for obtaining a license.

significantly reduces minority participation in the profession. These findings speak directly to longstanding debates over the rule. Darryl Matthews, president and CEO of the National Society of Black CPAs describes the rule as “not the only barrier, but it is a significant barrier” to increasing minority representation in the profession (Bloomberg [2021]). The AICPA’s website counters: “Education requirements have not created entry barriers in other professions that require graduate education... Minority students who plan to go on to graduate education will now be attracted to accounting” (AICPA [2020]).

We also add to the growing literature on the labor market for accountants (e.g., Bloomfield et al. [2017], Duguay, Minnis, and Sutherland [2020]). Work in this area explores the link between regulation-driven entry barriers to the profession and accounting quality (Cascino, Tamayo, and Vetter [2021], Barrios [2022], Vetter [2022]), which is relevant to the long literature on competition and audit quality (see DeFond and Zhang [2014] for a review). To our knowledge, our paper is the first to illustrate how licensing reduces entry through a socioeconomic status channel, which leads to fewer high-quality candidates entering the profession. This evidence is also relevant to broader ongoing discussions of accounting enrollment declines at U.S. colleges (Wall Street Journal [2022]).

Our study also advances the broader licensing literature. Blair and Chung [2019] examine entry into teaching, administrative work, and similar professions. Their main finding is that licensing reduces participation, more so for White than Black workers. Other work finds mixed evidence on how licensing affects minority entry (Law and Marks [2009], Klein, Powell and Vorotnikov [2012]).<sup>6</sup> One point of controversy in this literature surrounds empirical issues: (1) Extant work typically examines all employees in an occupation as a proxy because licensed individuals are not observable; (2) multiple occupations are studied at once; (3) much evidence is from the late 1800s–early 1900s, when laws and social norms differed considerably from today; and (4) licensing requirements are sticky. Our setting allows us to sidestep these empirical issues and offer new evidence on how and for whom licensing affects entry.

## 2. CPAs and the 150-Hour Rule

### 2.1 CPAS IN THE UNITED STATES

In most developed countries, entry into public accounting is controlled by occupational licensing. Occupational licensing is becoming an increasingly prevalent feature of U.S. labor markets: It affected just 5% of the

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<sup>6</sup> See also Bierstaker, Howe, and Seol [2005], who survey 600 students from one state about their intentions to enter the accounting profession after the 150-hour rule enactment. Their survey results suggest no deterrent effect for minorities, though they conclude “Further research is needed to determine if, with the inception of the 150-credit-hour rule, changes have occurred in the number of minorities and women taking the CPA exam” (p. 104).

workforce in the 1950s but 25% today (BLS [2021]).<sup>7</sup> There are over 500,000 CPAs in the United States, making public accounting one of the largest licensed occupations. Licensed CPAs can issue opinions on audited, reviewed, or compiled financial statements.

The AICPA is the professional organization of U.S. CPAs. It advocates on behalf of CPAs in rule-making, develops standards for private company audits and other CPA services, creates and grades the CPA exam, and enforces compliance with the profession's technical and ethical standards. Individual state accounting boards are tasked with implementing their state's education requirements and oversee license issuance, renewal, quality reviews, and disciplinary actions.<sup>8</sup>

To obtain a CPA license, one must satisfy the educational, exam, and work experience requirements established by the board of accountancy in their state. In terms of education, one must obtain a bachelor's degree and complete a minimum number of accounting-related courses. Most states require between 24 and 36 semester hours of accounting coursework; many also require additional coursework in business-related topics, including auditing, cost accounting, law, tax, math, and ethics. Educational requirements continue after becoming a CPA, as individuals must complete 40 hours of CPE annually, including several hours of ethics-related training.<sup>9</sup>

The Uniform CPA exam is administered by the AICPA. The exam is uniform in that it is the same in all states each period. Passing the exam requires achieving a score of 75 or higher on each of the following four sections: auditing and attestation (AUD), financial accounting and reporting (FAR), regulation (REG), and business environment concepts (BEC). Those failing a given section can retake that section while retaining credit for sections they have passed for 18 months. The pass rate on the individual sections typically ranges from 45% to 55%, and roughly 10% to 15% of exam takers pass all sections on the first attempt.

Satisfying the educational requirements, passing the Uniform CPA exam, gaining work experience (if required by the state), and paying dues entitles one to a CPA license. After becoming a CPA, one must pay dues (approximately \$200 per year) to the State Board of accountancy to keep the license active. CPAs are also subject to a professional code of conduct and can have their license suspended or revoked for failing to complete CPE requirements, fraudulently obtaining or renewing their license,

<sup>7</sup> The theoretical arguments surrounding licensing are expounded elsewhere. Rather than repeat them, we refer the interested reader to Akerlof [1970], Stigler [1971], Leland [1979], Peltzman [1984], and Becker [1986].

<sup>8</sup> State accounting board members are typically appointed by the governor and can include both CPAs and members of the public.

<sup>9</sup> See <https://www.nasbaregistry.org/cpe-requirements> for an overview. Ethics training is required in other professions, including law, medicine, and financial advising (see Kowaleski, Sutherland, and Vetter [2020]).

**TABLE 1**  
*150-Hour Rule Adoption*

Year	State
1983	Florida
1993	Tennessee
1994	Utah
1995	Alabama, Mississippi
1996	Louisiana
1997	Kansas, Montana, South Carolina, Texas
1998	Arkansas, Georgia, Nebraska, South Dakota
1999	Maryland, Missouri, Rhode Island
2000	Connecticut, District of Columbia, Guam, Idaho, Indiana, Kentucky, New Jersey, North Dakota, Ohio, Oregon, Puerto Rico, Washington, West Virginia, Wyoming
2001	Alaska, Hawaii, Illinois, Iowa, Nevada, North Carolina, Wisconsin
2002	Massachusetts
2003	Maine, Michigan, Oklahoma
2004	Arizona, New Mexico
2006	Minnesota, Virginia
2009	New York
2011	Pennsylvania
2012	Delaware
2014	California, New Hampshire, Vermont
2015	Colorado

This table provides a timeline for states' adoption of the 150-hour rule.

performing attestation services for an unlicensed firm or under an expired license, being suspended or barred from specific activity by the Securities and Exchange Commission or Internal Revenue Service, or engaging in “discreditable acts.”

## 2.2 THE 150-HOUR RULE

In 1988, the AICPA voted to require all new members to complete 150 credit hours of college education. The AICPA has offered several justifications for the expanded requirements, including “significant increases in official accounting and auditing pronouncements and the proliferation of new tax laws,” “business methods have become increasingly complex,” and “more sophisticated approaches to auditing now in use” (AICPA [2003, 2020]).

State Boards of Accountancy had discretion over when to enact the 150-hour rule. Starting with Florida in 1983, states began increasing the education requirement for CPAs from 120 to 150 credit hours. Table 1 provides a list of adoption years. Tennessee followed Florida in 1993, and by 2015 all states and territories had adopted the rule. Most states had grandfathering provisions that allowed candidates failing one or more exam section before the rule’s enactment to retake the exam within 18 months without completing the extra 30 credit hours (Carpenter and Stevenson [2006]). The increase effectively required an additional year of

university education to obtain a CPA license. Most states adopting the 150-hour rule did not impose specific education requirements, for example, by requiring additional accounting, auditing, or tax courses. This aspect of the rule has attracted controversy (Jacob and Murray [2006]).

State Boards of Accountancy enforce their educational requirements in several ways. First, to practice as a CPA in a given state, one must meet that state's licensing requirements, including educational requirements. Practicing without a valid license in one state can lead to financial sanctions and suspension of one's licenses from other states. Second, some states only permit residents to sit for the CPA exam. Third, although most states maintain mobility policies that permit CPAs from elsewhere to practice there (Cascino, Tamayo, and Vetter [2021]), those obtaining their license through a mobility provision typically have to first meet the state's own educational standards (Cumming and Rankin [1999]). Thus, avoiding the 150-hour rule during our sample period entailed relocating to another state or operating without the full rights granted by a CPA license in the home state. We consider the potential implications of avoidance for our analysis in section 4.3.1.

### 3. *Sample and Summary Statistics*

#### 3.1 CPA PROFILES

We collect data from the National Association of State Boards of Accountancy (NASBA) centralized repository, which compiles publicly available CPA license data from State Boards of Accountancy. Each profile contains the CPA's name, address, state of licensure, license number, license status, issue and expiration date, and records for enforcement, noncompliance, and disciplinary actions. CPAs may provide a business or personal address, and roughly 20% of profiles have missing addresses.<sup>10</sup> Record keeping issues in several states prevent us from identifying CPAs entering before 1986. Figure A.3 provides an example profile.

To predict the race and gender for each CPA, we apply, among other algorithms, Bayesian prediction techniques using the same software as related work.<sup>11</sup> In total, we use three software packages and eight approaches using different training data and criteria to assign CPAs to races, and one software package to assign CPAs to genders. The race categories for these approaches include Asian, Black, Hispanic, and White, and the gender categories are female and male. Each approach produces a probability that the first name–last name pairing is associated with each race and gender.

<sup>10</sup> Profiles contain only current addresses, preventing us from studying where an individual lived or worked when that person obtained the license.

<sup>11</sup> For other work using these techniques and software packages, see Imai and Khanna [2016], Karimi et al. [2016], Sood and Laohaprapanon [2018], Idan and Feigenbaum [2019], and Card et al. [2020].

There is no consensus in the literature as to which approach is superior. We therefore assign CPAs as follows. First, we choose the race predicted by the approach with the greatest confidence, based on having the largest probability difference between the first and second guess. Thus, the race assignment approach we choose from the eight available can differ across CPAs in our sample. Second, we eliminate CPAs whose first guess probability is less than 50%. Third, we eliminate CPAs where the probability difference between the first and second guess is less than 20%. We note, however, that 93.5% of first name–last name pairings produce an unambiguous prediction, so the two latter steps have little effect on our sample. In fact, following these three assignment steps, our final sample contains 99.8% of our original sample, versus as little as 73.3% if we were to choose one of the eight standalone approaches.

Section A of our appendix reports a battery of validation checks and sensitivity analyses for our assignment algorithm. To summarize, we first randomly select a subset of CPAs and compare their predicted race to the race identified from photos provided on their professional networking website profiles. We then calculate classification measures widely used in the literature (precision, recall, and F-score), and find our assignment produces classification statistics that compare favorably to those reported in related work (e.g., Ambekar et al. [2009], Imai and Khanna [2016], Sood and Laohaprapanon [2018]).

Second, like other name-based assignment approaches, ours inevitably includes some degree of measurement error. In general, measurement error will lead to attenuation in the *Post* coefficient in our specification described in section 4.1. However, a key feature of our estimation is the comparison of entry rates across groups before versus after a rule change. Then differences in measurement error over time become important. Thus, we conduct statistical tests comparing the accuracy across the pre- and post-150-hour rule CPAs. Table A.4 reports no statistical difference in accuracy for minority CPAs or nonminority CPAs.

### 3.2 SAMPLE CONSTRUCTION AND SUMMARY STATISTICS

Table 2, panel A, describes our sample construction. We observe the necessary license issue dates for all states, except Hawaii and Wisconsin. Our initial sample includes CPAs with active licenses between 1986 and 2019 in the remaining states. We observe 535,067 profiles for U.S. individuals.<sup>12</sup> There are 3,274 profiles for which we cannot predict the individual's race with sufficient confidence. We also eliminate 20,146 profiles from states with fewer than 10 new licenses per year. Doing so provides a usable sample for our analyses of minority CPAs. (States with under 10 new licenses

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<sup>12</sup>We eliminate profiles containing foreign addresses, because we cannot identify the appropriate state, and eliminate duplicate profiles arising from individuals transferring their license to another state.

**TABLE 2**  
*Sample and Summary Statistics*

Panel A: Sample						
All U.S. CPAs 1986-2019	535,067					
Drop CPAs missing race or gender prediction	(3,274)					
Drop CPAs from state-years with <10 new licenses	<u>(20,146)</u>					
Final Sample	511,647					
Panel B: Summary statistics						
	Mean	Std Dev	0.25	0.50	0.75	N
Asian	0.10	0.29	0.00	0.00	0.00	511,647
Black	0.02	0.12	0.00	0.00	0.00	511,647
Hispanic	0.03	0.18	0.00	0.00	0.00	511,647
White	0.86	0.35	1.00	1.00	1.00	511,647
Female	0.45	0.50	0.00	0.00	1.00	511,647
Length in profession	17.03	9.37	9.00	15.00	25.00	399,627
> 5 years in profession	0.90	0.30	1.00	1.00	1.00	399,627
> 15 years in profession	0.54	0.50	0.00	1.00	1.00	399,627
Disciplinary action (%)	0.54	7.35	0.00	0.00	0.00	388,200

This table describes our sample construction (panel A) and provides summary statistics (panel B). The unit of observation is individual. See figure 3 for variables definitions.

commonly have zero new minority CPAs.)<sup>13</sup> We use our final sample of 511,647 CPA profiles to construct a balanced state-year panel with 1,224 observations between 1986 and 2019 for our entry tests.<sup>14</sup> Table B.1 in appendix B presents the distribution of our CPA sample by state and year.<sup>15</sup>

Table 2, panel B, describes our sample. We classify 85.6% of the CPAs as White, 9.5% as Asian, 3.3% as Hispanic, and 1.5% as Black. Thus, 95% of the sample is comprised of nonminority CPAs (Asian or White) and 5% of minority CPAs (Black or Hispanic). Forty-five percent of CPAs are female. These figures closely resemble those based on CPA-reported survey responses gathered by the NASBA, the AICPA, and the Current Population Survey (ARPL [2021]). These organizations report that 84% of CPAs are White, 10% are Asian, 2% are Black, 5% belong to the ambiguous “other” category, and 48% are female.

We measure *Length in Profession* as the number of years between the CPA obtaining their license and when the license becomes inactive. For active

<sup>13</sup> Not employing this sample restriction or imposing higher thresholds (e.g., 25 licenses) does not alter our inferences.

<sup>14</sup> Our final sample omits all CPAs from Colorado, Delaware, Hawaii, Montana, Nebraska, North Dakota, Oklahoma, Pennsylvania, South Dakota, Utah, Vermont, West Virginia, Wisconsin, and Wyoming. During at least part of our sample period, these states do not have license issue dates, do not have at least 10 entries per year, do not provide sufficient address information required to identify the CPA’s current state, or multiple of the above.

<sup>15</sup> The distribution of observations across states and years is highly similar to the distribution of exam passers reported by the NASBA.

CPAs, we use the last year of our sample. The average (median) CPA participates in the profession for 17 (15) years.<sup>16</sup> Ninety (54) percent of CPAs participate more than five (15) years. We also collect data on disciplinary actions, when available.<sup>17</sup> Of the 388,200 CPAs licensed in states with disciplinary action data, 0.54% have a disciplinary record detailing at least one incident or violation. Appendix C describes and validates the discipline data.

## 4. Main Results

### 4.1 RESEARCH DESIGN

We model the number of new CPAs each state-year using the following generalized difference-in-differences estimation.

$$y_{st} = \alpha_s + \alpha_t + Post_{st} + \alpha_s \times t + \varepsilon_{st}. \quad (1)$$

The unit of observation is state-year, where  $s$  indexes states and  $t$  indexes years. The dependent variable is *Entries*, the log of one plus the number of CPAs obtaining their license in that state-year. We control for state fixed effects ( $\alpha_s$ ) to account for time-invariant factors affecting entry in each state including its size and industry base. We control for year fixed effects ( $\alpha_t$ ) to account for nationwide developments affecting entry, including overall economic conditions as well as securities laws and federal tax policy.  $Post_{st}$  is an indicator variable for years after the state enacts the 150-hour rule.  $\alpha_s \times t$  is a state-specific trend, which accounts for each state's growth in the number of new CPAs during our sample period. This trend is not absorbed by the state or year fixed effects because of the staggered enactment. We cluster standard errors by state. Intuitively, our specification is a generalized difference-in-differences estimation, where the *Post* coefficient reports the entry difference between adopting and nonadopting states within a year.

### 4.2 RESULTS

Table 3 presents the results. Column 1 finds a 14.4% decline in the number of new CPAs, similar to Barrios [2022]. The focus of our paper, however, is on the effects across demographic groups. Column 2 finds minority (Black or Hispanic) CPA entry declines by 26.0% more in states that have enacted than those that have not (yet) enacted, whereas column 3 finds just a 14.0% relative decline for nonminority (Asian or White) CPAs.

<sup>16</sup>We report statistics for the sample in our table 7 estimation. Our sample is smaller than for our other variables, because Arizona and Kansas do not provide license expiration dates for all CPAs, and we limit the estimation sample in these tests to cohorts for which we have both treated and untreated CPAs to mitigate censoring concerns.

<sup>17</sup>Beyond the states omitted from our main sample, Alabama, Arizona, California, Idaho, Kansas, Maryland, and Minnesota do not provide disciplinary action data, disciplinary action descriptions that allow us to categorize types of misconduct, or data to construct the control variables in our disciplinary action regressions.

**TABLE 3**  
*150-Hour Rule and Entry*

	(1)	(2)	(3)
	Log Entries		
	All	Minority	Nonminority
<i>Post</i>	-0.144*	-0.260***	-0.140*
	(0.071)	(0.083)	(0.072)
Difference in coefficients (col 3 – col 2)		0.120**	
State FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
State trend	Yes	Yes	Yes
Observations	1,224	1,224	1,224
Adjusted $R^2$	0.940	0.891	0.939

This table models entry using our CPA license sample and equation (1). The unit of observation is state-year. The dependent variable is *Log Entries*, the log of one plus the number of new CPAs that state-year. *Post* is an indicator for years after the state has adopted the 150-hour rule. The sample is limited to the group labeled in each column. Minority (Nonminority) CPAs include Black and Hispanic (Asian and White) CPAs. See figure 3 for variables definitions. Reported below the coefficients are standard errors clustered at the state level. \*, \*\*, \*\*\* indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively. Significance levels for coefficient differences are based on Wald tests.

(The difference in *Post* coefficients is significant at the 3% level based on Wald tests.)

Figure 1 presents an event study plot based on a piecewise version of equation (1). The benchmark period is  $t > 4$  (greater than four years before enactment). For the full sample of CPAs (panel A) and minority CPAs (panel B), entries vary little up until two years before enactment ( $t = -2$ ) (i.e., trends are parallel). In  $t = -1$ , entries increase for the full sample, consistent with the rule enticing entry before enactment (typically states announced adoption more than a year before enactment). After enactment we observe a sustained and significant decline in CPA entries.<sup>18</sup> Notably, there is no pretrend for minority CPAs (in panel B, the coefficients for  $t = -2$  and  $t = -1$  are positive and insignificant), alleviating concerns that concurrent events drive the minority entry decline we find in the *Post* period. We are unaware of other developments that would explain parallel entry trends in the pre-enactment period, bunching prior to the enactment, and a sustained entry decline thereafter.

We also investigate issues with heterogeneous treatment effects in staggered estimations such as ours (Sun and Abraham [2020], Baker, Larcker, and Wang [2022], Barrios [2021], Goodman-Bacon [2021]). Because the literature has yet to converge on a single diagnostic or solution, we conduct a series of tests that consider different trend specifications, samples, and corrections. Table D.1 shows that our inference of a greater decline in minority CPA entry is robust to controlling for time trends in different

<sup>18</sup> Interpreting the coefficient for the enactment year ( $t = 0$ ) is difficult because roughly half of states adopt the rule midway through the year or later.

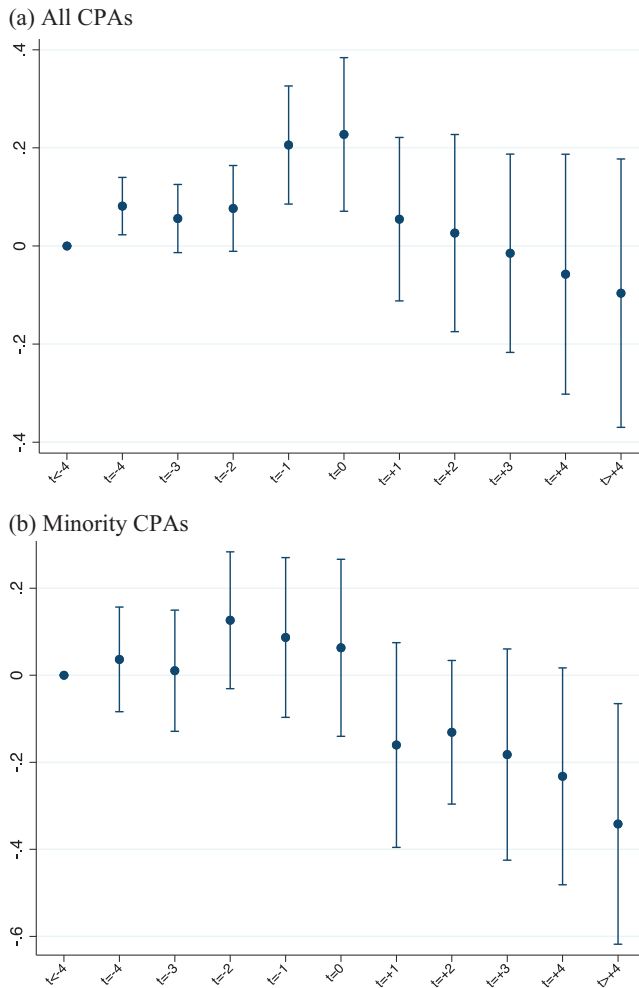


FIG. 1.—Event study plots. This figure plots the coefficients from estimating a piecewise version of equation (1) using event year indicators. The dependent variable is *Log Entries*, the log of one plus the number of new CPAs that state-year. The lines plot 95% level confidence intervals. The benchmark period is event years  $t < -4$ , where  $t = 0$  refers to the year of 150-hour rule enactment in the state.

ways, limiting the sample to states that switch from control to treatment during our sample window, and limiting the sample to pre-2006 observations, such that we have a group of not-adopting states as controls. Moreover, figures D.1 and D.2 present event study plots based on the Sun and Abraham [2020] and Callaway and Sant’Anna [2020] corrections. Once again we find a starker decline for minority CPAs beginning only after enactment.

To help further quantify our results, we estimate how many minority CPAs would have entered the profession if not for the rule, as follows. We

use 2000 as the base year and the  $-0.26$  coefficient from table 3, column 2, as the estimated decline in minority CPAs (26%) from this base year over the subsequent 10 years. We estimate that without the rule there would be 1,390 more minority CPAs over a 10-year period. For context, in a typical year in the early 2000s, there were roughly 700 minority CPAs entering the profession. Because we only consider 10 years and do not evaluate knock-on effects from mentoring affecting minority entry (e.g., Kofoed [2019]), our estimates are likely conservative. Although estimating counterfactuals involves assumptions and we abstract away from general equilibrium effects, this evidence suggests the 150-hour rule had an economically meaningful effect on the demographic composition of the CPA occupation.

### 4.3 ROBUSTNESS

We then evaluate the robustness of our main result to (1) alternative specifications and (2) alternative approaches to identifying minority CPAs. The first set of robustness analyses model entry using the following within state-year estimation.

$$y_{dst} = \alpha_{st} + \alpha_{ds} + \alpha_{dt} + Post_{st} \times Minority_d + \varepsilon_{dst}. \quad (2)$$

The unit of observation is demographic group-state-year, where  $d$  indexes demographic groups (the two groups are minority and nonminority CPAs),  $s$  indexes states, and  $t$  indexes years. The dependent variable is *Entries*, the log of one plus the number of CPAs obtaining their license in that state-year for each demographic group. As before,  $Post_{st}$  is an indicator variable for years after the 150-hour rule is enacted, and  $Minority_d$  is an indicator for observations from minority groups.

We fully saturate our model with the following fixed effects. We control for state-year fixed effects ( $\alpha_{st}$ ) to account for time-varying factors affecting 150-hour rule adoption and economic shocks affecting overall entry into the CPA occupation in the state that year (i.e., shocks having a common effect on all demographic groups).  $\alpha_{ds}$  are indicators for each pairing of a demographic group and state and account for time-invariant differences across states in the number of new CPAs in each demographic group.  $\alpha_{dt}$  are indicators for each demographic groupbyyear, such that we control for nationwide entry changes for each group over time, and how each group responds to nationwide economic conditions within a year. Effectively, this estimation compares the change in entry for minority and nonminority groups in the same state at the same time.<sup>19</sup> We cluster standard errors by state.

*4.3.1. Alternative Specifications and Avoidance.* Our first robustness tests assess the sensitivity of our results to alternative specifications (table 4,

<sup>19</sup> Our inferences are similar if our specification instead analyzes the minority share of CPAs in the state, or uses a weighted least squares or Poisson estimation.

**TABLE 4**  
*Specification Robustness and Avoidance*

Panel A: Specification robustness				
	(1)	(2)		(3)
		Log Entries		
	Full Sample	Drop t-1 to t+1	Exclude Asian	
Post × Minority	-0.131** (0.056)	-0.176*** (0.064)	-0.138** (0.056)	
State × Year FE	Yes	Yes	Yes	
State × Demographic FE	Yes	Yes	Yes	
Demographic × Year FE	Yes	Yes	Yes	
Observations	2,448	2,448	2,448	
Adjusted R <sup>2</sup>	0.980	0.981	0.979	
Panel B: Exploring avoidance				
	(1)	(2)	(3)	(4)
		Log Entries		
	Full Sample	Full Sample	Full Sample	No Mobility
Post × Minority	-0.133** (0.057)	-0.133** (0.058)	-0.131** (0.056)	-0.131** (0.056)
Not All Neighbors × Minority	-0.032 (0.058)			
Post First Neighbors × Minority		0.034 (0.068)		
Mobility × Minority			0.018 (0.079)	
State × Demographic FE	Yes	Yes	Yes	Yes
Demographic × Year FE	Yes	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes	Yes
Observations	2,448	2,448	2,448	2,448
Adjusted R <sup>2</sup>	0.980	0.980	0.980	0.980

This table models entry using our CPA license sample and equation (2). Panel A explores alternative specifications or samples, and panel B evaluates avoidance of the 150-hour rule. The unit of observation is state-group-year, where a group is defined as a demographic group (minority or nonminority). The dependent variable is *Log Entries*, the log of one plus the number of new CPAs that state-group-year. *Post* is an indicator for years after the state has adopted the 150-hour rule. *Minority* is an indicator variable equal to one for Black and Hispanic CPAs. *Not All Neighbors* is an indicator for years where at least one neighboring state has not yet adopted the rule. *Post First Neighbor* is an indicator for years after any neighboring state has adopted the rule. *Mobility* is an indicator for years after the state has adopted the CPA mobility provisions. Panel A, column 2, eliminates observations from the year before to year after the state has adopted the 150-hour rule. In panel A column 3, the benchmark group (Nonminority) is comprised only of White CPAs. Panel B, column 4, limits the sample to before 2006, when many states began enacting mobility provisions, and excludes Ohio and Virginia, which enacted mobility provisions in 1960 and 1999, respectively. See figure 3 for variables definitions. Reported below the coefficients are standard errors clustered at the state level. \*, \*\*, \*\*\* indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively.

panel A) and explore whether individual avoidance of the 150-hour rule can explain our main findings (panel B).

Table 4, panel A, presents the results from estimating equation (2). In column 1, we find a 13.1% greater drop in entry for minority than nonminority CPAs. Column 2 eliminates the year before, year of, and year after adoption to avoid complications associated with anticipation and

selection around adoption dates (e.g., Ashenfelter [1978]) or grandfathering policies.<sup>20</sup> Column 3 includes only White CPAs in the nonminority benchmark group (i.e., we omit Asian CPAs). In both columns 2 and 3, the  $Post \times Minority$  interaction term remains significantly negative.

We also consider whether states' adoption decisions could confound our estimation. Roberts and Kurtenbach [1998] and Colbert and Murray [2013] find adoption timing is associated with the political power of CPAs (e.g., Stigler [1971]), as measured by the percentage of State Board of Accountancy members who are CPAs. In appendix table E.1, we extend their analyses by including a larger set of states and adding covariates measuring recent corporate fraud in the state, macroeconomic and labor market conditions, and the political party controlling the legislature and governorship. Similar to prior work, we find the main adoption driver is the political power of CPAs.<sup>21</sup> We find little role for economic or labor market variables that could explain why minority entries decline so starkly after the 150-hour rule is enacted. Likewise, we find no evidence that recent corporate fraud in the state is important to adoption timing.

As we discuss in section 2.2, State Boards of Accountancy enforce educational requirements in several ways, including by mandating that practicing CPAs meet these requirements, regardless of where they initially studied. Nevertheless, enforcement may be imperfect, and one resulting concern is that individuals moving from one state to another to avoid the rule could contribute to our results. We investigate this possibility in several ways, while noting that any avoidance behavior would have to be concentrated in minority CPAs to affect our main inferences.

First, we introduce interaction terms that measure whether a neighboring state has enacted the 150-hour rule. A practical avoidance strategy would be to obtain a license and work in a neighboring state, because transportation costs would be low. As an example, suppose a prospective CPA in New Jersey (enacted the 150-hour rule in 2000) could find a way to obtain a CPA license in New York (2009) and then work as a CPA in New York. To evaluate this, we measure *Not All Neighbors*, an indicator for whether any adjacent state has yet to enact, and *Post First Neighbor*, an indicator for whether any adjacent state has enacted.<sup>22</sup> We expect interactions between *Minority* and either indicator to be significant under an avoidance interpretation. However, columns 1 and 2 of table 4, panel B, show insignificant interaction terms, whereas the  $Post \times Minority$  coefficient is virtually identical to our original finding.

<sup>20</sup> For example, most states allowed candidates failing an exam section before the rule's enactment to retake the exam within 18 months without completing the extra 30 credit hours (Carpenter and Stevenson [2006]).

<sup>21</sup> Ball [2009] explains, "the political process that creates and monitors regulation tends to be captured by the regulated industry and organized special-interest groups, so it typically does not promote general social welfare" (p. 279).

<sup>22</sup> The mean value of *Not All Neighbors* (*Post First Neighbor*) is 0.59 (0.64).

Second, CPA mobility provisions matter to our setting, because they could allow candidates obtaining their license elsewhere to practice in the state. States adopted CPA mobility provisions in a staggered pattern, starting in 2006 (Cascino, Tamayo, and Vetter [2021]). A few states with mobility provisions do not require CPAs from elsewhere to meet their own requirements (including educational requirements). Therefore, in column 3, we add an interaction  $Mobility \times Minority$  to control for whether the state has adopted the mobility rule as of that year. Our results for  $Post \times Minority$  are virtually identical to our original findings, and the  $Mobility \times Minority$  interaction is statistically and economically insignificant. In column 4, we limit our sample to before 2006 (when many states began enacting mobility provisions) and exclude Ohio and Virginia, which adopted mobility provisions in 1960 and 1999, respectively. We continue to find a greater entry decline for minority CPAs.

*4.3.2. Name Assignment-Free Estimation.* One potential concern with our main results is that they rely on inferring races from names. Despite our best efforts to implement our assignment algorithm to reduce measurement error and our examination of alternative approaches, evaluating data with actual rather than inferred races (“assignment-free” data) is worthwhile to verify our findings.<sup>23</sup>

We collect data from the Integrated Postsecondary Education Data System (“IPEDS”) on the number of masters program graduates from each university program, dating back to 1995. For a given school, we can observe the number of students graduating with an accounting major. IPEDS tabulates the number of graduates by demographic group, based on individual students’ *self-identified race*. Not all masters graduates become CPAs, and not all CPAs complete a masters program. However, masters programs (especially Masters of Accounting programs) are very common choices for CPAs to fulfill the extra 30 credit hour requirement.

Table A.5 in appendix A models the log of one plus the number of masters graduates as a function of our *Post* variable, and year and university fixed effects. Columns 1–4 limit the sample to accounting graduates, whereas column 5 includes accounting and finance graduates. Column 1 shows that the number of accounting graduates increases after the 150-hour rule’s enactment, consistent with many students pursuing masters degrees to fulfill the new requirement. However, in line with our main results, the increase is unequal across groups: Columns 2 and 3 show a 35.4% increase for nonminority students, versus just an 8.3% increase for minority students. Likewise, column 4 performs a stacked estimation with  $university \times year$  and  $university \times group$  fixed effects, and finds the share

<sup>23</sup>In terms of alternative approaches, we limit our sample to cases where every available approach of the eight we consider produce an identical predicted race, and exclude female CPAs from our sample given the convention of changing surnames at marriage could confound our name-based assignment. In both cases, our main results remain.

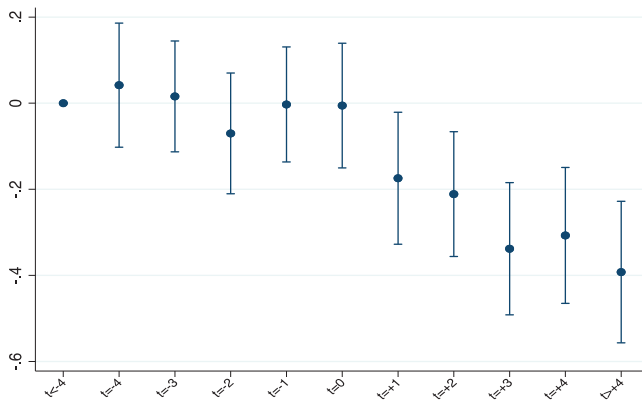


FIG. 2.—Masters program graduates. This figure plots the coefficients for  $Event\ Year \times Minority$  from a piecewise version of our table A.5, column 4, analysis. The dependent variable is *Log Graduates*, the log of one plus the number of graduates from a university-degree type-group that year, where a group is defined as a demographic group (minority or nonminority). The lines plot 95% level confidence intervals. The benchmark period is event years  $t < -4$ , where  $t = 0$  refers to the year of 150-hour rule enactment in the state.

of minority graduates is 27.1% lower after enactment. Figure 2 presents an event study plot based on column 4, and shows a parallel trend before the 150-hour rule and a sustained minority share decline thereafter.

Finally, in column 5, we use finance masters students as a control group that faces similar labor market conditions but is not subject to the 150-hour rule. Reinforcing our column 4 inference, the triple interaction term indicates that the 150-hour rule more adversely affected minority candidates.<sup>24</sup> Overall, these assignment-free analyses indicate that our evidence of a large decline in minority CPA entry does not stem from measurement error in our name assignment approach.

### 5. Why Does the 150-Hour Rule Reduce Minority Entry?

In this section, we develop cross-sectional and other evidence to understand the mechanism behind our main results.

First, we examine how the 150-hour rule affects the socioeconomic composition of the profession. To approximate socioeconomic composition, we collect undergraduate affiliation information from the professional networking websites of a subsample of our CPAs, and match this to the IPEDS data set covering average parental income at undergraduate institutions. We then aggregate the parental income measure to the state-year level, such that we measure average parental income for the CPAs entering the profession that state-year.

<sup>24</sup> Our sample size declines from column 4 due to the large number of singletons.

**TABLE 5**  
*Socioeconomic Status, the 150-Hour Rule, and Entry*

Panel A: Parental income		
	(1)	(2)
	Log Parental Income	
	All	Nonminority
Post	0.030*** (0.009)	0.021** (0.008)
State FE	Yes	Yes
Year FE	Yes	Yes
State Trend	Yes	Yes
Observations	1,054	1,052
Adjusted $R^2$	0.901	0.939
Panel B: Entry and financial aid		
	(1)	(2)
	Log Entries	
	Minority	Nonminority
Post $\times$ Low Financial Aid	-0.397*** (0.102)	-0.219** (0.086)
Post $\times$ High Financial Aid	-0.130 (0.116)	-0.066 (0.104)
$p$ -value for Interaction Difference	0.093	0.266
State FE	Yes	Yes
Aid-Year FE	Yes	Yes
State Trend	Yes	Yes
Observations	1,224	1,224
Adjusted $R^2$	0.890	0.939

This table examines the interaction between the 150-hour rule, CPA entry, and socioeconomic status. The unit of observation is state-year. The dependent variable in panel A is the log average parental income at CPAs' undergraduate institutions. The dependent variable in panel B is *Log Entries*, the log of one plus the number of new CPAs that state-year. *Post* is an indicator for years after the state has adopted the 150-hour rule. *Low Financial Aid* (*High Financial Aid*) is an indicator for states with below (above) median financial aid. The sample is limited to the group labeled in each column. Minority (Nonminority) CPAs include Black and Hispanic (Asian and White) CPAs. Panel A uses our parental income sample, whereas panel B uses our CPA license sample. See figure 3 for variables definitions. Reported below the coefficients are standard errors clustered at the state level. \*, \*\*, \*\*\* indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively. Significance levels for coefficient differences are based on Wald tests.

Column 1 of table 5, panel A, shows that following enactment, CPAs increasingly come from universities where students have high parental income. To illustrate the economic magnitude, suppose that in each pre-enactment year in a given state there are 100 new CPAs coming from families with an income of \$50,000. For context, in 1990, undergraduate institutions' average parental income was \$49,226 and the standard deviation was \$4,635. Then, the 3% coefficient in column 1 is equivalent to 10 of the 100 new CPAs now coming from families with income of \$65,000 after the state enacts the rule, or five of the 100 new CPAs now coming from families with income of \$80,000. Column 2 limits the CPA subsample to nonminor-

**TABLE 6**  
*Cross-Sectional Evidence on Entry*

	(1)	(2)	(3)		(4)	(5)
	Minority Female	Minority Male	Log Entries		Nonminority Male	Asian
Post	-0.201** (0.076)	-0.237*** (0.068)	-0.123* (0.063)	-0.151* (0.083)	-0.114 (0.088)	
State FE	Yes	Yes	Yes	Yes	Yes	
Year FE	Yes	Yes	Yes	Yes	Yes	
State Trend	Yes	Yes	Yes	Yes	Yes	
Observations	1,224	1,224	1,224	1,224	1,224	
Adjusted $R^2$	0.851	0.853	0.936	0.930	0.922	

This table models entry using our CPA license sample and equation (1). The unit of observation is state-year. The dependent variable is *Log Entries*, the log of one plus the number of new CPAs that state-year. *Post* is an indicator for years after the state has adopted the 150-hour rule. The sample is limited to the CPAs labeled in each column. Minority (Nonminority) CPAs include Black and Hispanic (Asian and White) CPAs. See figure 3 for variables definitions. Reported below the coefficients are standard errors clustered at the state level. \*, \*\*, \*\*\* indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively.

ity CPAs and finds a similar pattern, providing additional support for the socioeconomic status channel.

Our second test examines how the 150-hour rule interacts with the financial aid offered by individual states. We create an indicator for *High Financial Aid* and *Low Financial Aid* based on whether the state's financial aid per student to GDP per capita in 1995 falls above or below median (aid data are only available starting in 1995). The financial aid data come from the National Center of Science and Engineering Statistics.<sup>25</sup> Column 1 of table 5, panel B, shows the minority entry decline is driven by states where less aid is offered (only the *Post*  $\times$  *Low Financial Aid* interaction is significant, and it is statistically distinct from the *Post*  $\times$  *High Financial Aid* interaction at the 10% level). Column 2 repeats this test for the nonminority subsample and finds a similar pattern: Statistically, entries decline only in states with low affordability. Similar to our parental income evidence, this finding indicates that socioeconomic differences are the primary drivers of the differential entry decline across minority and nonminority CPAs.

Third, table 6 repeats our main results by demographic group.<sup>26</sup> If the entry declines stem from the additional year of university and foregone wages complicating plans to start a family, then we should find far starker declines for female than male CPAs. However, columns 1–4 show the opposite pattern: For both minority and nonminority CPAs, the decline is slightly greater for men. Thus, we find little support for explanations based on the 150-hour rule disrupting candidates' plans to start a family. And, when we

<sup>25</sup> One limitation of our tests is that an individual can obtain their license in a different state than where they obtain aid and attend university. Such cases introduce measurement error that, in general, makes it more difficult to detect an interaction between the 150-Hour Rule and aid.

<sup>26</sup> To ease comparison, we use the same specification as in table 3, but we verify our inferences are the same using the table 4 specification.

study Asian CPAs, we once again find evidence in favor of a socioeconomic status channel. In the United States, Asians are among the highest earning demographic groups, but are frequently the targets of animus and discrimination. Column 5 shows an insignificant entry decline for Asian CPAs following the 150-hour rule enactment, and the coefficient is significantly smaller than that for minority CPAs.

Finally, we reviewed media coverage of the 150-hour rule, to develop a sense for the concerns that potential CPAs, accounting firms, policymakers, and other interested parties raise. We found no discussions of the rule complicating CPAs' plans to start a family. Instead, commentary consistently references how the burden of the 150-hour rule disproportionately falls on low-income individuals. For example:

The famously grueling CPA exam and the 150 credit hours pose hurdles for any hopeful. But candidates like Winston's clients often face additional obstacles, including family obligations, work, and especially money, she said. Winston's clients tell her: "I just want to get out of school, get my degree, go to work and make some money. Is the certification even worth me staying in school for this extra amount of time?" she said. (Bloomberg [2021])

It's an all too common debate. First-generation college students, especially Black and Hispanic students, often pay their way through school, and they want to start earning right away to pay off debt and support their families. Others are trying to squeeze in school or exam prep on top of a day job. (Bloomberg [2021])

The industry's leaders do not think a simple rebranding will be enough to bring in the number of accountants needed or to break down barriers in diverse communities. Many point to the CPA exam itself, which requires candidates to have completed 150 hours of higher education, a financially onerous fifth year on top of a traditional four-year course. (Financial Times [2022])

Overall, our collection of evidence in this section points to entries declining through a socioeconomic mechanism that disproportionately affects minorities, given the nature of income and wealth inequality in the United States.

## 6. *Tenure in the Profession*

For those who can afford the extra year, the additional educational requirements may increase the signaling value of the CPA license (Law and Marks [2009]). Although we cannot observe individual salaries, an increase in the license's signaling value could manifest in individuals spending more time in the profession. Intuitively, one's tenure in a profession is a function of their opportunity costs and their ability to enter the profession in the

first place. To investigate this, we model CPA length in the profession using the following cross-sectional regression.

$$y_i = \alpha_{ds} + \alpha_{cs} + PostCohort_{cs} \times Minority_d + PostCohort_{cs} \times NonMinority_d + \varepsilon_{dst}. \quad (3)$$

The unit of observation is individual  $i$ . We index individuals according to their demographic group  $d$  (as before, the two groups are minority and nonminority CPAs), the state where they obtained their license  $s$ , and the CPA cohort they belong to  $c$  (the year they obtained their license). The dependent variable is *Length in Profession*, the log of one plus the number of years between when they obtained their license and their final year in the profession.  $PostCohort_{cs}$  is an indicator equal to one for individuals obtaining their license after the state enacts the 150-hour rule.  $Minority_d$  ( $NonMinority_d$ ) is an indicator equal to one for minority (nonminority) CPAs.

We control for demographic-state fixed effects ( $\alpha_{ds}$ ) to account for time-invariant factors affecting length in the profession for groups in each state. We also control for cohort-state fixed effects ( $\alpha_{cs}$ ) to account for unobserved heterogeneity within the cohort of CPAs obtaining their license in a given state-year. For example, some states differ in their flexibility around individuals maintaining an “active” license while not working in the profession. Or, economic conditions in a given year may affect the type of candidate who enters the profession rather than pursue a different career. Thus, our design uses two sources of variation: (1) whether the individual obtains their license before the state enacted the 150-hour rule and (2) whether the individual belongs to a minority group. To mitigate censoring issues (we imperfectly measure length in profession for CPAs who have yet to exit), we limit our sample to cohorts with common support (i.e., state-year cohorts with both minority and nonminority entries). We cluster standard errors by the state where the individual obtains their CPA license.

Table 7 presents the results. Column 1 shows that individuals belonging to post-150-hour rule cohorts spend more time in the profession. The 7.2% (4.4%) coefficient for minority (nonminority) CPAs represents an additional 1.2 (0.8) years, or five more additional months for minority CPAs than nonminority CPAs.<sup>27</sup>

The remaining columns estimate alternative specifications, designed to mitigate censoring issues. In columns 2 and 3, the dependent variable is an indicator for whether the individual spends more than 5 or 15 years in the profession. In column 4, we limit the sample to CPAs who obtained their license in 2000 or before. Across these columns, we find a similar pattern to column 1 in that postenactment cohorts stayed in the profession longer,

<sup>27</sup>For CPAs who ultimately work at firms with mandatory retirement policies, the effective increase is greater because the extra year of education reduces the time they are available to work.

**TABLE 7**  
*150-Hour Rule and Length in Profession*

	(1)	(2)	(3)	(4)
	Log Length in Profession	>5 Years in Profession	>15 Years in Profession	>15 Years in Profession
Post Cohort × Minority	0.072** (0.034)	0.021** (0.010)	0.030 (0.029)	0.048** (0.020)
Post Cohort × Nonminority	0.044* (0.025)	0.007 (0.010)	0.029 (0.031)	0.035* (0.019)
<i>p</i> -value for Interaction Difference	0.395	0.277	0.984	0.491
Controls	Yes	Yes	Yes	Yes
State × Demographic FE	Yes	Yes	Yes	Yes
Cohort × Demographic FE	Yes	Yes	Yes	Yes
Cohorts	All	All	All	≤2000
Observations	399,627	399,627	399,627	204,574
Adjusted $R^2$	0.250	0.042	0.481	0.071

This table models length in the profession using our CPA license sample and equation (3). The unit of observation is individual. The dependent variable in column 1 is *Log Length in Profession*, the log of one plus the number of years between the CPA obtaining their license and that person's final year in the profession. The dependent variable in columns 2–4 is an indicator for CPAs who stay in the profession more than 5 or 15 years, as labelled. *Post Cohort* is an indicator for CPAs obtaining their licenses after the state has adopted the 150-hour rule. *Minority* (*Nonminority*) is an indicator variable equal to one for Black and Hispanic (Asian and White) CPAs. In column 4, the sample is limited to CPAs obtaining their license in 2000 or earlier. See figure 3 for variables definitions. Reported below the coefficients are standard errors clustered at the state level. \*, \*\*, \*\*\* indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively. Significance levels for coefficient differences are based on Wald tests.

especially minority CPAs. However, the coefficients are neither economically large nor consistently significant; moreover, the differences between the two *Post Cohort* interaction terms are never significant at conventional levels. Then, one interpretation of our findings thus far is that educational requirements associated with licensing can lead to significant entry declines that depend on college affordability and initial wealth. However, for those who can afford to meet the requirements, the signaling value of the license (as proxied by the time spent in the profession) may be greater, albeit only slightly.

## 7. CPA Quality and Labor Market Perception of CPAs

Because a common justification for licensing is that it improves service quality, we study the quality consequences of the 150-hour rule.<sup>28</sup> The literature examines both (1) professional quality, under the assumption that more competent professionals provide better service (Larsen et al. [2020], Barrios [2022]), and (2) service quality itself (Anderson et al. [2020], Chung [2020]). Therefore, we first study candidates' CPA exam

<sup>28</sup> For example, licensing can protect uninformed consumers in credence good markets (Darby and Karni [1973]), such as those for CPA services (Causholli and Knechel [2012], Cook et al. [2020]).

performance, presuming that better performance signals ability relevant to practice. Second, we study whether CPAs face disciplinary actions for professional misconduct, which can harm CPA service consumers. Third, we examine accounting job postings to understand whether CPAs are perceived differently after the 150-hour rule is enacted.

### 7.1 EXAM PERFORMANCE

We study CPA candidate exam performance using NASBA's annual Candidate Performance on the Uniform CPA Exam reports between 1984 and 2003. Our sample stops in 2003 because NASBA changed the way it aggregated exam candidates thereafter. Individuals can register to sit for the exam in May or November each year. The reports tabulate, for each exam sitting, the number of candidates, the percentage passing each of the four individual sections, the percentage passing all four sections, the percentage passing some, and the percentage passing none. These figures are presented for each university-month (May or November)-year-candidate category (first time or repeat, as described below). We have 51,327 university-month-year observations from candidates passing the exam, and 1,371 unique universities.

We assign CPA candidates to three quality categories based on their exam performance. We take advantage of the fact that NASBA reports the number of exam takers and passers from each university for each sitting and separates individuals into first-time versus repeated attempts. Low-quality candidates fail the exam. Because one must pass the exam to become a CPA, these failed candidates do not affect the CPA pool quality. Medium-quality candidates pass the exam but only after failing a prior attempt. High-quality candidates pass on the first attempt. We use these exam performance categories to understand changes in the types of candidates entering the profession (Barrios 2022), and more important for our purposes, the interaction with the share of minority students at the university and the financial aid available.

We study exam performance using the following regression, similar to Barrios [2022].

$$y_{usmt} = \alpha_u + \alpha_m + \alpha_t + Post_{st} + Year\ Before\ Rule_{st} + \alpha_u \times Trend_t + \varepsilon_{usmt}. \quad (4)$$

The unit of observation is university-state-month-year, equivalent to an exam sitting for individuals from a given university.  $u$  indexes universities,  $s$  indexes states,  $m$  indexes months, and  $t$  indexes years. The dependent variable is *Passers*, the log of one plus the number of individuals passing the CPA exam from a given university that month-year. We control for university fixed effects ( $\alpha_u$ ) to account for unobservable characteristics that tend to be constant at universities, including their selectivity, location, and the size of their accounting and business departments.  $\alpha_m$  are indicators for each exam sitting month (May or November), and  $\alpha_t$  are year fixed effects.  $Post_{st}$  is an indicator variable for years after the 150-hour rule is enacted. Exploiting the staggered enactment allows us to abstract away from changes to the

uniform exam over time, such as the ability to take the exam on a computer or modifications in subject matter and time allotments.

We estimate separate  $Post_{st}$  coefficients for universities with above- and below-median shares of minority students (relative to all students at the university) compared to other universities in the state, measured in 1990 (the first year these variables are available). Similarly, we categorize universities based on the financial aid they offer, as reported by IPEDS.<sup>29</sup>  $Year\ Before\ Rule_{st}$  is an indicator for exam sittings the year before the 150-hour rule is enacted.  $\alpha_u \times Trend_t$  is a university-specific trend term, which accounts for linear growth in the number of exam candidates each university produces. We cluster standard errors by university.

Table 8 presents the results. Column 1 shows an 8.9% decline in the number of high-quality passers after enactment. Column 2 estimates a piecewise version, with separate  $Post$  coefficients for universities with high and low minority-student populations. We find the decline in high-quality passers is driven by universities with a greater share of minority students. Likewise, column 3 studies financial aid at the university level, and finds a significant decline only for schools offering below-median aid.

By comparison, column 4 shows a 5.6% increase in the number of medium-quality passers. The opposite signs for the high- (column 1) and medium-quality (column 4) groups point to the average quality of the CPA pool deteriorating following the 150-hour rule: Fewer high-quality and more medium-quality candidates enter. Once again, we study which types of universities drive this result. Column 5 finds the increase in medium-quality passers is coming from universities with fewer minority students, and column 6 finds an increase from universities offering high financial aid. Overall, these tests reinforce our inference that the Rule has differential effects on CPA candidates based on their socioeconomic status.

## 7.2 CPA DISCIPLINARY ACTIONS

We study disciplinary actions using the following OLS specification.

$$y_{ics} = \alpha_c + \alpha_s + Post\ Cohort_{is} + Controls_i + Length\ in\ Profession\ CPA_i + Length\ in\ Profession_i^2 + \varepsilon_{ics}. \quad (5)$$

The unit of observation is individual-cohort-state, where  $i$  indexes individuals,  $c$  indexes cohorts, and  $s$  indexes states. That is, we cannot easily extract dates for all disciplinary actions, and therefore we do not have a panel for this particular test.<sup>30</sup> The dependent variable is *Disciplinary Action*, 100 times an indicator for whether the individual has a disciplinary action recorded on the State Board of Accountancy website. We control for cohort fixed effects ( $\alpha_c$ ), such that we compare individuals obtaining their

<sup>29</sup> Specifically, we designate universities as below- or above-median with respect to the percent of students receiving aid, relative to all other universities in the state-year.

<sup>30</sup> Given records are not standardized across states, we are unable to extract dates from over half of the disciplinary actions. Additionally, incidents commonly span multiple years.

**TABLE 8**  
*150-Hour Rule and CPA Pool Quality*

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Passers					
	High Qual	High Qual	High Qual	Med Qual	Med Qual	Med Qual
Post	-0.089 <sup>***</sup> (0.029)			0.056 <sup>***</sup> (0.020)		
Post × High Minority Share		-0.109 <sup>***</sup> (0.041)			0.036 (0.029)	
Post × Low Minority Share		-0.062 (0.042)			0.056 <sup>**</sup> (0.028)	
Post × High Financial Aid			-0.024 (0.026)			0.081 <sup>***</sup> (0.029)
Post × Low Financial Aid			-0.143 <sup>***</sup> (0.039)			0.028 (0.027)
<i>p</i> -Value Difference in Interactions		0.422	0.048		0.605	0.18
Controls	Yes	Yes	Yes	Yes	Yes	Yes
University FE	Yes	Yes	Yes	Yes	Yes	Yes
University Trend	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21,978	21,978	21,404	29,349	29,349	28,555
Adjusted <i>R</i> <sup>2</sup>	0.886	0.886	0.710	0.958	0.958	0.822

This table models the number of CPA exam passers using our NASBA exam sample and equation (4). The unit of observation is university-state-month-year. The dependent variable is *Log Passers*, the log of one plus the number of exam passers from the university that month-year. *Post* is an indicator for years after the state has adopted the 150-hour rule. *High Minority Share (Low Minority Share)* is an indicator variable for universities with an above- (below-) median share of minority students, defined as Black and Hispanic students. *High Financial Aid (Low Financial Aid)* is an indicator variable for universities with an above- (below-) median level of financial aid. We control for the month of the exam sitting and sittings for the year before 150-hour rule enactment. The sample is limited to the group labeled in each column, where High Qual (Med Qual) refers to individuals who pass the CPA exam on the first (subsequent) attempt. See figure 3 for variables definitions. Reported below the coefficients are standard errors clustered at the state level. <sup>\*</sup>, <sup>\*\*</sup>, <sup>\*\*\*</sup> indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively. Significance levels for coefficient differences are based on Wald tests.

**TABLE 9**  
*150-Hour Rule and Disciplinary Action*

	(1)	(2)	(3)	(4)
	Disciplinary Action			
	All	Administrative	Tax	Professional
Post Cohort	-0.016 (0.100)	0.063 (0.084)	-0.054 (0.041)	-0.044 (0.046)
Controls	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Cohort FE	Yes	Yes	Yes	Yes
Observations	388,200	388,200	388,200	388,200
Adjusted R <sup>2</sup>	0.007	0.003	0.001	0.002

This table models disciplinary actions using our CPA license sample and equation (5). The unit of observation is individual. The dependent variable is *Disciplinary Action*, 100 times an indicator for whether the individual is involved in a disciplinary action recorded by their State Board of Accountancy. The disciplinary action categories are labelled at the top of each column (all types, administrative, tax, and professional). *Post Cohort* is an indicator for CPAs obtaining their license after the state has adopted the 150-hour rule. See figure 3 for variables definitions. Reported below the coefficients are standard errors clustered at the state level. \*, \*\*, \*\*\* indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively.

license in the same year. We control for state fixed effects ( $\alpha_s$ ) to account for time-invariant factors affecting enforcement, reporting, and adjudication at the state level. *Post Cohort<sub>is</sub>* is an indicator variable for individuals obtaining their license in the state after 150-hour rule enactment. *Controls<sub>i</sub>* refer to indicator variables for each of the four race and two gender categories described earlier. Because CPAs differ in their career length and all else equal disciplinary actions are more likely among longer serving CPAs, we control for the first- and second-order terms of the number of years as a CPA (*Length in Profession* and *Length in Profession squared*). We cluster standard errors by the state where the individual obtains their CPA license.

Table 9 presents the results. Column 1 finds no statistical or economic disciplinary action difference across the pre- and postcohort CPAs. We then conduct a textual analysis of disciplinary action descriptions, where available, to shed light on how the 150-hour rule affected various aspects of CPA behavior. We examine three disciplinary action categories: (1) administrative violations (e.g., failure to complete CPE requirements or pay dues), (2) tax-related violations (e.g., tax fraud or IRS sanctions), and (3) professional violations (e.g., negligence in preparing financial statements, failure to satisfy peer review requirements, or theft of funds or documents).<sup>31</sup> Table 2 reports that 0.54% of CPAs have a disciplinary action on their record. Using the above categories, 0.28% of CPAs have an administrative violation, 0.09% have a tax violation, and 0.14% have

<sup>31</sup> Specifically, we develop a set of over 75 regular expressions to assign disciplinary actions to the three categories. This approach enables us to abstract away from syntax differences and capture various ways to describe incidents. We do not limit disciplinary actions to a single category, as occasionally, incidents involve multiple infraction types.

a professional violation. Column 2 of table 9 shows no difference in the frequency of administrative violations across the pre- and postcohort CPAs. Columns 3 and 4 examine tax-related and professional violations, respectively, and likewise arrive at a null result.<sup>32</sup>

### 7.3 CPA LABOR MARKET PERCEPTIONS

Finally, we access the job posting data set from Atalay et al. [2020] to understand how accountant employers perceive the 150-hour rule. The data set aggregates nearly 8 million job postings appearing in the *Boston Globe*, *New York Times*, and *Wall Street Journal* between 1940 and 2000. We study labor market perceptions using the following OLS specification.

$$y_{ot} = \alpha_o + \alpha_t + \text{Accounting} \times \text{Enactment}_{ot} + \varepsilon_{ot}. \quad (6)$$

The unit of observation is occupation-year, where  $o$  indexes occupations based on six-digit SOC code, and  $t$  indexes years (there is no geographic dimension to the data). The dependent variable  $y_{ot}$  measures the log of one plus the number of job postings or the share of postings seeking candidates with more than five years of experience. Intuitively, the number of postings proxies for labor market demand, whereas the experience requirement reveals changes in the type of CPA employers seek (after a state enacts the 150-hour rule, less experienced CPAs will have more education). If employers prefer candidates with the extra year of education, we expect a decline in postings seeking accountants with more experience. *Accounting* is an indicator equal to one for postings for SOC occupation 132011. *Enactment* measures the share or weighted share of states that have enacted the 150-hour rule to date. For the latter, the weights are based on state employment according to the Quarterly Census of Employment and Wages.  $\alpha_o$  and  $\alpha_s$  are occupation and year fixed effects, respectively. We consider both the full set of occupations (panel A) and accounting plus benchmark occupations including only financial managers (SOC 113031), financial analysts (132051), lawyers (231011), audit and accounting clerks (433031), and tax examiners (132081).

Table 10 presents the results. Panel A, column 1, shows no relation between the share of states that have adopted and the number of postings for accounting positions. Based on the 95% confidence band, we can reject with 95% confidence that increases in the number of accounting postings exceed 0.39 (or 20% of the accounting posting standard deviation). Columns 2 and 3 show this inference is not sensitive to weighting the share by state employment or to measuring a simple linear time trend. Columns 4–6 show experience requirements do not change either: employers are

<sup>32</sup> Individual-year level tests or Poisson tests lead us to the same inference. Additionally, although the point estimate in column 1 on *Post Cohort* is insignificant, we can reject with 95% confidence that the rule leads to a disciplinary action decline that exceeds -0.22% (the lower bound of the 95% confidence interval) or 2.3% of the pre-period disciplinary action standard deviation. Thus, quality improvements are, at best, rather small (see appendix C for more discussion).

**TABLE 10**  
*150-Hour Rule and Labor Market Perceptions of CPAs*

Panel A: Full sample

	(1)	(2)	(3)	(4)	(5)	(6)
		Log Ads			Seeking Highly Experienced	
Accounting × Adoption	0.002 (0.198)			-0.009 (0.008)		
Accounting × 150 Adoption Wtd		-0.047 (0.215)			-0.008 (0.008)	
Accounting × Trend			-0.015 (0.010)			0.000 (0.000)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
SOC FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,090	16,090	16,090	16,090	16,090	16,090
Adjusted $R^2$	0.924	0.924	0.924	0.089	0.089	0.089

(Continued)

TABLE 10—(Continued)

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel B: Accounting plus similar occupations					
		Log Ads			Seeking Highly Experienced	
Accounting × Adoption	0.155 (0.113)			0.002 (0.008)		
Accounting × 150 Adoption Wtd		0.106 (0.140)			0.003 (0.008)	
Accounting × Trend			-0.008 (0.008)			0.000 (0.000)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
SOC FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	126	126	126	126	126	126
Adjusted R <sup>2</sup>	0.967	0.967	0.967	0.642	0.642	0.642

This table models the number of job postings and share of postings seeking a highly experienced candidate using the Atalay et al. [2020] job posting sample and equation (6). The unit of observation is occupation-year. The dependent variable in columns 1–3 (4–6) is *Log Postings*, the log of one plus the number of job postings (*Seeking Highly Experienced*, the share of postings seeking a candidate with more than five years experience). *150 Adoption (150 Adoption Wtd)* is the share of sample states that have enacted the 150-hour rule to date (the share weighted by employment in that state). *Trend* is a linear time trend equal to one starting in 1980. Panel B limits the sample to accounting, financial managers (SOC 113031), financial analysts (SOC 132051), lawyers (SOC 231011), audit and accounting clerks (SOC 433031), and tax examiners (SOC 132081). See figure 3 for variables definitions. Reported below the coefficients are robust standard errors. \*, \*\*, \*\*\* indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively.

no less likely to seek experienced candidates lacking the extra year of education.<sup>33</sup>

Accounting is a distinct profession, and it is conceivable that these null results stem from our inclusion of occupations that have little in common with accounting. Panel B then limits the control (i.e., nonaccounting) sample to closely related occupations that are plausible alternatives for candidates considering an accounting career. We continue to find no association between the 150-hour rule enactment and labor demand.

## 8. Conclusion

Entry into many professions, including accounting, law, and medicine, is governed by occupational licensing. As licensing has affected an increasing share of the U.S. workforce over recent decades, many have raised concerns about unintended consequences, including entry barriers to high-paying professions (Kleiner, Krueger, and Mas [2011]). Because licensing boards often impose costly educational requirements, entry could depend on initial wealth and access to finance, which may result in less minority participation. On the other hand, some have argued that licensing can increase minority participation if it enables workers to signal their quality (Law and Marks [2009], Blair and Chung [2021]). This debate has attracted considerable controversy (Law and Marks [2012]) and mixed findings (Klein, Powell, and Vorotnikov [2012], Blair and Chung [2019]).

We therefore examine U.S. CPAs over the past 35 years, a period covering the staggered adoption of additional educational requirements across all states. This setting allows us to infer demographic information for all members of the profession, control for state-specific labor market conditions, and observe key details of each individual's career, including tenure in the profession and professional misconduct.

Although we find some evidence consistent with licensing facilitating signaling—postrequirement minority CPAs remain in the profession 1.2 years longer versus 0.8 years longer for postrequirement nonminority CPAs—the more fundamental effects on entry are considerably larger and far more robust. Specifically, we find a 13% greater entry decline following enactment for minority than nonminority CPAs. Our analyses of parental income and financial aid availability point to a socioeconomic status channel explaining the differential entry declines.

Using granular data, we cannot detect any improvement in CPA quality following the enactment of the additional educational requirements. In fact, our analyses of licensing exam passing patterns indicate a decline in high-quality candidates that is concentrated in universities with large minority populations. Moreover, our analyses of disciplinary actions point to the 150-hour rule having a null, or if anything, weakly positive effect on

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<sup>33</sup> We arrive at similar inferences if we instead measure the proportion of postings with any experience requirement.

	<b>Definition</b>
Entries	The number of new CPAs that state-year.
Minority	An indicator variable equal to one for Black and Hispanic CPAs, and zero for Asian and White CPAs.
Nonminority	An indicator variable equal to one for Asian and White CPAs, and zero for Black and Hispanic CPAs.
Post	An indicator variable equal to one for years after the state adopts the 150-hour rule, and zero otherwise.
Not All Neighbors	An indicator variable equal to one for years where at least one neighboring state has not yet adopted the 150-hour rule, and zero otherwise.
Post First Neighbor	An indicator variable equal to one for years after a neighboring state adopts the 150-hour rule, and zero otherwise.
Post Cohort	An indicator variable equal to one for CPAs obtaining their license after the state has adopted the 150-hour rule, and zero otherwise.
Mobility	An indicator variable for years after the state has adopted the CPA mobility provisions, and zero otherwise.
Graduates	The number of accounting major graduates from a university-degree type that year. Degree types can include Masters of Accounting, Masters of Business Administration, etc.
Low Financial Aid	An indicator variable for states (universities) with below median financial aid, and zero otherwise in Table 5 (Table 8).
High Financial Aid	An indicator variable for states (universities) with above median financial aid, and zero otherwise in Table 5 (Table 8).
Passers	The number of individuals passing the CPA exam from a given university that month-year.
High Minority Share	An indicator variable for universities with an above median share of minority students, and zero otherwise.
Low Minority Share	An indicator variable for universities with a below median share of minority students, and zero otherwise.
Disciplinary Action	One hundred times an indicator variable equal to one for CPAs with a disciplinary action on their public profile, and zero otherwise.
Length in Profession	The number of years between when the CPA obtains their license and their final year in the dataset.
>5 Years in Profession	An indicator variable equal to one for CPAs whose <i>Length in Profession</i> is more than five years, and zero otherwise.
Ads	The number of job postings for a given occupation in a year.
Seeking Highly Experienced	The share of job postings with a requirement that the candidate has at least five years of work experience.
150 Adoption	The share of sample states that have enacted the 150-hour rule as of that year.
150 Adoption Wtd	The share of sample states that have enacted the 150-hour rule as of that year, weighted by the employment in that state according to the Quarterly Census of Employment and Wages.
Trend	A linear time trend variable equal to one starting in 1980.

FIG. 3.—Variable definitions.

professional misconduct. Last, we find no evidence that the 150-hour rule altered accountant employers' perceptions of CPAs.

Overall, our evidence suggests that licensing requirements can lead to lower minority participation in professional occupations and impede income mobility and employers' efforts to diversify their workforces. Our evidence is relevant to debates surrounding licensing requirements and alter-

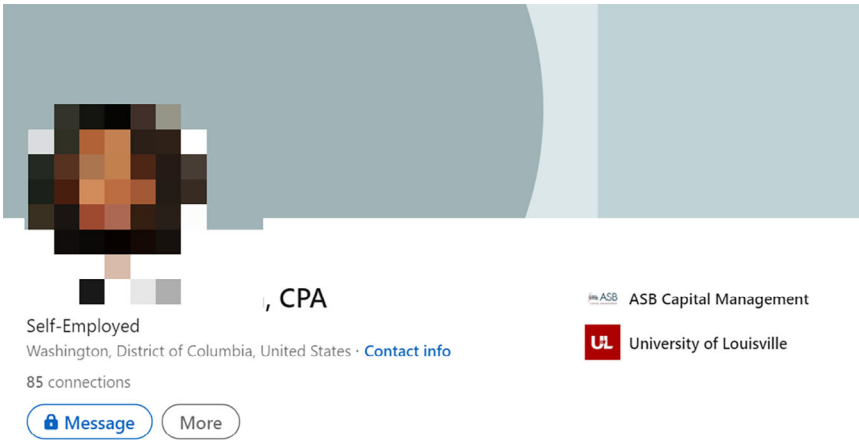


IMAGE A.1.—Example professional networking website profile.

native proposed regimes involving optional certification (Kleiner [2000]) or reliance on reputational mechanisms (Farronato et al. [2020]).

#### APPENDIX NAME-BASED PREDICTION VALIDATION AND APPROACH COMPARISON

To validate our name-based prediction approach, we retrieve information from professional networking websites for a randomly selected subset of CPAs in our estimation sample, manually classify their races, and compare name-based classifications with these manual categorizations. In the following, we outline this validation approach and compare our main classification algorithm with alternatives.

##### COLLECTING PROFESSIONAL NETWORKING WEBSITE INFORMATION

We begin by collecting profile information from a professional networking website for a randomly selected group of 6,555 CPAs in our estimation sample. We then refine the sample as follows. First, we eliminate profiles missing a photo. Second, we eliminate profiles lacking sufficient information to match to the CPA's license. We require the profile to contain matching information for the CPA's license number, name, location, and approximate age.<sup>34</sup> See image A.1 for a typical profile (name and photo redacted for confidentiality) and image A.2 for CPA license number information. Third, we discard duplicate profiles or profiles where we cannot assign a race with confidence. We manually classified verified profiles into the four races using the following steps. Two research assistants (A and B) independently assign a race to each CPA based on their profile information on the professional networking website. Cases where A and B disagree

<sup>34</sup> See Card et al. [2020] for a similar validation approach.

## Licenses &amp; certifications



Certified Public Accountant

VBOA - Virginia Board of Accountancy

Issued Dec 2009 · Expired Dec 2020

Credential ID [REDACTED]

IMAGE A.2.—Example of CPA license number on a professional networking website profile.

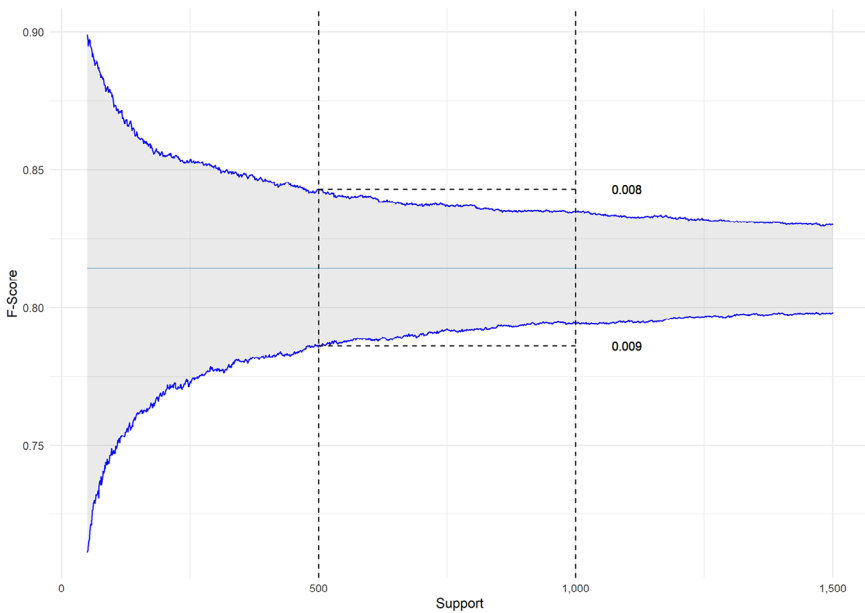


FIG. A.1.—Bootstrap confidence intervals for different support levels.

are presented to a third individual (C) who independently either resolves the conflict or, if no resolution is possible, discards the profile. Finally, we randomly eliminate remaining profiles until we have exactly 125 verified profiles per race (500 profiles in total).

## VALIDATION SUPPORT CONSIDERATIONS

In total, we manually assign races for 500 CPA profiles. To our knowledge, there is no rule of thumb for choosing sufficient sample sizes for validation exercises like this one. We therefore turn to a bootstrapping procedure to gauge the extent to which our validation might hinge on our chosen support size. In figure A.1, we plot bootstrapped 95% confidence intervals (Efron [1987]) for our F-score measure for support levels ranging from 50 to 1,500. Although confidence bands narrow with increasing support, reductions decline rapidly for hypothetical supports with more than 500 validated profiles. For instance, doubling our support from 500 to 1,000 only leads to a marginal confidence interval decline—the upper (lower) end of the confidence interval declines (increases) by around

**TABLE A.1**  
*Confusion Matrix (Combined Approach)*

		True Cases				
		Asian	Black	Hispanic	White	Total
Predicted Cases	Asian	121	0	0	4	<b>125</b>
	Black	11	72	1	41	<b>125</b>
	Hispanic	3	3	95	24	<b>125</b>
	White	2	2	1	120	<b>125</b>
	<b>Total</b>	<b>137</b>	<b>77</b>	<b>97</b>	<b>189</b>	<b>500</b>

**TABLE A.2**  
*Precision, Recall, F-Score (Combined Approach)*

Race	Precision	Recall	F-Score	Support
Asian	0.968	0.883	0.924	125
Black	0.576	0.935	0.713	125
Hispanic	0.760	0.979	0.856	125
White	0.960	0.635	0.764	125
<b>Average/Total</b>	<b>0.816</b>	<b>0.858</b>	<b>0.814</b>	<b>500</b>

0.008 (0.009). In light of this and considering the high costs of manual classification, we deem our support size sufficient.

VALIDATION STATISTICS

To evaluate the performance of our approach, we primarily rely on F-scores. The F-score is commonly used to benchmark classification algorithms (e.g., Sood and Laohaprapanon [2018]) and is defined as follows.

$$FScore = 2 * \frac{Precision * Recall}{Precision + Recall}$$

where Precision = TP/(TP + FP) and Recall = TP/(TP + FN). TP denotes true positives, FP false positives, and FN false negatives. To illustrate, we can calculate the F-score for, for instance, the category “Asian” using the information provided in a confusion matrix presented in table A.1. Precision for the category “Asian” is 121 / (121 + 4) = 0.968, Recall is 121 / (121 + 16) = 0.883, and the resulting F-score is 0.924. For completeness, we show Precision, Recall, and F-Scores for all races in table A.2.

COMBINING AND COMPARING METHODS

We predict the race and gender for each CPA by applying, among other algorithms, name-based Bayesian prediction techniques used in related work. We use three software packages to predict race. First, the Python ethnicolr package, which assigns names to races based on data from the U.S. Census, Florida voting records, and Wikipedia.<sup>35</sup> The ethnicolr package allows the user to choose between using U.S. Census or Florida voting record

<sup>35</sup> <https://ethnicolr.readthedocs.io/ethnicolr.html#using-ethnicolr>

training data. Second, the R *predictrace* package uses a string-matching approach based on U.S. Census data.<sup>36</sup> Third, the R “wru” package uses Bayesian prediction using U.S. Census data.<sup>37</sup> The “wru” package allows further refinement based on whether, in addition to name, the algorithm considers location (L), age (A), and gender (G) information or combinations thereof.

In total, we employ three software packages and eight standalone approaches, using different training data and criteria, to assign individuals to race categories. The approaches also differ in their sample coverage. (For some names, several approaches fail to predict a race with sufficient confidence.) The race categories for these approaches include Asian, Black, Hispanic, and White. Each approach produces a probability that the first name–last name pairing is associated with each race. The eight standalone approaches are as follows:

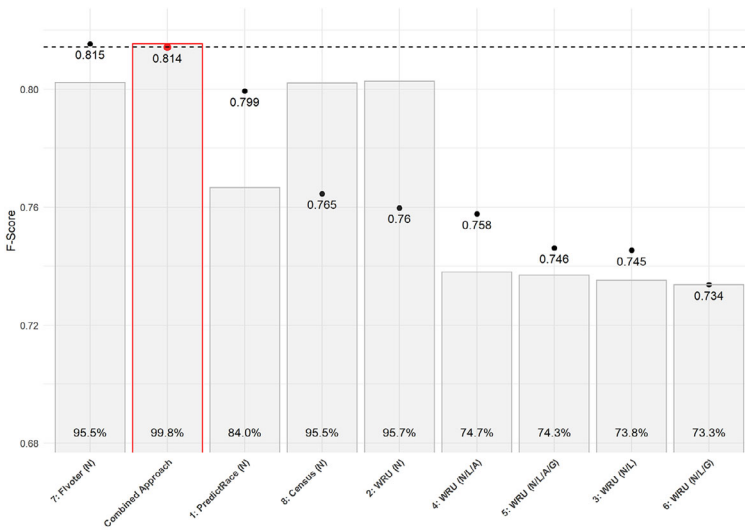
1. **PredictRace (N)**: *predictrace* package based on name only;
2. **WRU (N)**: *wru* package based on name only;
3. **WRU (N/L)**: *wru* package based on name, and location;
4. **WRU (N/L/A)**: *wru* package based on name, location, and age;
5. **WRU (N/L/A/G)**: *wru* package based on name, location, age, and gender;
6. **WRU (N/L/G)**: *wru* package based on name, location, and gender;
7. **Flvoter (N)**: *ethnicolr* package based on Florida voter data and name only;
8. **Census (N)**: *ethnicolr* package based on U.S. Census data and name only.

Our main analysis uses a combination of these eight approaches, which we refer to as the *Combined Approach*, as follows. We prioritize the prediction method that maximizes the probability difference between the first and the second guess. To illustrate, consider two CPAs, A and B. For A, the *ethnicolr* Florida voting record approach assigns an 80% probability for “White” and a 20% probability for “Hispanic,” whereas the *predictrace* approach assigns a 65% probability for “White” and a 35% probability for “Hispanic.” For simplicity, assume the other six approaches produce the same probabilities as *predictrace*. We assume A is “White” based on the *ethnicolr* Florida voting record approach having the largest difference between the first and second probability ( $80\% - 20\% = 60\%$ ).

For B, the *ethnicolr* U.S. Census approach assigns a 55% probability for “Black,” a 35% probability for “Hispanic,” and a 10% probability for “Asian.” The *wru* name and location approach assigns a 67% probability for “Hispanic,” a 25% probability for “Black,” and an 8% probability for “Asian.” Once again, assume the other six approaches produce the same

<sup>36</sup> <https://github.com/jacobkap/predictrace/>

<sup>37</sup> <https://github.com/kosukeimai/wru>



Note to Figure A.2: This figure presents F-Scores (dots) and the sample size relative to the original sample (bars) for each standalone method and our combined approach.

FIG. A.2. — Method comparison. This figure presents F-scores (dots) and the sample size relative to the original sample (bars) for each standalone method and our combined approach.

probabilities as ethnicolr U.S. Census. We assume B is “Hispanic” based on the wru name and location approach having a greater probability difference ( $67\% - 25\% = 42\%$ ) than the ethnicolr U.S. Census approach ( $55\% - 35\% = 20\%$ ).

To summarize, we assign CPAs as follows. First, we choose the race predicted by the approach with the greatest confidence as measured by the probability difference between the first and second guess. Thus, the race assignment method we choose of the eight available can differ across CPAs in our estimation sample. Second, we eliminate CPAs whose first guess probability is less than 50%. Third, we eliminate CPAs where the probability difference between the first and second guess is less than 20%. We note, however, that the overwhelming majority of first name–last name pairings produce an unambiguous prediction, so the two latter steps have little effect on our sample. Moreover, our regression estimates are robust to a range of alternative assignment approaches (e.g., requiring all eight approaches agree, or eliminating female CPAs from our sample given the convention of changing surnames at marriage could confound our name-based assignment).

Our combined approach permits us to study a larger set of CPAs, leverages unique aspects of each approach, and results in high classification performance. We summarize these advantages in figure A.2, where we plot both the average F-score as well as the proportion of individuals in our estimation sample that we can categorize for each standalone method and our

**TABLE A.3**  
*F-Scores All Methods*

Race	Combined Approach	PredictRace (N)	WRU (N)	WRU (N/L)	WRU (N/L/A)	WRU (N/L/A/G)	WRU (N/L/G)	Flvoter (N)	Census (N)
Asian	0.924	0.934	0.886	0.905	0.909	0.898	0.898	0.907	0.893
Black	0.713	0.636	0.571	0.545	0.561	0.524	0.505	0.676	0.579
Hispanic	0.856	0.845	0.845	0.818	0.824	0.821	0.816	0.880	0.849
White	0.764	0.783	0.736	0.713	0.737	0.741	0.717	0.799	0.737
<b>Average</b>	<b>0.814</b>	<b>0.799</b>	<b>0.760</b>	<b>0.745</b>	<b>0.758</b>	<b>0.746</b>	<b>0.734</b>	<b>0.815</b>	<b>0.765</b>

This table shows the F-score for our combined approach (column 2) and each standalone approach (columns 3–10).

**TABLE A.4**  
*Prerule and Postrule Accuracy*

Group	Prerule Accuracy	Postrule Accuracy	p-Value for Difference
Minority	0.559	0.684	0.215
Nonminority	0.917	0.972	0.244

This table tests the difference in accuracy across the pre- and post–150-hour rule cohorts.

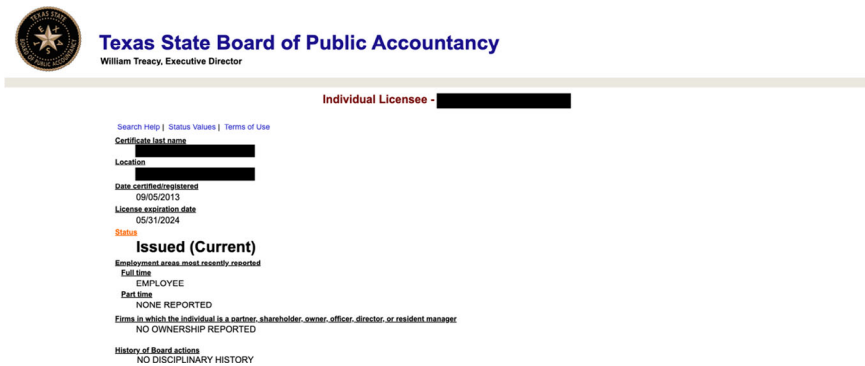


FIG. A.3.—Example CPA profile.

combined approach. We further show F-scores not only on average but also broken down by race in table A.3.

Figure A.2 shows that the combined approach allows us to categorize 99.8% of the CPAs in our original sample, far more than any of the standalone approaches. In terms of performance, the combined approach shows similar or higher F-scores than the standalone approaches. Overall, the combined approach allows us to categorize the most CPAs while maintaining a high classification performance, both compared to the standalone methods and when compared to F-scores reported in other work (e.g., Sood and Laohaprapanon [2018]).

Figure A.3 provides an example CPA profile from a State Board of Accountancy website.

**TABLE A.5**  
*Name Assignment Robustness*

	(1)	(2)	(3)	(4)	(5)
	Log (Graduates)				
	All	Nonminority	Minority	All	All
Post	0.337*** (0.059)	0.354*** (0.058)	0.083** (0.041)		
Post × Minority				-0.271*** (0.046)	
Post × Minority × Accounting					-0.345*** (0.104)
University FE	Yes	Yes	Yes	No	No
Year FE	Yes	Yes	Yes	No	No
University × Demographic FE	No	No	No	Yes	No
University × Year FE	No	No	No	Yes	No
Demographic × Year FE	No	No	No	Yes	No
University × Demographic × Major FE	No	No	No	No	Yes
University × Demographic × Year FE	No	No	No	No	Yes
University × Major × Year FE	No	No	No	No	Yes
Demographic × Major × Year FE	No	No	No	No	Yes
Observations	9,647	9,647	9,647	19,294	13,490
Adjusted R-squared	0.587	0.634	0.614	0.747	0.849

This table studies the number of graduates from masters programs. The unit of observation is university-major-group-year. The dependent variable is *Log Graduates*, the log of one plus the number of graduates for a demographic group from a university-major that year (the two demographic groups are minority and nonminority students). *Post* is an indicator for years after the state has adopted the 150-hour rule. *Accounting* is an indicator for accounting majors. *Minority* is an indicator variable equal to one for minority students. Columns 1–4 limit the sample to accounting graduates, whereas column 5 includes accounting and finance graduates. See figure 3 for variables definitions. Reported below the coefficients are standard errors clustered at the university level. \*, \*\*, \*\*\* indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively.

**APPENDIX B: SAMPLE DISTRIBUTION**

Table B.1

**APPENDIX C: DISCIPLINE DATA AND ANALYSES**

We obtain disciplinary actions from 21 states with sufficient CPA information and incident descriptions for our tests. The key data points recorded (in addition to the text that summarizes the disciplinary action) include the CPA’s first name, last name, license number, state, license issue date, and the date when the disciplinary action took effect. Due to formatting differences between the disciplinary data and our existing license data set, we use a fuzzy matching approach, encompassing both full names and license numbers.

We then categorize the disciplinary actions into three categories: Administrative, Tax, and Professional. One of the primary challenges in this exercise stems from the vastly different styles and lengths of disciplinary

**TABLE B.1**  
*Sample Distribution*

State	# Entries	% Entries	Year	# Entries	% Entries
AK	1,000	0.2%	1986	15,492	3.0%
AL	8,559	1.7%	1987	15,409	3.0%
AR	5,275	1.0%	1988	15,626	3.1%
AZ	9,402	1.8%	1989	16,665	3.3%
CA	52,789	10.3%	1990	16,206	3.2%
CT	5,819	1.1%	1991	15,637	3.1%
FL	18,503	3.6%	1992	17,041	3.3%
GA	14,022	2.7%	1993	16,065	3.1%
IA	5,891	1.2%	1994	14,844	2.9%
ID	1,572	0.3%	1995	14,772	2.9%
IL	36,367	7.1%	1996	14,497	2.8%
IN	8,217	1.6%	1997	13,544	2.6%
KS	5,739	1.1%	1998	13,718	2.7%
KY	8,031	1.6%	1999	14,681	2.9%
LA	4,882	1.0%	2000	13,158	2.6%
MA	21,724	4.2%	2001	12,100	2.4%
MD	13,914	2.7%	2002	12,180	2.4%
ME	1,392	0.3%	2003	12,803	2.5%
MI	10,900	2.1%	2004	12,157	2.4%
MN	17,654	3.5%	2005	10,584	2.1%
MO	11,929	2.3%	2006	21,581	4.2%
MS	3,913	0.8%	2007	13,428	2.6%
NC	21,077	4.1%	2008	14,466	2.8%
NH	3,009	0.6%	2009	16,206	3.2%
NJ	12,746	2.5%	2010	16,726	3.3%
NM	3,200	0.6%	2011	15,914	3.1%
NV	1,839	0.4%	2012	15,838	3.1%
NY	50,851	9.9%	2013	16,232	3.2%
OH	18,663	3.6%	2014	15,782	3.1%
OR	7,014	1.4%	2015	15,933	3.1%
RI	1,261	0.2%	2016	15,668	3.1%
SC	3,542	0.7%	2017	14,745	2.9%
TN	15,822	3.1%	2018	15,931	3.1%
TX	54,013	10.6%	2019	16,018	3.1%
VA	31,055	6.1%			
WA	20,061	3.9%			
Total	511,647	100.0%	Total	511,647	100.0%

This table presents our sample distribution by state (columns 1–3) and year (columns 4–6).

summaries provided by individual accounting boards. The spectrum of descriptions ranged from concise summaries capturing the essence of the disciplinary actions, to exhaustive legal proceedings (see figure C.1 for examples of disciplinary actions).

Given the varied textual descriptions, we adopted a Regular Expressions (RegEx) approach for classification. To illustrate, the RegEx pattern: “(?i)(Continuing)?\s?Education(al)?(\s?(Requirements?|Deficienc(y|ies)))?” matches administrative violations associated with continuing education requirements.

*Panel A: Texas (tends to provide short descriptions)*

**Administrative Violation:** “The SOAH ALJ issued a Proposal for Decision (PFD) finding that Respondent repeatedly failed to pay licensing fees, maintain continuing professional education (CPE), and breached an ACO. The ALJ recommended in the PFD that the Board revoke Respondent's CPA license and certificate. The Board accepted the ALJ's recommendation to revoke the certificate.”

**Tax Related Violation:** “Respondent entered into an Agreed Consent Order with the Board whereby Respondent was reprimanded. In addition, Respondent must pay \$1,500 in administrative penalties and \$577.95 in administrative costs. Respondent failed to complete a client's tax engagement, failed to respond to a client's inquiries in a timely manner, and failed to return a client's records.”

**Professional Violation:** “Respondent entered into an ACO with the Board whereby Respondent's certificate was revoked. Respondent pleaded no contest to the second degree felony of misapplication of fiduciary property of a value between \$100,000 and \$200,000.”

*Panel B: California (tends to provide longer descriptions)*

**Administrative Violation:** “CALIFORNIA BOARD OF ACCOUNTANCY PB:MR Attachments: Statement to Cited Licensee Notice of Appeal Government Code Sections 11507.5, 11507.6, and 11507.7 Item No. 1 Section(s) CALIFORNIA BUSINESS AND PROFESSIONS CODE Violated: DIVISION 3. Professions and Vocations Generally CHAPTER 1. Accountants ARTICLE 4. Applications, Registrations, Permits Generally SECTION 5072. Requirements for Registration as a Partnership. (a) No persons shall engage in the practice of accountancy as a partnership unless the partnership is registered by the board. Description Ms. Keh held out and practiced under the partnership name of Yee & Keh CPAs, which was not registered with the California Board of Accountancy (CBA). The partnership, Yee & Keh CPAs, has been unregistered with the CBA since 1990 (22 years). Order of Comply with all CBA statutes and regulations. Abatement: Order of Pay the administrative fine as set forth in the citation. Correction: Discontinue practicing under the firm name of Yee & Keh CPAs until properly registered with the CBA. Time to 30 days /By March 6, 2013 Correct: Administrative \$1,500 Fine.”

FIG. C.1.—Example discipline records.

This RegEx-based approach enables us to abstract away from syntax differences and capture various ways to assess the type of incident. Additionally, we do not limit disciplinary actions to a single class but allow for multiclass categorization. We acknowledge that a RegEx-based approach introduces some noise as it is more prone to Type I errors than, for example, simple targeted phrases. We try to minimize those errors by iteratively refining our RegEx list based on the more than 15,000 descriptions in our data set.

To help validate the discipline data, we model length in the profession as a function of whether the CPA has a disciplinary action on their record. We expect such actions to drastically reduce tenure in the profession, as individuals face sanctions, bans, and reputation harm from involvement in professional or off-the-job misconduct. This is what we find in table C.1: Across a range of specifications, disciplinary actions are significantly negatively related to length in the profession.

**TABLE C.1**  
*Length in Profession and Disciplinary Action*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Log Length in Profession							
		> 5 Years in Profession	> 5 Years in Profession	> 15 Years in Profession	> 15 Years in Profession	> 15 Years in Profession	> 15 Years in Profession	> 15 Years in Profession
Disciplinary Action	-0.546*** (0.071)	-0.567*** (0.069)	-0.172*** (0.020)	-0.174*** (0.019)	-0.267*** (0.036)	-0.279*** (0.036)	-0.302*** (0.029)	-0.301*** (0.029)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × Demographic FE	Yes	No	Yes	No	Yes	No	Yes	No
Cohort × Demographic FE	Yes	No	Yes	No	Yes	No	Yes	No
State × Cohort × Demographic FE	No	Yes	No	Yes	No	Yes	No	Yes
Cohorts	All	All	All	All	All	All	≤2000	≤2000
Observations	399,627	399,627	399,627	399,543	399,627	399,543	204,574	204,574
Adjusted R <sup>2</sup>	0.283	0.310	0.062	0.083	0.499	0.532	0.118	0.128

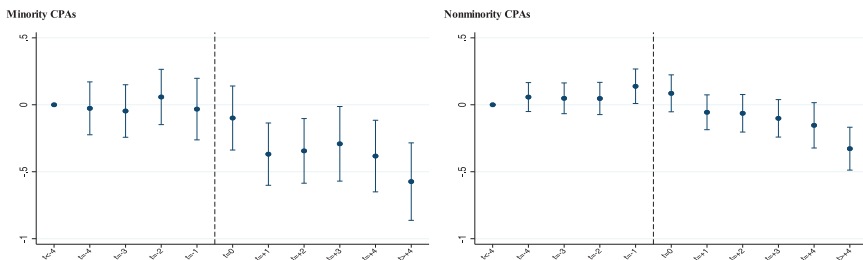
This table models length in the profession as a function of whether the CPA has a disciplinary action on their record. The length in the profession variables and controls are the same as those in table 7.

Finally, we note that table 9 uncovers a null effect of the 150-hour rule on disciplinary actions. Interpreting null results is difficult, but we note several aspects of our test that mitigate the possibility that weaknesses in our design are biasing against us finding any role for the 150-hour rule in reducing disciplinary actions. First, we observe the near universe of U.S. CPAs over the past four decades, and our sample covers nearly 400,000 individuals. Not only does this feature provide power for our tests, but it also prevents selection concerns from contaminating our results. State Board of Accountancy website profiles are mandatory, and those facing disciplinary actions cannot hide or withhold their profiles, even after exiting the profession. Second, staggered adoption of the 150-hour rule sharpens our identification of its effects on disciplinary events. Third, we also arrive at null results if we omit administrative violations and focus only on disciplinary actions involving serious infractions, thus reducing the potential for measurement error to attenuate our *Post Cohort* coefficient. Fourth, although the point estimate in column 1 on *Post Cohort* is insignificant, we can reject with 95% confidence that the rule leads to a disciplinary action decline that exceeds  $-0.22\%$  (the lower bound of the 95% confidence interval) or 2.3% of the preperiod disciplinary action standard deviation. Thus, quality improvements are, at best, rather small.

Finally, we note that others have studied CPA quality around the 150-hour rule’s enactment, from different perspectives (Meehan and Stephenson [2020], Barrios [2022]), and also fail to find evidence of improvement. This consistent lack of findings across exam performance (Meehan and Stephenson and our study), career path (Barrios), and professional misconduct measures (our study) lends credibility to our inference that the rule has, at best, little effect on overall quality.

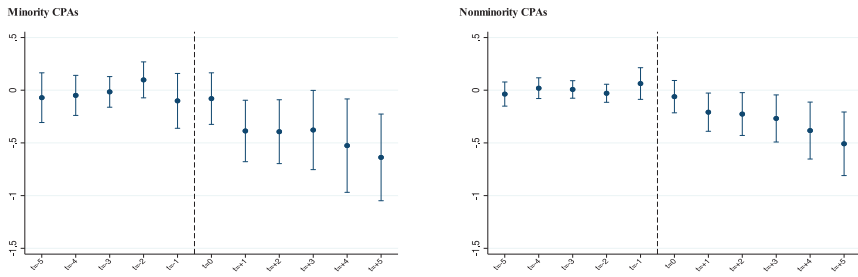
APPENDIX D: STAGGERED DIFFERENCE-IN-DIFFERENCES  
DIAGNOSTICS

Figures D.1 and D.2 present event study plots based on alternative cor-



Note to Figure D.1: this figure presents event study plots using the Sun and Abraham (2020) correction.

FIG. D.1.—Sun and Abraham [2020] correction. This figure presents event study plots using the Sun and Abraham [2020] correction.



Note to Figure D.2: this figure presents event study plots using the Callaway and Sant’Anna (2020) correction.

FIG. D.2.—Callaway and Sant’Anna [2020] correction. This figure presents event study plots using the Callaway and Sant’Anna [2020] correction.

rections as labelled.

APPENDIX E: PREDICTING STATE ADOPTION

We model state adoption of the 150-hour rule as a function of five sets of variables: (1) recent corporate fraud in the state, (2) CPA board and licens-

TABLE D.1  
Staggered Difference-in-Differences Diagnostics

	(1)	(2)	(3)	(4)	(5)
Panel A: Minority sample					
Post	-0.263*** (0.111)	-0.302*** (0.094)	-0.260*** (0.083)	-0.217*** (0.091)	-0.252*** (0.103)
Panel B: Nonminority sample					
Post	-0.132 (0.095)	-0.164* (0.082)	-0.140* (0.072)	-0.125 (0.077)	-0.141** (0.058)
p-Value for difference	0.025	0.009	0.032	0.215	0.130
State FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Census Region Trend	No	Yes	No	No	No
State Trend	No	No	Yes	Yes	Yes
Sample	Full	Full	Full	1983 < Adoption < 2006	Year < 2006
Observations	1,224	1,224	1,224	1,020	720

This table evaluates the sensitivity of our table 3, columns 2 and 3, results to alternative trend specifications, samples, and corrections. The unit of observation is state-year. The dependent variable is *Log Entries*, the log of one plus the number of new CPAs that state-year. *Post* is an indicator for years after the state has adopted the 150-hour rule. The sample in the top (bottom) panel is limited to minority (nonminority) CPAs and further restricted as follows. Column 3 repeats our original result. Column 4 limits the sample to states adopting the 150-hour rule after 1983 and before 2006 (i.e., the sample contains only switching states). Column 5 limits the sample to before 2006 (i.e., the sample contains non-adopting states as controls). Reported below the coefficients are standard errors clustered at the state level. \*, \*\*, \*\*\* indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively.

ing characteristics, (3) CPA labor market conditions, (4) macroeconomic conditions, and (5) political variables.

To assess whether recent fraud in the state accelerates adoption, we measure the percentage of public firms subject to an accounting and auditing enforcement release (*AAER Share*) in the state over the past year. This allows us to examine whether boards respond to recent prominent scandals in the state (and the subsequent media attention and public pressure) by increasing educational requirements.

Our CPA board and licensing variables include the percentage of State Board of Accountancy members who are CPAs (*% CPAs*) and at national accounting firms (*% National*). We also measure the initial fee required to obtain a CPA license (*License Fee*) and whether the State Board has funding autonomy (*Funding Autonomy*). These variables help us evaluate whether the political power of the board influences adoption. Each state's legislature has enacted public accountancy laws governing the board's composition and funding; hence, these variables are time-invariant.

For accounting labor market conditions, we measure the difference between the state's average and national average accounting industry wage and accounting industry unemployment rate (*Abnormal Accounting Wage* and *Abnormal Accounting Unemployment Rate*, respectively), where the accounting industry is defined as NAICS 541211 (Casino, Tamayo, and Vetter [2021]). We measure accounting pay and employment growth in the state over the past 10 years (*Accounting Pay Growth* and *Accounting Employment Growth*, respectively). Including these measures helps us assess whether adoption decisions are influenced by demand for accounting labor.

Our macroeconomic variables include the state's unemployment rate (*Unemployment Rate*), average income (*GDP per Capita*), job growth (*Job Creation*), and rate of new business initiation (*Establishment Formation*). Last, our political variables include indicators for the political party controlling the state's legislature and governorship (*Legislature Democratic* and *Governor Democratic*, respectively).

We track each state from 1990 until the adoption year, giving us 512 state-year observations. Data availability issues prevent us from examining years before 1990 and several states. Similar to Liberti, Sturgess, and Sutherland [2022], we estimate a Weibull proportional hazard model using the accelerated failure-time metric, in which the log years to state adoption (*Time to Adoption*) is modeled as a linear function of (mostly) time-varying covariates. A negative coefficient implies that an increase in the covariate accelerates adoption. We standardize our continuous independent variables to mean zero and a standard deviation of one. This approach is amenable to gauging how much a change in the covariates raises or lowers the years to adoption; using other hazard estimations (e.g., a Cox proportional hazard model) produces similar inferences surrounding the important predictors of adoption.

Table E.1 below presents the results. We estimate the model as a function of each individual set of variables listed above (columns 1–5) as well as the full set of variables (column 6). Column 1 shows that recent fraud in the

**TABLE E.1**  
*State Adoption*

	(1)	(2)	(3)	(4)	(5)	(6)
	Time to Adoption					
%AAER	0.003 (0.023)					-0.008 (0.013)
%CPAs		-0.057*** (0.021)				-0.053** (0.022)
%National		0.006 (0.023)				-0.020 (0.036)
License Fee		0.014 (0.020)				0.019 (0.025)
Funding Autonomy		-0.095 (0.076)				-0.108 (0.093)
Abnormal Accounting Wage			0.049 (0.037)			0.024 (0.026)
Abnormal Accounting Unemployment			0.003 (0.030)			0.002 (0.030)
Accounting Pay Growth			0.024 (0.027)			0.023 (0.025)
Accounting Employment Growth			0.001 (0.023)			0.026 (0.030)
Unemployment Rate				0.008 (0.020)		-0.003 (0.019)
GDP per Capita				0.063*** (0.023)		-0.023 (0.054)
Job Creation				-0.042* (0.025)		-0.043* (0.025)
Establishment Formation				-0.001 (0.021)		0.019 (0.024)
Legislature Democratic					-0.006 (0.048)	-0.005 (0.038)
Governor Democratic					0.002 (0.048)	-0.001 (0.038)
Observations	512	512	512	512	512	512

This table models state adoption as a function of recent corporate fraud in the state, CPA board and licensing characteristics, accounting labor market conditions, macroeconomic conditions, and political variables. The unit of observation is state-year. All columns use a Weibull accelerated failure time model. To facilitate interpretation, all continuous independent variables have been standardized to mean zero and a standard deviation of one. The dependent variable is the log *Time to Adoption*, defined as one plus the number of years since 1990 (the first year of the prediction model sample). States are eliminated from the sample after adoption. Our sample spans 1990–2015. Reported below the coefficients are Z-statistics calculated with standard errors clustered at the state level. \*, \*\*, \*\*\* indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively.

state does not influence the adoption timing. Changing the window over which we count AAERs in the state (e.g., the past three or five years) or measuring AAERs differently (an indicator variable for any AAER in the state) does not affect our inferences.

In terms of CPA board and licensing characteristics, column 2 shows that states adopt earlier when there are more CPAs on the board of accountancy. Economically, a one standard deviation increase in the number of

CPA board members accelerates adoption by almost one year. We find little role for the percentage of board members belonging to national firms, how the board is funded, or the license fee.

Column 3 finds accounting labor market conditions do not explain adoption timing. Column 4 shows that job creation (GDP per capita) accelerates (delays) adoption. We find little role for our political variables in column 5. Column 6 combines all five sets of variables into the model and finds similar inferences: The percentage of CPAs on the State Board of Accountancy and job creation are the sole predictors of adoption. Adoption does not appear to respond to recent scandals or accounting labor market conditions.

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