

## **Supplemental Appendix**

### **Regulatory Spillovers in Common Audit Markets**

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## **Evidence of Demand Shock and Labor Inelasticity Subsequent to the Passage of SOX**

In this section of the supplemental appendix, we discuss two conditions that allowed changes in the public audit market caused by SOX to affect the attestation market for nonpublic entities: (1) the regulation caused a demand shock to public companies; and (2) accounting labor was sufficiently inelastic, causing audit firms to reallocate resources to address mandated public company demand. We present descriptive evidence supporting both conditions. Figure A1 plots the annual residuals from a regression of log public company audit fees on a linear trend, company size, and industry fixed effects. Consistent with prior work, this plot shows a sharp upward shift in 2004—the first year companies had to comply with the Section 404 provision of SOX (Griffin and Lont 2007; Ettredge et al. 2007; Iliev 2010, Badertscher, Jorgensen, Katz, and Kinney 2014). Moreover, the increase is large: total audit fees for public companies increased by nearly \$4 billion, or 70% from 2003 to 2004. While per-unit price increases likely account for some portion of the fee spike in Figure A1, an increase in the volume of auditing was undoubtedly an important factor given the considerable amount of effort entailed in IC attestation.

We next present descriptive evidence of accounting labor supply around the passage of SOX. Figure A2 plots the number of individuals working in offices of CPAs. Notably, the number *declined* at the same time as the sharp increase in audit fees shown in Figure A1, with employment reaching a local low in 2005. We suggest two explanations for this. First, following the passage of SOX, public companies (i.e., the audit clients) improved their internal controls. To do so, they hired many accountants, including individuals from CPA firms. Figure A3 plots the number of individuals working as “Accountants and Auditors” regardless of what type of entity employs them. In contrast to the decline shown in Figure A2, Figure A3 shows a steady increase, concentrated between 2002 and 2008. Thus, non-CPA firms such as industrial, financial, and service companies were employing significantly more accountants. Second, accounting education and licensure requirements produce a short-run inelasticity in supply and the number of students graduating from accounting programs significantly dropped in the years surrounding the passage of SOX. The American Institute of Certified Public Accountants (AICPA) reports that the number of new graduates with either

a masters or undergraduate degree fell from approximately 60,000 in 2000-01 to just over 40,000 in 2005-06 (AICPA 2015). The graduation rate recovered by 2009, approximately five years after the audit demand shock in 2004 and consistent with the five years of college education to produce an accountant.

Collectively, audit fees for public companies increased substantively in 2004 with the enactment of Section 404 IC testing, while at the same time employment in accounting firms experiences a local low point, supporting—at least descriptively—the potential combination of a public company demand shock and inelastic labor supply. These short-run conditions were paired with potentially longer run changes in the form of new audit standards and regulation of public audit firms. To investigate the extent to which these audit market features allowed SOX to have spillover effects on entities other than public companies, we examine the audit market for privately held companies and NPOs in both the short- and long-run.

## Specialization across Audit Firms

In this section of the supplemental appendix, we provide a detailed description of our analysis of the long-run specialization across audit firms. We begin by reporting the coefficient estimates of the predictive model described in equation (4). In Panel A of Table A3, we find NPO size is positively and significantly related to the probability of using a public company specialist. We then report by year the mean NPO size and predicted value of *Auditor100PublicClients* in Columns 2 and 3 of Panel B of Table A3. In 2001, the mean NPO has \$22.87 million of assets, and a 15.4% probability of matching with large auditor of public companies, according to the parameters of our 2000 model. Column 4 shows the actual probability of matching with such an auditor is 14.8%; just 0.7% below the predicted probability (column 5), and the difference is insignificant (column 6). After SOX, we find much greater divergence between the predicted and actual audit matches. More important to the prediction of a structural change in the audit market (as opposed to temporary labor shortage), note the persistence of divergence between predicted and actual matches. Each year from 2005 to 2013, the predicted probability of an annually inspected auditor match exceeds the actual probability by at least 6.4%, and the difference is always statistically significant. This evidence is consistent with SOX increasing the separation between the public and nonpublic entity markets.

The subsequent panels of Table A3 repeat our Panel B analysis on different samples. First, Panel C partitions the sample based on NPO size. Because the smallest NPOs are unlikely to have matched with a large auditor *ex ante* and because we want to assure our results are not driven by an influx of smaller NPOs, we restrict our sample each year to the NPOs with an above median level of assets.<sup>1</sup> We find the differences between predicted and actual matches are economically and statistically significant each year from 2005 to 2013.

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<sup>1</sup> Our prediction model—which includes NPO size—should already account for any change in composition based on size or activity type; however, partitioning the sample further assures that un-modeled size composition changes are accounted for. Moreover, to ensure our findings are not solely induced by auditors leaving the public audit market (e.g., DeFond and Lennox 2011), in untabulated results we assign audit firms based on whether they are public company specialists *beyond* 2004—i.e., we look ahead to 2004-2005 (after the exodus of auditors) to assign an auditor as a public specialist only if they continue to audit public companies. Our results are economically and statistically similar.

One concern with the analysis presented thus far in Table A3 is that switching costs, rather than segmentation, could account for persistence of the results through 2013. Specifically, NPOs may have switched from large auditors upon the initial SOX shock, but did not return to those auditors when the labor market recovered because of the fixed costs associated with switching back. To address this concern, we next consider only NPOs newly entering the Single Audit market. Examining whether NPOs newly entering the sample are less likely to match with large auditors post-SOX mitigates concerns that the longer run results come from switching costs. Panel D presents a significantly large difference between predicted and actual audit matches from 2005 to 2013. That the divergence is so stark (in 2013, the actual match of 4.6% is about one-third the predicted match of 12.8%) indicates that the loss of new client market share significantly contributes to our panel B results.

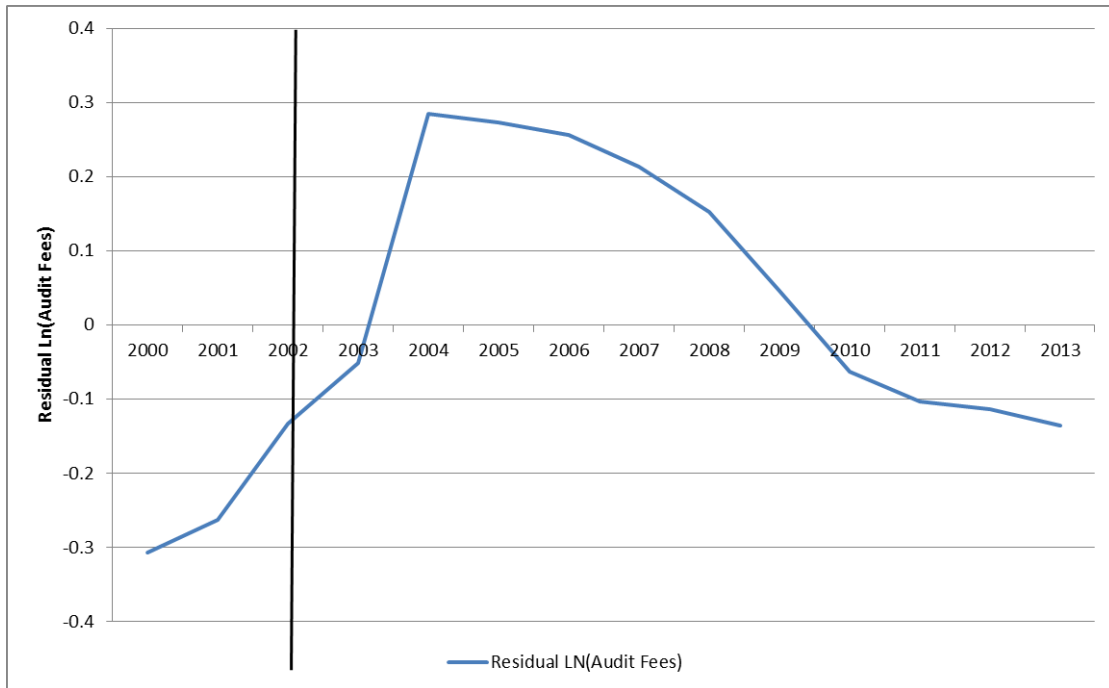
An additional concern is that the Fama and French (2001) approach, while accounting for composition changes, relies on using a parsimonious model to make out of sample predictions. An alternative way to test for separation is to simply track over time the market share of NPOs captured by public company specialist auditors. Column 4 highlights that the actual market share declines. Together, our analysis is consistent with SOX inducing separation in audit supply.

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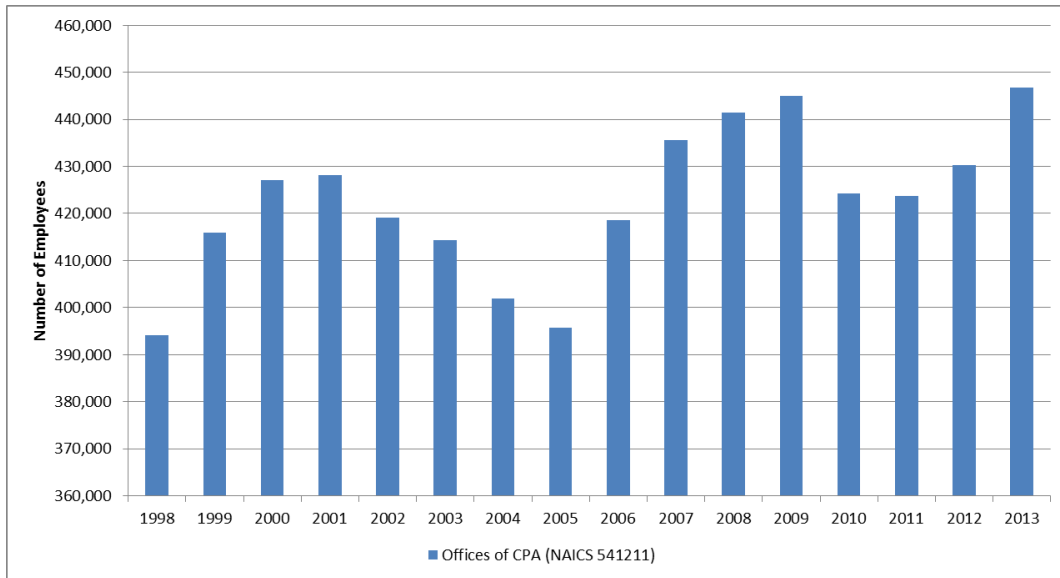
### Figure A1: Residual Public Companies Audit Fees

This figure plots the sum of the residuals for each year from the regression:  $\ln(\text{audit fees})_{i,t} = \beta_1 \ln(\text{assets})_{i,t} + \beta_2 \text{trend}_i + \text{industry}_i + e_{i,t}$ . The data is for all companies included in Audit Analytics.



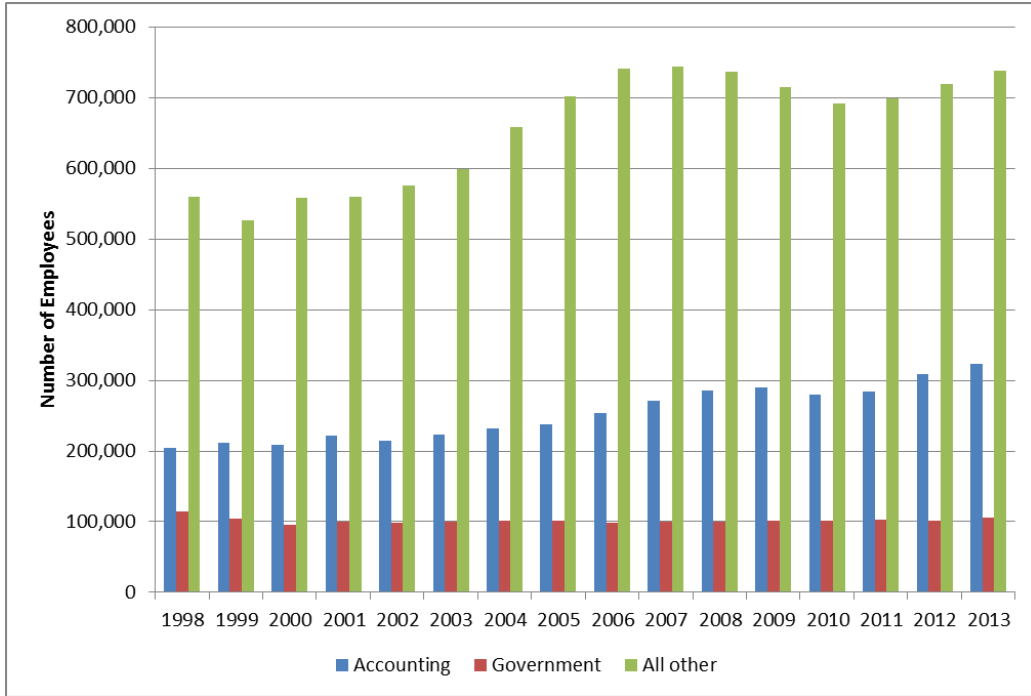
**Figure A2: Employees at Offices of Certified Public Accountants**

This graph plots the number of employees at establishments of CPA firms by year. The data comes from Census Bureau's County Business Patterns.



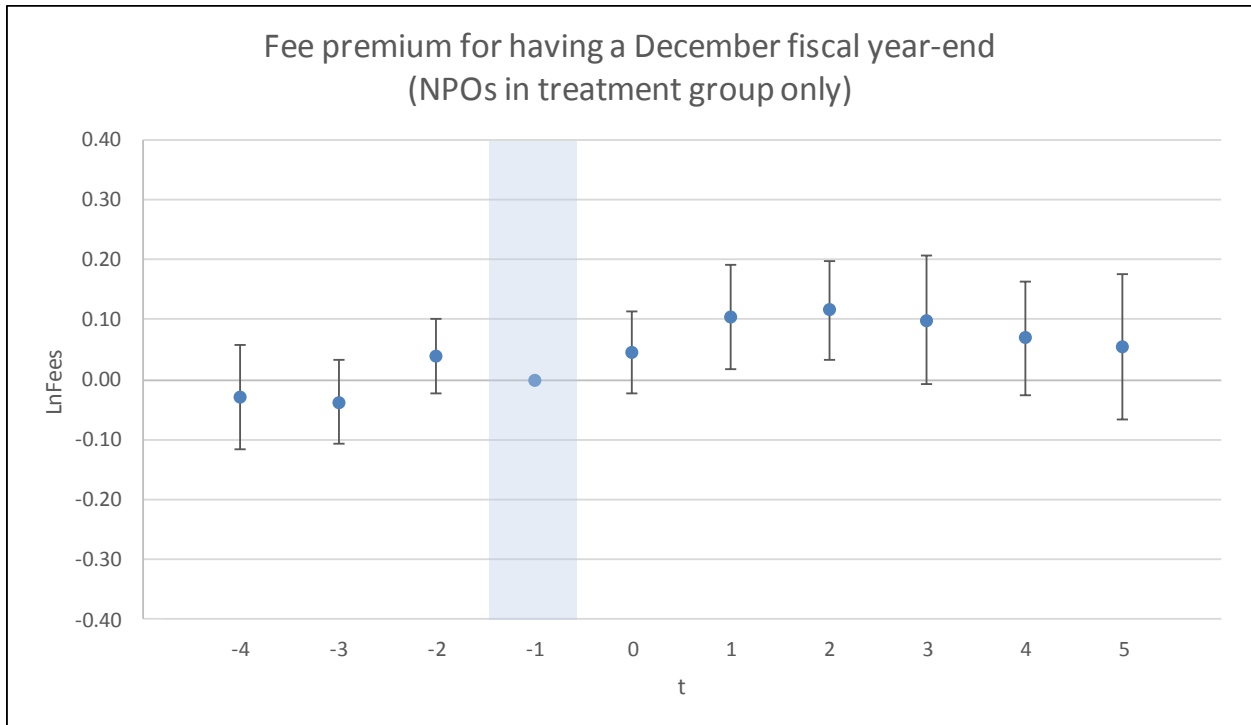
**Figure A3: Number of Individuals Employed as Accountants and Auditors**

This Figure plots the number of individuals employed as “Accountants and Auditors” (BLS occupation code 13-2011). These are individuals employed in a variety of firms and industries with the description of: “Examine, analyze, and interpret accounting records to prepare financial statements, give advice, or audit and evaluate statement prepared by others. Install or advise on systems of recording costs or other financial and budgetary data” (BLS, Occupational Employment Statistics).



### Figure A4: Premium in Audit Fees for Having a December Fiscal Year-End

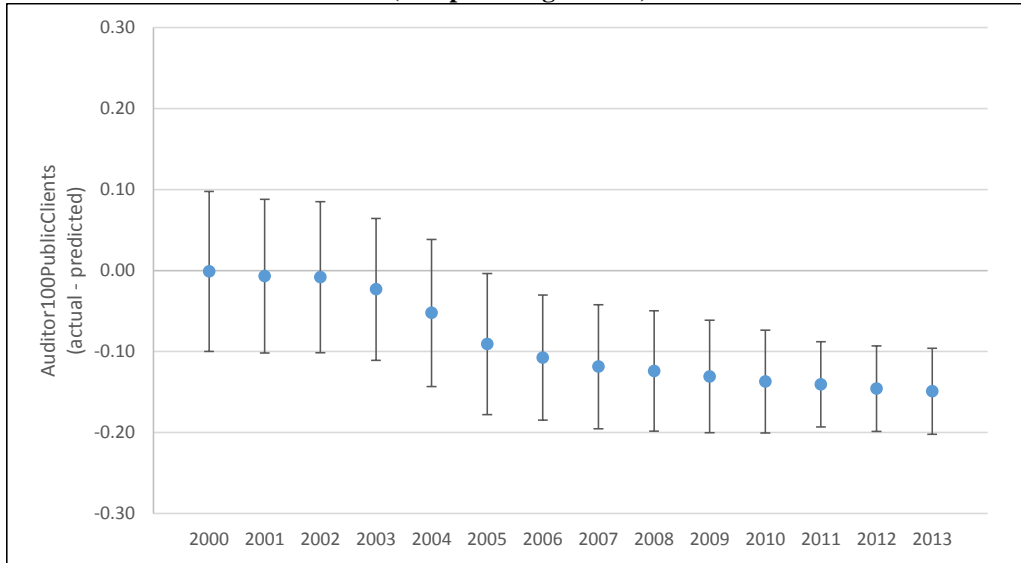
The purpose of this figure is to assess the parallel trend assumption between NPOs with a December year-end and NPOs with a non-December year-end, in the treatment group. The figure is a graphical representation of the difference-in-differences analysis of the effect of Section 404 on the premium in audit fees for having a December fiscal year-end (relative to the premium at t-1). Only observations in the treatment group are included. We estimate a version of equation (2) where we measure the difference in audit fees between NPOs with a December year-end and NPOs with non-December year-end.  $t=0$  is the first year an NPO's auditor issues internal control attestations to public companies. Period t-1 has a coefficient of zero and no confidence interval because it serves as the benchmark period. We plot the coefficients and their 95% confidence interval.



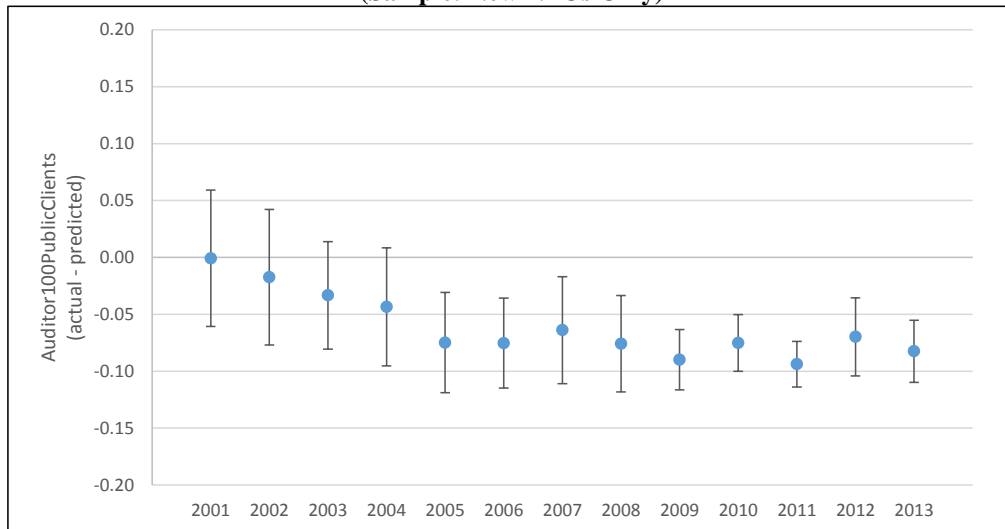
**Figure A5: NPO Characteristics and the Propensity to use an Auditor with Public Clients – Additional Specifications**

This figure presents the difference between the actual and predicted propensity of NPOs to match with large auditors of public companies. We estimated the predicted propensity using the probit model from eq. (4) estimated in 2000 (2001) for Figures A5A (A5B). Figure A5A (A5B) restricts the sample to NPOs with above median assets that year (newly entered NPOs in a given year). The bandwidths correspond to the 95% confidence interval based on standard errors clustered at the auditor level.

**Figure A5A: Propensity of NPOs to Match with Large Auditors of Public Companies (Sample: Large NPOs)**



**Figure A5B: Propensity of NPOs to Match with Large Auditors of Public Companies (Sample: New NPOs Only)**



### Table A1: SOX and Reporting Practices of Private Companies—Clustering Robustness

This table models financial statement collection by banks as a function of time. The dependent variable is % CPA, the proportion of financial reports which are either unqualified audits, reviews, or compilations. *Year 04-09* and *Year 02-03* are indicators for observations in those respective years. The sample spans 1995-2011. The unit of observation is industry-region-company size category-year. Reported below the coefficients are t-statistics calculated with standard errors clustered at the region x size group (Panel A) or industry and region x size group (Panel B) level. \*, \*\*, \*\*\* indicate significance at the two-tailed 10%, 5% and 1% levels, respectively. See Appendix A for variable definitions.

#### Panel A: Cluster by Region x Size Group

	(1)	(2)	(3)	(4)	(5)
	% CPA	% CPA	% CPA	% CPA	% CPA
Year 04-09	-0.022***	-0.021***	-0.020***	-0.023***	-0.019***
	[-4.09]	[-3.73]	[-4.41]	[-4.24]	[-3.31]
Year 02-03					0.014**
					[2.58]
Adj R-Sq.	0.781	0.846	0.781	0.794	0.781
N	34,902	34,902	34,902	34,902	34,902
Linear Trend	Yes	Yes	Yes	No	Yes
Second and Third Order Trend	No	No	Yes	No	No
Industry-Specific Trend	No	No	No	Yes	No
Industry FEs	Yes	No	Yes	Yes	Yes
Region FEs	Yes	No	Yes	Yes	Yes
Size Category FEs	Yes	No	Yes	Yes	Yes
Industry-Region-Size Category FEs	No	Yes	No	No	No
Clustering	Size x Region	Size x Region	Size x Region	Size x Region	Size x Region

#### Panel B: Cluster by Industry and Region x Size Group

	(1)	(2)	(3)	(4)	(5)
	% CPA	% CPA	% CPA	% CPA	% CPA
Year 04-09	-0.022***	-0.021***	-0.020***	-0.023***	-0.019***
	[-3.68]	[-3.59]	[-3.95]	[-3.57]	[-2.86]
Year 02-03					0.014*
					[1.96]
Adj R-Sq.	0.781	0.846	0.781	0.794	0.781
N	34,902	34,726	34,902	34,902	34,902
Linear Trend	Yes	Yes	Yes	No	Yes
Second and Third Order Trend	No	No	Yes	No	No
Industry-Specific Trend	No	No	No	Yes	No
Industry FEs	Yes	No	Yes	Yes	Yes
Region FEs	Yes	No	Yes	Yes	Yes
Size Category FEs	Yes	No	Yes	Yes	Yes
Industry-Region-Size Category FEs	No	Yes	No	No	No
Clustering	Size x Region, Industry	Size x Region, & Industry	Size x Region, & Industry	Size x Region, & Industry	Size x Region, & Industry

### Table A2: SOX and Reporting Practices of Private Companies—2004-2005 Post Period

This table models financial statement collection by banks as a function of time. The dependent variable is % CPA, the proportion of financial reports which are either unqualified audits, reviews, or compilations. *Year 04-05* and *Year 02-03* are indicators for observations in those respective years. The sample spans 1995-2011, omitting 2006-2009. The unit of observation is industry-region-company size category-year. Reported below the coefficients are t-statistics calculated with standard errors clustered at the industry level. \*, \*\*, \*\*\* indicate significance at the two-tailed 10%, 5% and 1% levels, respectively. See Appendix A for variable definitions.

	(1)	(2)	(3)	(4)	(5)
	% CPA	% CPA	% CPA	% CPA	% CPA
Year 04-05	-0.024***	-0.022***	-0.027***	-0.025***	-0.021***
	[-4.80]	[-4.70]	[-7.08]	[-4.76]	[-3.66]
Year 02-03					0.014***
					[2.78]
Adj R-Sq.	0.760	0.825	0.761	0.774	0.761
N	26,125	26,125	26,125	26,125	26,125
Linear Trend	Yes	Yes	Yes	No	Yes
Second and Third Order Trend	No	No	Yes	No	No
Industry-Specific Trend	No	No	No	Yes	No
Industry FEs	Yes	No	Yes	Yes	Yes
Region FEs	Yes	No	Yes	Yes	Yes
Size Category FEs	Yes	No	Yes	Yes	Yes
Industry-Region-Size Category FEs	No	Yes	No	No	No
Clustering	Industry	Industry	Industry	Industry	Industry

**Table A3: NPO Characteristics and the Propensity to use an Auditor with Public Clients**

This table presents the predicted and actual propensity of NPOs to match with large auditors of public companies. In Panel A, we present the coefficient estimates for the following probit model estimated in 2000 for Panels A-C (2001 for Panel D):

$$Auditor100PublicClients_{NPO} = \beta_1 \times LnAssets_{NPO} + \alpha_{State} + \alpha_{Activity\ Type} + \varepsilon_{NPO}$$

Panel B reports by year the mean assets for all NPOs, the predicted and actual percent of NPOs that use an auditor with 100 or more public clients, and the difference between the predicted and actual values. The sample includes all NPOs in the GuideStar dataset. Panel C (D) restricts the sample to NPOs with above median assets that year (newly entered NPOs in a given year). The t-statistics are calculated with standard errors clustered at the auditor level. \*, \*\*, \*\*\* indicate significance at the two-tailed 10%, 5% and 1% levels, respectively.

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Panel A: Predictive model

	Auditor100PublicClients	Auditor100PublicClients	Auditor100PublicClients
LnAssets	0.350*** [8.55]	0.472*** [9.65]	0.305*** [7.56]
Pseudo R-Sq.	0.258	0.271	0.251
N	12,582	6,258	2,589
State FEs	Yes	Yes	Yes
Activity type FEs	Yes	Yes	Yes
Year	2000	2000	2001
Above median size only	No	Yes	No
New NPO clients only	No	No	Yes

Panel B: Predicted vs actual propensity to use an auditor with 100 public clients - full sample

Year	Assets	Predicted	Actual	Difference	t-stat
2000	23,505	15.6%	15.5%	-0.1%	-0.03
2001	22,870	15.4%	14.8%	-0.7%	-0.18
2002	22,854	15.4%	14.7%	-0.8%	-0.21
2003	22,244	15.4%	13.6%	-1.8%	-0.53
2004	27,813	17.4%	13.4%	-4.0%	-1.28
2005	31,482	18.5%	12.1%	-6.4%	-2.21**
2006	30,848	18.0%	10.6%	-7.4%	-2.87***
2007	31,742	18.2%	10.1%	-8.1%	-3.21***
2008	28,841	17.9%	9.2%	-8.8%	-3.71***
2009	27,651	17.8%	8.5%	-9.3%	-4.12***
2010	26,299	17.3%	7.7%	-9.7%	-4.82***
2011	23,721	16.4%	6.4%	-9.9%	-6.08***
2012	23,607	16.3%	6.1%	-10.2%	-6.26***
2013	23,897	16.4%	6.1%	-10.3%	-6.19***

Panel C: Predicted vs actual propensity to use an auditor with 100 public clients - large NPOs

Year	Assets	Predicted	Actual	Difference	t-stat
2000	46,189	24.3%	24.2%	-0.1%	-0.02
2001	44,918	24.0%	23.3%	-0.7%	-0.14
2002	44,905	24.1%	23.2%	-0.8%	-0.17
2003	43,781	24.0%	21.7%	-2.3%	-0.52
2004	54,364	28.1%	22.8%	-5.2%	-1.13
2005	61,613	30.3%	21.2%	-9.1%	-2.04**
2006	60,371	29.5%	18.7%	-10.8%	-2.73***
2007	62,007	29.7%	17.8%	-11.9%	-3.04***
2008	56,229	28.8%	16.4%	-12.4%	-3.28***
2009	53,947	28.2%	15.1%	-13.1%	-3.69***
2010	51,315	27.3%	13.6%	-13.7%	-4.24***
2011	46,303	25.6%	11.5%	-14.1%	-5.22***
2012	46,181	25.6%	11.0%	-14.6%	-5.40***
2013	46,759	25.9%	11.0%	-14.9%	-5.50***

Panel D: Predicted vs actual propensity to use an auditor with 100 public clients - New NPOs only

Year	Assets	Predicted	Actual	Difference	t-stat
2001	14,239	11.4%	11.3%	-0.1%	-0.03
2002	16,771	12.8%	11.1%	-1.8%	-0.58
2003	12,432	12.8%	9.5%	-3.3%	-1.39
2004	15,825	14.0%	9.7%	-4.3%	-1.64
2005	19,164	15.5%	8.0%	-7.5%	-3.33***
2006	14,518	13.9%	6.4%	-7.5%	-3.74***
2007	12,036	12.7%	6.4%	-6.4%	-2.67***
2008	18,812	14.5%	6.9%	-7.6%	-3.51***
2009	16,017	13.2%	4.3%	-9.0%	-6.62***
2010	12,961	11.7%	4.2%	-7.5%	-5.91***
2011	10,560	12.4%	3.0%	-9.4%	-9.17***
2012	13,367	12.1%	5.1%	-7.0%	-3.98***
2013	13,760	12.8%	4.6%	-8.3%	-5.91***