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## Determinants and career consequences of early audit partner rotations

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No. 676

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# Determinants and Career Consequences of Early Audit Partner Rotations\*

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**ABSTRACT:** We examine how often and why some audit partners rotate off client engagements before the end of the maximum five-year cycle period. Specifically, we investigate whether audit quality issues play a role for engagement partners and clients to separate prematurely. For a sample of about 4,000 within-audit firm partner rotations for Big 6 clients over the 2008 to 2014 period, we find that client characteristics such as financial leverage or performance have little explanatory power. In contrast, severe audit quality issues such as financial restatements or PCAOB inspection findings are associated with early partner rotations. These associations are more pronounced for early rotations that are not explained by scheduled retirements, promotions, or temporary leaves as well as for large clients and when partners are less experienced. We also find that female partners have a higher likelihood of early rotation for audit quality reasons. Early rotations have career consequences. Partners are assigned to fewer SEC issuer clients, manage fewer audit hours, receive lower partner ratings, and are more likely to be internally inspected after being rotated early. Our results suggest that audit quality concerns are an important factor for early partner rotations with ensuing negative career consequences for partners' client assignments and management responsibilities.

**JEL Classifications:** *J01; J44; L84; M21; M42.*

**Keywords:** *auditor rotation; audit quality; audit partners; career development; audit industry; PCAOB.*

\* This study uses nonpublic PCAOB data. Brandon Gipper was an Economic Research Fellow of the PCAOB in 2015 and 2016. Gipper initially submitted a research proposal to the PCAOB describing the research questions, the research design as well as the nonpublic data necessary to conduct the study. As a condition of data access, our study is reviewed by the PCAOB with respect to the release of nonpublic information (but not for its results). The PCAOB, as a matter of policy, disclaims responsibility for any private publication or statement by any of its economic research fellows, advisors, and employees. The views expressed in this paper are our own and do not necessarily reflect the views of the Board, individual Board members, or staff of the PCAOB. From 2013 to 2018, Christian Leuz served as an Economic Advisor to the PCAOB. We appreciate the helpful comments of workshop participants at the CGEC Research Series, Junior Accounting Faculty Zoom Brownbag Series, PCAOB's Center of Economic and Risk Analysis, and Stanford University.

## 1. INTRODUCTION

Regulators around the world mandate audit partner rotation. The regulatory intent for these rotations is to encourage fresh look and prevent capture (e.g., Hamilton et al., 2005; Bamber and Iyer, 2007; Corona and Randhawa, 2010). For U.S. firms, a five-year mandate for issuers registered with the U.S. Securities and Exchange Commission (SEC) was established as part of the Sarbanes-Oxley Act (SOX) in 2002. Since then, the rotation of the lead partner after a five-year term is the norm, and several studies examine the economic and audit quality consequences of these mandatory rotations (e.g., Manry et al., 2008; Litt et al., 2014; Laurion et al., 2017; Fitzgerald et al., 2018; Gipper et al., 2021). In contrast, we know relatively little about the occurrence and reasons for audit partner rotations that take place early, that is, *before* the end of the five-year term.<sup>1</sup> Survey and anecdotal evidence suggest that early audit partner rotations are rare events (Litt et al., 2014; Laurion et al., 2017). Yet, Gipper et al. (2021) show for a large sample of Big 6 U.S. audit engagements that about a third of the partner rotations within-audit firm occur before the end of the mandatory term. This high frequency raises important questions about the reasons for and consequences of early rotations. Do audit firms reallocate partners exhibiting low audit quality? Do clients push for the replacement of an engagement partner after negative audit quality events? Do early rotations, in particular if they are for audit quality issues, affect the career trajectory of the involved partners? Alternatively, do clients engage in partner-level opinion shopping, as has been shown in China (e.g., Chen et al., 2016)? In this study, we take a first step towards answering these questions and provide evidence on the role of audit quality for early partner rotations and the ensuing career consequences for partners.

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<sup>1</sup> Throughout the text, we synonymously use the terms “early rotations,” “non-mandatory rotations,” or “premature rotations.” However, we avoid the term “voluntary rotations,” because the reasons for replacing the engagement partner before the end of the five-year term may be involuntary from the perspective of the partner or the client.

Early partner rotations can occur for many reasons. On the one hand, they could simply be the result of audit partners' regular career progression such as promotions to leadership roles, moving into specific fields of expertise, or retirements at the end of careers. They also could reflect certain life events like geographical relocation for personal reasons, periodic sabbaticals, or parental leaves (e.g., Maister, 2012). All these factors are likely unrelated to audit quality. On the other hand, audit quality issues could play a role when clients and audit firms and/or engagement partners separate (e.g., Menon and Williams, 1991; Krishnan, 1994; Newton et al., 2016). For instance, audit firms are keen to preserve their reputation and, hence, could switch partners to improve audit quality and reduce the risk of material misstatements. The new partner could provide a fresh look or new expertise that is required after a change in client or engagement characteristics. The incumbent partner could be a poor match for the client or provide low audit quality. The clients' audit committees could also request the replacement of a partner for similar reasons. Alternatively, from an agency cost perspective, management could pressure the audit firm or the engagement partner to reduce audit quality or to acquiesce to its accounting choices (e.g., Beattie et al., 2000; Gibbins et al., 2001). Audit firms may accommodate such partner-level opinion shopping by removing strict partners and installing less strict partners to appease the client.<sup>2</sup>

To provide evidence on the role of audit quality for early partner rotations, we use proprietary data from the Public Company Accounting Oversight Board (PCAOB) to construct a client-year panel over the period 2008 through 2014—that is, before the names of the engagement partners had to be disclosed on Form AP. We use this panel to identify 2,512 mandatory and 1,461 non-mandatory rotations among the more than 3,300 SEC issuer clients of Big 6 audit firms in our

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<sup>2</sup> Examples in the U.S. preceding our sample period include Arthur Andersen's removal of Carl Bass from Enron (Greising, 2002) or KPMG's removal of Ronald Safran from Xerox (Andrejczak, 2003). In both cases, the clients believed that the partners were too strict and successfully pressed the audit firms to remove Bass and Safran, replacing them with more lenient partners. Later, Enron and Xerox were revealed to commit accounting fraud.

sample. Thus, 37 percent of the within-audit firm partner rotations are early. We focus on these and examine potential factors related to their occurrence. In particular, we examine a range of client characteristics as well as audit quality proxies, including PCAOB inspection results and audit firms' internal inspection outcomes, which are unique to the PCAOB data. We further use the PCAOB data to construct a partner-year panel covering about 4,500 engagement partners with at least one SEC issuer client over the same sample period. This data structure allows us to follow the career paths of individual partners over time and to study their career trajectories around early partner rotations.

Our analysis proceeds in four steps. First, we examine whether various client attributes and characteristics of the audit engagement can explain the occurrence of non-mandatory rotations. We find that client performance such as past stock returns, sales growth, or profitability are unrelated to early rotations. So are structural client attributes like financial leverage or future growth prospects, except that larger firms are less likely to incur an early partner rotation. On the other hand, several partner attributes are associated with early rotations. Partners that spend less time with the client and have fewer publicly traded clients are more likely to exhibit a non-mandatory rotation. We also find a positive relation between partner experience and early rotations, but this association reverses once we control for senior partners moving to exclusive management positions or retirements (Maister, 2012). The findings suggest that partner rather than client characteristics play a more important role in determining whether a client-partner relationship is terminated prematurely. Based on this insight, we distinguish between early rotations that are explainable by ordinary life events over a partner's career such as scheduled retirements, upward promotions, office switches, or temporary leaves/replacements (Litt et al.,

2014; Laurion et al., 2017) and those that remain unexplained. We expect audit quality issues to matter only for the latter category, which accounts for 78 percent of all early partner rotations.

Second, we examine audit quality patterns around non-mandatory rotations. Using our client-year panel, we regress several direct measures of low audit quality (i.e., restated financial statements, PCAOB inspection findings, and audit firm internal inspection findings) on an indicator marking the year leading up to an early partner rotation. This model allows us to benchmark associations for audit quality against those in other years, such as the year before mandatory rotations, and to include a comprehensive set of controls and fixed effects. We find that partners are more likely to be rotated off early right after fiscal years for which clients (later) must restate their financials or for which a PCAOB inspection results in a Part I finding. The timing of these early rotations is consistent with audit firms or clients responding to audit quality issues, rather than audit firms acquiescing to client pressures. In addition, the effects are present only for early rotations that are unexplained by changes in partners' common life circumstances and—for the subset of PCAOB inspected engagements—when the detected audit deficiencies can be considered severe. These findings further bolsters the audit quality interpretation. In cross-sectional analyses, we find that the results are concentrated among larger and, hence, important clients, when the responsible audit office is relatively unconstrained in assigning partners, and for younger, less experienced partners. These results are consistent with audit firms actively managing client relations and still learning about the quality of newer partners. We also find that the likelihood of early rotations for audit quality reasons is elevated for female partners, pointing to a potentially disparate treatment across genders, as has been shown in other settings (e.g., Goldin and Rouse, 2000; Egan et al., 2018).



Third, we switch our focus to the partner level and exploit the wealth of PCAOB data to provide descriptive statistics about engagement partners and their client portfolios as their career progresses. We measure career progress by the years of experience since being granted partnership at the firm. The typical partner manages fewer clients over time, and her focus shifts from private and not-for-profit firms to SEC issuer clients. Consistent with this shift to larger, more important clients, the partner manages more staff hours, generates larger fees, and spends less time on billable client work as her career progresses. The clients not only become larger but also more profitable and exhibit lower growth rates as time goes on. These patterns are intuitive and suggest a natural career progression of the average partner in the hierarchy of the audit firms.

Fourth, we examine how unexplained, non-mandatory rotations—and implicitly, audit quality issues leading to these early rotations—affect partners’ career trajectories. To do so, we use the partner-year panel and regress attributes of partners’ client portfolios and their job performance on a set of indicators marking the first, second, third, and all later years after a partner’s initial early rotation over the sample period. For benchmarking, we also include the same yearly indicators following the partner’s initial mandatory rotation in the model. We find a stark decline in the number of SEC issuer clients assigned to partners after early rotation, and that this loss of clients is only partially compensated by private or not-for-profit clients over time. The new clients are not only smaller but also perceived as less risky by the audit firms. Consequently, partners manage fewer staff hours and generate less fees after early rotations. They also take a dip in their time spent on billable client work, are more likely to be internally inspected, and receive lower partner ratings in the year immediately following an early reassignment. To the contrary, after mandatory rotations, partners get assigned more SEC issuer clients, oversee more staff, generate larger fees, and are less likely to be internally inspected. In sum, the results suggest that audit quality issues

and the ensuing early rotations have negative implications for partners' future careers, both in terms of client assignments and management responsibilities.

This paper makes several contributions to the literature. First, we systematically examine early rotations of audit partners in the U.S., which are not as infrequent as one would think based on prior literature (Litt et al., 2014; Laurion et al., 2017), but occur in about a third of all within-audit firm rotations. We find that audit quality concerns are an important factor for early partner rotations. As we conduct our analyses before partners' name disclosures began in 2017, our results are free of influences associated with partner transparency. Therefore, our evidence can serve as baseline when studying the effects of partner name disclosure around early rotations. Second, we provide broad sample evidence on audit partners' career progression in general and following non-mandatory partner rotations in particular. Our focus on early rotations that are not explained by career progression and ordinary life events allows us to highlight the role of audit quality for partners' career trajectories. We find that early rotations for audit quality reasons have negative career implications for the respective partners. Third, our analyses allow comparisons with prior papers that examine early (or voluntary) partner switches in other countries, such as Australia (e.g., Hamilton et al., 2005), China (e.g., Firth et al., 2012; Chen et al., 2016), or Taiwan (e.g., Chi et al., 2009). Our findings, along with the analyses on mandatory rotations in Gipper et al. (2021), suggest that the U.S. is different from these countries in important ways. For instance, our evidence suggests that early rotations are an important tool for audit firms to address and manage audit quality issues, whereas findings from China or Taiwan point to client pressures and clients' internal opinion shopping as an explanation for early rotations. Finally, we provide preliminary evidence that female audit partners are treated differently after audit quality issues (see also Lee, Nagy, Zimmerman, 2019; Hardies, Lennox, and Li, 2020), similar to discriminatory findings for female

CEOs (Bertrand and Hallock, 2001), financial analysts (Kumar, 2010), or financial professionals (Egan et al., 2018). This differential treatment together with our evidence on the negative career impact of early rotations suggests one mechanism through which gender disparities can have lasting effects within audit firms.

## **2. PRIOR LITERATURE AND HYPOTHESIS DEVELOPMENT**

### **2.1. Literature on Partner Rotations, Internal Monitoring, and Partner Assignments**

Our study is related to three streams of literature: (i) audit partner rotations, (ii) audit firm internal monitoring, and (iii) audit partner assignments and client-partner matching. We briefly discuss each of these literatures.

The first stream of literature examines the determinants and economic consequences of (early) partner rotations. There are studies on these issues in Australia, China, Germany, Italy, and Taiwan, which is largely driven by the fact that partner names are disclosed in these countries. Prior to partner tenure limits, all partner rotations could be considered non-mandatory. The U.S. introduced a partner tenure limit in the 1970s (see Gipper et al., 2021 for more discussion). Rotation mandates differed across countries in the past but have largely converged following SOX. At this point, most countries have five-year cycles, though sample periods of partner rotation studies sometimes predate these changes and cover longer tenures. Studies find mixed results when it comes to the effects of partner tenure and switches on audit quality, even within the same country and over similar time periods. Some studies find results consistent with fresh look benefits—that is, higher audit quality after rotation—and partner capture over time—that is, lower audit quality before rotation (e.g., Carey and Simnett, 2006; Fargher et al., 2009). Others find results consistent with learning and experience benefits (e.g., Chen et al., 2008; Azizkhani et al., 2013).

Several studies examine partner switches directly and find low audit quality before a non-mandatory rotation and/or high(er) audit quality afterwards (e.g., Hamilton et al., 2005; Gold et al., 2012; Lennox et al., 2014; Aobdia and Petacchi, 2019). This evidence can be interpreted as consistent with fresh look benefits from installing a new partner. Firth et al. (2012) and Chen et al. (2016) study Chinese auditors and find the reverse pattern, that is, high (low) audit quality before (after) a non-mandatory rotation, using audit adjustments and modified audit opinions as proxies. They interpret these findings as evidence of client pressures or a form of (internal) opinion shopping. Chi et al. (2009) examine audit quality with and without mandatory partner rotations in Taiwan and find no quality differences between the two regimes using accruals models. However, they find that firms' earnings response coefficients are lower for early partner rotations during the mandatory rotation regime, suggesting a potential effect on investor perceptions.

The second stream of related literature deals with audit firms' internal monitoring. In the U.S., audit firms are required to have quality control processes to monitor compliance with their own audit standards (see QC Section 30 originally written by the AICPA and adopted by the PCAOB). Thus, audit firms regularly conduct internal monitoring, including post-issuance reviews of the engagement working papers by independent inspection teams. These internal inspection data have been used in some studies to measure audit quality (e.g., Bell et al., 2015; Aobdia, 2019; Gipper et al., 2021). Because of data confidentiality or lack of access to such data, other studies could not use this information for their analyses of the internal auditing processes or auditors' career progression (e.g., Bedard et al., 2008; Houston and Stefaniak, 2013). However, anecdotal evidence suggests that partners suffer monetary consequences for not being able to retain clients or low audit quality (e.g., Knechel et al., 2013).

Separate from internal inspections, audit firms also regularly evaluate partners' job performance. For example, many audit partners receive updated performance ratings at least once a year, as we can infer from year-on-year changes in internal inspection ratings and partner ratings submitted to the PCAOB by the audit firms. Similarly, Coram and Robinson (2017) conclude from interviews of Australian audit partners that audit firms use detailed data and metrics to measure partner performance, such as staff feedback, employee satisfaction, percent growth in fees, chargeable hours, etc. Generally speaking, however, partner performance measures remain largely unexamined by academic research (e.g., Huddart, 2013; Lennox and Wu, 2018).

The third stream of literature considers partner assignments and client-partner matching. Partner assignments can be important for delivering high audit quality. Survey evidence of audit partners indicates that partner assignments are regularly discussed with the client and that clients show an active interest in the assigned partners (e.g., McCracken et al., 2008; Daugherty et al., 2012; Dodgson et al., 2020). Further, individual attributes of the partners have been shown to associate with audit characteristics in many settings. For example, Gul et al. (2013) find significant variation in audit quality across individual audit partners in China using a partner-fixed effects approach. Aobdia et al. (2015) provide similar evidence for Taiwan. For Sweden, Knechel et al. (2013) show persistence in partner audit quality and that capital markets recognize these partner "types" and penalize low quality. Other papers suggest that specific partner characteristics matter in setting fees, such as gender (e.g., Lee et al., 2019) or industry expertise (e.g., Aobdia et al., 2019). However, we have little evidence on how low audit quality events relate to the client-partner matching process and affect individual partner attributes.

## 2.2. PCAOB Data and Hypotheses

We examine a large sample of U.S. engagements by six large audit firms. During our sample period, partner names were not disclosed in the U.S., so we rely on a proprietary dataset collected by the PCAOB. SOX authorizes the PCAOB to collect data on audit firms with SEC issuers. The PCAOB obtains data from the audit firms via an annual data request and via the inspection process. A key advantage of our sample period that predates Form AP filings is that we can study early rotation effects that are largely unaffected by influences stemming from partner name disclosures. Further, the PCAOB data allow us to exploit more direct measures of audit quality such as PCAOB inspection findings and audit firm internal inspection findings. We can construct client-year and partner-year panels for the analyses and enrich these datasets with partner-level attributes not available elsewhere (even after Form AP disclosures), including counts of SEC issuer and non-issuer clients, staff hours under management, risk ratings of clients, and partner ratings.

We use these unique data to provide evidence on early partner rotations, audit quality, partner assignments, internal control processes, and audit partner career consequences, as called for in a recent review of research on audit partners (Lennox and Wu, 2018). More specifically, we examine the interplay between severe audit quality issues and the premature replacement of audit partners as well as the career consequences of such early rotations. There are two competing arguments why partners rotate early for audit quality reasons. On the one hand, there is the reputation or internal quality control perspective. Under this view, the audit firm could determine that the lead partner's audit is of low quality or a bad match for the client, for example, because the needs or characteristics of the client have changed and, hence, the firm decides to rotate the partner before the end of the mandatory term. Similarly, the client could identify the need for a more experienced or technically competent audit partner and request a rotation. In both cases, we would expect audit

quality to be lower (or low) preceding the rotation and higher (or “normal”) thereafter. Such early rotations for quality assurance purposes should have negative career consequences for the involved partners that could take the form of internal reassignments to lower responsibility tasks, pay reductions, negative performance evaluations, or ultimately even dismissals.

On the other hand, there is the agency cost or client pressure perspective (e.g., Gibbins et al., 2001; Chen et al., 2016). Under this view, client management tries to hide certain information and to do so, it pressures the audit firm to replace a strict or dissenting engagement partner with a more lenient or consenting one. These early rotations could occur if the lead partner attempts to change or even successfully forces the client to change poor accounting practices. Thus, the agency perspective predicts higher (or “normal”) audit quality prior to an early rotation and reduced audit quality thereafter or, at a minimum, no change in (low) audit quality around the early rotation. The career consequences for the involved partners in such an internal opinion shopping scenario are ambiguous as the “strict” partner could be penalized for standing up against the client and causing dissonance in the client-firm relationship. Alternatively, she could be rewarded for upholding audit quality and working to protect the audit firm from potential reputation and monetary damages in the event of regulatory investigations or shareholder litigation.

Under either view, the predicted relations between audit quality and early rotations should only apply to partner replacements that do not occur for ordinary life events or career progress like a partner moving to a different office for personal reasons, taking a parental leave, or reaching retirement age. In those cases, audit quality should be unrelated to partners’ early rotations.

### **3. CLIENT-LEVEL ANALYSES**

Our first set of empirical tests examines potential factors that could explain early partner rotations. Specifically, we investigate whether certain characteristics of the client, the audit

engagement, or the engagement partner help explain why for some engagements the lead partner rotates before the end of the mandatory five-year cycle. We also distinguish between early partner rotations that can be explained by career or life events like promotions, office moves, or parental leaves and the remaining (unexplained) rotations. Much of the analysis focuses on the question whether audit quality plays a role in these remaining rotations.

### 3.1. Research Design

The unit of analysis for the empirical tests in this section is an audit client relationship in a given year. The data are organized as a client-year panel as illustrated in Figure 1. We trace each client of one of the Big 6 audit firms over the years 2008 to 2014, for which we have access to the PCAOB data. The panel allows us to keep track of the engagement partner and the audit firm over time, and we can augment the dataset with year-specific client attributes (e.g., size, profitability) and audit engagement attributes (e.g., hours spent on the engagement). Importantly, the panel lets us identify audit partner rotations and whether they occur when a partner reaches the five-year maximum tenure or beforehand. As the figure illustrates, these partner rotations typically take place after the audit concludes for the current fiscal year and before the beginning of the new auditing period covering the next fiscal year. Based on this information we create a binary indicator for *Non-mandatory Rotations*, which serves as the dependent variable in our analysis of potential explanatory factors. For the audit quality analyses, we create another indicator marking the *Year before Non-mandatory Rotations* and include it as a regressor in the model along with indicators for other periods. With this design, we can benchmark the year leading up to an early rotation to other, potentially similar periods like the year before a mandatory rotation or before an audit firm switch (also indicated in the figure). Below, we provide the regression specifications for both designs.



To examine various potential determinants of early audit partner rotation, we estimate the following Ordinary Least Squares (OLS) regression model:

$$\begin{aligned} \text{Non-mandatory Rotation}_i = & \beta_0 + \sum \beta_m \text{Client Firm Characteristics}_{i,t} + \sum \beta_n \text{Audit} \\ & \text{Engagement Characteristics}_{i,t} + \sum \beta_k \text{Fixed Effects}_{i,t} + \varepsilon_{i,t}. \end{aligned} \quad (1)$$

As mentioned above, the dependent variable is the indicator marking whether client firm  $i$  experiences an early audit partner rotation during the upcoming fiscal year. We describe the selection of client firm and audit engagement characteristics that we use as potential explanatory factors in Section 3.3. In additional analyses, we use this model to identify factors like scheduled retirements, promotions, or parental leaves that help explain why certain partners leave early due to career and life events. This distinction lets us zoom in on the remaining (unexplained) early partner rotations in the analyses that follow. The model includes fixed effects for partner tenure years (TY), SIC two-digit industry (I), and audit firm-by-fiscal year (AF×Y), which—among other things—control for time trends (that may vary by audit firm) and unobserved (time-invariant) industry characteristics. We measure all independent variables in fiscal year  $t$ .

To analyze whether early partner rotations are associated with audit quality issues, we estimate the following OLS regression model:

$$\begin{aligned} \text{Audit Quality}_{i,t} = & \beta_0 + \beta_1 \text{Year before Non-mandatory Rotation}_{i,t} + \sum \beta_p \text{Benchmark Periods}_{i,t} \\ & + \sum \beta_j \text{Audit- and Client-specific Controls}_{i,t} + \sum \beta_k \text{Fixed Effects}_{i,t} + \varepsilon_{i,t}. \end{aligned} \quad (2)$$

The dependent variables are various proxies of audit quality. We code them as binary indicator variables that take on the value of ‘1’ for client  $i$  in fiscal year  $t$  if the firm subsequently restated its financials for that year, or the PCAOB or the audit firm issued an inspection finding for the engagement for that year. All three events occur infrequently but are indicative of audit deficiencies or at least related to audit quality problems (DeFond and Zhang, 2014; Aobdia, 2019). We provide more details on the variable computations in Section 3.4.

Our primary variable of interest is the indicator for the *Year before Non-mandatory Rotation*. We derive it for our client-year panel as shown in Figure 1, identifying partners and partner switches based on the partner names provided in the PCAOB database.<sup>3</sup> We use partner information for the current year as well as for prior or future engagement years provided by the audit firms to the PCAOB to fill gaps in the time series and to fill in missing leading or trailing years in the client-year panel under the assumption that a partner started out or completed the full cycle of five years.<sup>4</sup> The inclusion of *Year before Non-mandatory Rotation* as an independent variable allows us to benchmark outcomes that occur during this year (e.g., restated financial statements) against those that occur during other relevant periods. Specifically, we include binary indicators for the *Year after Non-mandatory Rotation*, the *Year before Mandatory Rotation* and the *Year before Audit Firm Switch*. For instance, the latter variable controls for potentially confounding effects of incomplete five-year terms due to a change of audit firm and limits the non-mandatory rotation effects to occur *within* existing client relationships. We further include fixed effects for partner tenure years 1 through 5 (with *Tenure Year 3* serving as base period) to strip out audit quality effects that occur over the regular tenure of a partner with the client. In some analyses, we split the *Year before Non-mandatory Rotation* variable into one for explainable (marked with the subscript *expl*) and one for the remaining unexplained (*unexpl*) early partner rotations.

We include a series of audit- and client-specific controls that the prior literature suggests are related to audit quality (e.g., Minutti-Meza, 2013), such as firm size, leverage, profitability, growth

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<sup>3</sup> Because the PCAOB dataset did not have numerical identifiers for partners at the time of this study, we match on the exact spelling of the partner's family name within audit firm, which is inherently noisy and creates the possibility of mismatches based on name changes or common names (e.g., "Smith"). We manually inspect our data and find no cases in which the matching procedure leads to a tenure cycle exceeding five years. To avoid misspelling errors (e.g. "Smith" in 2008 and "Smiht" in 2009), we also perform a "fuzzy" match and find fewer than 10 such cases.

<sup>4</sup> This second assumption over-assigns mandatory rotations in the early years when often we only observe the last year of an outgoing partner on the engagement (i.e., 2008 and 2009). We verify that the results are similar, and none of our inferences changes, when we drop the approximately 1,300 back-filled observations (not tabulated).

opportunities, or the perceived audit risk of the client (see the respective table notes for the full list and Appendix A for variable definitions). Finally, we include fixed effects for (i) the client firm (C) to capture (time-invariant) unobservable client characteristics and aspects of the client-audit firm match; (ii) audit firm-by-fiscal year (AF×Y) to account for general trends in the data; and (iii) audit firm tenure (AT) to control for the length of time the client is with the same audit firm (e.g., Johnson, Khurana, and Reynolds, 2002; Bell et al., 2015). Throughout the client-level analyses, we assess the statistical significance of the OLS coefficient estimates using robust standard errors clustered by client firm.

### **3.2. Sample Composition and Description**

The PCAOB collects nonpublic data from all audit firms but only the large auditors are subject to yearly inspections and provide annual data in machine-readable format. Our sample selection starts with all client-years from the Big 6 firms with PCAOB data over the 2008 to 2014 period.<sup>5</sup> After matching the PCAOB data with the client-level financial variables used in the regression analysis, the panel contains a maximum of 17,901 yearly observations from 3,328 clients. This sample corresponds to 67 (78) percent of the Big 6 clients (client-years) in the Audit Analytics universe and to 46 percent of the SEC issuers. The sample firms tend to be much larger than the non-Big 6 clients (median total assets of \$1,380 million compared to \$34 million), have higher growth rates (median sales growth of 4.7 percent versus 3.2 percent), and are more profitable (median return on assets of 2.9 percent relative to -0.2 percent).

Panel A of Table 1 provides a breakdown of the sample by years. We list the yearly numbers of within-audit firm partner rotations, separately for the maximum five-year tenure cycle and for

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<sup>5</sup> The Big 6 audit firms are BDO USA, Deloitte & Touche, Ernst & Young, Grant Thornton, KPMG, and PwC PricewaterhouseCoopers. These are the largest among annually inspected audit firms.

early rotations.<sup>6</sup> We count 2,512 mandatory rotations, averaging about 14 percent of the yearly observations (below a theoretical value of 20 percent). We have 1,461 non-mandatory rotations in our sample and—as one would expect—the annual frequency is lower than for mandated rotations, except in 2012.<sup>7</sup> Note that we cannot observe early rotations in 2014 because we began this study prior to the availability of data with 2015 SEC issuer fiscal year ends. Overall, the early rotations represent 37 percent of all within-audit firm partner rotations in our sample, which is a notably higher proportion than what prior (anecdotal) evidence suggests.<sup>8</sup> Of these, 323 can be explained by scheduled retirements, promotions, office switches, or temporary leaves and replacements (see also Section 3.3), which leaves us with 1,138 unexplained non-mandatory rotations. For comparison, audit firm switches are rare with only 431 or 2 percent of the sample client-years, in line with prior literature (e.g., Minutti-Meza, 2013).

Panel B of Table 1 provides descriptive statistics for the main variables used in the client-year analyses. Out of the 8.2 percent early partner rotations, 1.8 percent can be explained by career and life events, 6.4 percent remain unexplained.<sup>9</sup> On average, both staff and partners spend 10,887 billable hours on a client engagement, but the distribution is highly skewed, reflecting substantial heterogeneity among audit clients. The median lead partner accounts for 325 hours per engagement or about 5 percent of the (median) total audit hours. These figures are comparable to prior studies

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<sup>6</sup> Technically, the partner rotations typically occur *after* the audit is complete for the client's annual financial statements (e.g., during March 2010 for a December 2009 fiscal year-end client). Thus, the numbers in the table represent the fiscal years leading up to the respective partner rotations.

<sup>7</sup> The number of sample observations differs slightly from Gipper et al. (2021), Table 1, Panel B (p. 312) because of data availability for some of the additional control variables that we use. Moreover, the numbers of mandatory (+127) and non-mandatory rotations (-6) are also slightly different, primarily because—unlike in Gipper et al. (2021)—we do not require that Audit Analytics data is available in both years surrounding the partner rotation.

<sup>8</sup> For instance, Litt et al. (2014), p. 67, survey 13 offices from Big 4 audit firms and receive responses indicating only one pre-five-year rotation. Laurion et al. (2017), p. 211, had discussions with partners from all Big 4 firms and note that “few partner rotations in the U.S. are voluntary.”

<sup>9</sup> Note that because we require data in two adjacent years for the coding, the variables *Non-mandatory Rotation* and *Year before Non-mandatory Rotation* are identical in our sample.

(e.g., O’Keefe et al., 1994; Hackenbrack and Hogan, 2005; Bell, Doogar, and Solomon, 2008). In 17.2 percent of the client-years, issuers had to restate their financials. Roughly 9 (10) percent of the client-years are subject to PCAOB inspections (internal audit-firm inspections), of which 34 (26) percent are flagged as having some sort of audit deficiencies. We provide all variable definitions and details on the data sources in Appendix A.

### 3.3. What Explains Early Partner Rotations?

We begin by estimating Eq. (1) separately for various client firm and audit engagement characteristics. Panel A of Table 2 reports the results. The general idea is to identify potential factors related to the client and/or auditor that might explain early partner rotations at the conclusion of the current fiscal period. In column (1), we include several proxies for a firm’s performance, namely annual *Stock Returns*, accounting performance measured as *Return on Assets*, *Sales Growth*, and an indicator variable for firms with negative income before extraordinary items (*Loss Firm*). Stragglings client performance can put more strain on the auditor-client relationship and lead to renegotiations between the two parties (Lennox, 2000; Carcello and Neal, 2003). None of the variables is significant in explaining *Non-mandatory Rotation*. In column (2), we assess the impact of size (measured by *Total Assets*), a firm’s financing structure proxied by *Financial Leverage*, and future growth prospects (*Book-to-Market*). Partner learning costs and benefits to continuity tend to be higher for larger firms, and—consistent with this argument—we find a negative and significant coefficient on *Total Assets*. The other two factors are insignificant.

We next examine attributes of the audit engagement. The amount of time the auditor or, specifically, the lead partner dedicates to an engagement likely reflects the importance of the client to the audit firm. Particularly during the critical transition from one partner to the next, auditors

tend to spend more time on the engagement (Gipper et al., 2021). We find negative coefficients on both total *Audit Hours* and *Partner Hours*, but only the latter is significant. This finding suggests that less time spent on an engagement increases the propensity of early partner turnover. In column (4), we consider attributes of the partner. We find that *Partner Experience*, measured by the time since a partner has been granted partnership at the firm, is positively associated with early rotations. This relation is likely driven by retirements of older, experienced partners as they may do so mid-cycle (Burke et al., 2021). Once we control for scheduled retirements (see also the next paragraph and Table 4), the relation becomes negative and significant, suggesting that experience lowers the risk of early rotations. We also find a negative relation for the number of *SEC Issuer Clients*. Together, these findings point to a natural progression over a partner's career as older, more experienced partners are likely to advance in the management hierarchy of the firm and are assigned to fewer but larger and, thus, often more important clients (Maister, 2012). We investigate these factors in more detail in the partner-level analyses in Section 4.<sup>10</sup>

Based on the insight that ordinary life events over a partner's career can explain whether she is able to complete the full five-year tenure cycle or not, we examine a series of such factors in Panel B of Table 2. Specifically, we consider scheduled retirements, upward promotions, office switches, or temporary leaves/replacements as common explanations for early partner rotations (Litt et al., 2014; Laurion et al., 2017). As we cannot observe these career and life events directly, we try to infer them from the panel data. We identify scheduled *Partner Retirements* as years in which a partner drops from the PCAOB dataset after more than 15 years of having attained partnership at the firm. This coding of the variable is likely noisy because the partner could

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<sup>10</sup> When we repeat these analyses with logit estimation or Poisson regression instead of OLS (not tabulated), the results are similar, with the same signs and significance levels across all coefficient estimates, except for  $\text{Ln}(\text{Partner Hours})$  which is no longer significant at conventional levels (i.e., two-sided  $p$ -value of 0.161 for logit estimation).

disappear from the dataset for reasons other than retirements, like the move to an exclusive management position, chronic illness, switch of employer, or firing. But it is the best we can do with the data we have. We identify *Partner Promotions* as year-to-year changes in partner titles as submitted by the audit firm to the PCAOB. It is possible that only a subset of title changes reflects actual promotions to a different (and higher) management function that would force partners to abandon current engagements. However, the data contains a substantial number of unique titles; it is not feasible to assess and code each title change individually. We code a *Partner Office Move* in years in which a partner changes his or her audit office location. We assume that this move is for reasons unrelated to the existing client relationship. Finally, we identify *Temporary Leaves* as years in which a partner quits her engagement prematurely but rotates back after one or two years, for instance, because she is ill, on sabbatical, or for parental leave. *Temporary Replacements* mark years in which the partner who has filled in during the interim is again herself replaced when the previous partner rotates back. Both variables, by construction, are tied to early rotations.

As the panel shows, only the coefficients for the three variables that are mechanically linked to (non-mandatory) rotations are positive and significant. Partner promotions and office moves are not systematically related to early rotations, which could indicate measurement error but also that these events do not require a partner to abandon her clients and occur at the end of the regular tenure cycle at a client. Nonetheless, we use all five factors to divide our *Year before Non-mandatory Rotation* indicator into those early rotations that likely are explained by ordinary life events (i.e., when they coincide with one of the five life events as marked by the subscript *expl*) and those that remain unexplained (*unexpl*). If our classification provides a valid split, we expect (low) audit quality to play a role—if at all—for *unexplained* non-mandatory rotations but to be unrelated to *explainable* early rotations.

### 3.4. Audit Quality Around Early Partner Rotations

Panel A of Table 3 provides results from estimating Eq. (2) using three different measures of audit quality as the dependent variable: (i) *Restated Financials* are annual reports that originally received an unqualified audit opinion but subsequently had to be restated because the client or auditor identified a material departure from GAAP. We measure the variable in the fiscal year of the restated reports. (ii) *PCAOB Part I Findings* represent fiscal years for which the PCAOB staff, during its inspections, finds insufficient evidence to support an audit engagement's opinion and mentions this deficiency in the inspection report (PCAOB 2004). Such findings are often substantial and can be related to restatements (e.g., Gipper, Leuz, and Maffett, 2020). (iii) *Audit Firm Inspection Findings* are any findings discovered during the audit firms' internal inspection of their own engagements (e.g., the lack of sufficient work documentation or the failure to perform certain audit procedures), as required by law and reported to the PCAOB (e.g., Bell et al., 2015). All three proxies are indicative of audit quality issues and more directly related to the audit work than discretionary accruals or similar accounting quality proxies. We code all three audit quality proxies as binary indicators, and the latter two variables are available only for client-years that were subject to the respective inspection activities.

In the first three columns of Panel A, we report average effects around early partner rotations. We find that, in the last year before the lead partner leaves early, the client is more likely to restate its financials (column 1) and the likelihood of a PCAOB Part I finding is elevated, although the coefficient for the latter is not statistically significant (column 2).<sup>11</sup> Internal inspection findings are not significantly associated with early rotations and the coefficient is negative. To gauge the

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<sup>11</sup> The magnitude of the *Year before Non-mandatory Rotation* coefficient for *PCAOB Part I Finding* is more than double the (significant) coefficient on *Restated Financials*, pointing to lack of power as likely explanation. Notably, we only have 1,560 client years with PCAOB inspections. The results in column (5) confirm this conjecture.



effects leading up to early rotations, we turn to the benchmark periods. We find no evidence for audit quality issues in the first year of the incoming partner after an early rotation. The coefficient on *Year after Non-mandatory Rotation* is smaller in size and not significant across all three models. Similarly, there is no sign of elevated audit quality issues in the final year of a regularly scheduled mandatory rotation.<sup>12</sup> Finally, the likelihood of “quality” events like restatements or PCAOB Part I findings seems higher in the year before a client switches the auditor, as indicated by the large (relative to *Year before Non-mandatory Rotation*) coefficients on *Year before Audit Firm Switch*. This rank order is intuitive as substantive audit quality issues likely constitute an important reason for dissonances between an auditor and its client, which could lead the two parties to separate (e.g., Lennox, 2000; Johnstone and Bedard, 2004; Chung, Sonu, Zang, and Choi, 2019). However, the coefficients are not significant at conventional levels (two-sided *p*-values of 0.122 and 0.137 for columns 1 and 2, respectively) likely—at least in part—due to the low incident count of audit firm switches.<sup>13</sup>

As noted above, early rotations can take place for different reasons. Thus, we next examine the effects for explainable (or planned) non-mandatory rotations and all the others (unexplained) non-mandatory rotations and report results in columns (4) to (6). We find that the likelihood for both restated financials and PCAOB Part I findings is higher only for the subset of *unexplained* non-mandatory rotations. The respective coefficient for audit firms’ internal inspections remains insignificant, but we do find that explainable non-mandatory rotations have a lower likelihood of having a finding when internally inspected (the 0.101 difference between the two coefficients has

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<sup>12</sup> These findings are consistent with Gipper et al. (2021) who only find some limited evidence of “fresh look” benefits (regarding the announcement of restatements and the release of 404b opinions that contain or confirm material control weaknesses) in the first year of incoming audit partners on the engagement.

<sup>13</sup> In additional analyses (not tabulated), we also use indicators for the announcement of restated financials and for qualified internal control opinions on misstated financial statements (i.e., those that are subsequently restated) as dependent variables and find positive and significant coefficients in the year before early rotations. However, the interpretation of these variables is ambiguous, as they could indicate good as well as bad audit quality.

an  $F$ -statistic of 1.84 and a  $p$ -value of 0.175). These nuanced findings are intuitive and lend credibility to our partitioning variable for explained early rotations. More importantly, the results for unexplained early rotations suggest that at least some lead partners are rotated when audit quality is low and, in turn, low audit quality can have implications for audit partners' career path.

Arguably, the "cleanest" audit quality assessments come from PCAOB inspections as they are specifically evaluating, at the engagement level, whether the audit exhibits any deficiencies. In Panel B of Table 3, we focus on additional PCAOB inspection outcomes (over and above the Part I findings already reported in Panel A). In column (1), we show that inspection findings contributing to an audit firm's Part II deficiencies (which are not made public when remediated to the satisfaction of the PCAOB and pertain to the audit firm's overall quality control system) also display elevated frequencies in the year before unexplained early rotations.<sup>14</sup> In column (2), we combine the Part I and II findings and use the (log transformed) count as the dependent variable. The results indicate that, on average, unexplained non-mandatory rotations are associated with 26 percent higher numbers of PCAOB findings.<sup>15</sup> No such effect is present for planned transitions. Finally, we distinguish between more and less severe inspection findings.<sup>16</sup> We find a significantly positive association for the incidence of severe inspection findings before unexplained early rotations (but not for less severe findings).

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<sup>14</sup> The coefficient is not significant at conventional levels (two-sided  $p$ -value of 0.166). However, it is substantially different from the corresponding coefficient for explainable non-mandatory rotations ( $F$ -statistic of 3.77 with a  $p$ -value of 0.053). Due to the pervasive nature of quality control problems, any single client engagement typically does not give rise to a Part II finding. Instead, individual findings contribute to an audit firm's overall quality control deficiencies.

<sup>15</sup> We compute the average percentage change as  $(e^{0.233} - 1) = 0.262$ .

<sup>16</sup> During the period of study, the PCAOB did not distinguish findings by severity; the public output of the inspections were binary. Either the audit firm failed to perform sufficient audit work to support an opinion and, hence, has a Part I finding or not. We create this classification marking findings as severe when both the financial statement and the internal controls opinions are not supported or the PCAOB discovers a likely departure from GAAP.

### 3.5. Cross-sectional Analyses on the Effects of Audit Quality

To further support the above evidence that low audit quality is linked to early partner rotation, we identify areas in which we deem audit quality issues to play a more salient role. We expand Eq. (2) by splitting the *Year before Non-mandatory Rotation<sub>unexpl</sub>* indicator into two separate variables representing two (non-overlapping) groups. Table 4 presents the results. We only tabulate the main coefficients of interest for *Restated Financials* and *PCAOB Part I Findings* (but not for *Audit Firm Inspection Findings*, for which we did not find significant results in Table 3).

Our first partition is based on firm size, measured using total assets. Larger clients are likely more important to the audit firm (DeAngelo, 1981; Ashbaugh, LaFond, and Mayhew, 2003), so that when there is disagreement on audit quality, the client might push for a replacement of the lead partner. Moreover, it is feasible that the PCAOB may apply more scrutiny on audits of large engagements when an inspection reveals quality problems. At the same time, the client itself could fear reputational damage if an auditor exits prematurely (but note that during our sample period, the identity of the lead partners was not publicly disclosed). The evidence in columns (1) and (2) shows that for large clients early (unexplained) rotations of the audit partner are more likely to occur when audit quality issues are present. The same coefficients for small clients are still elevated but not significant.

We next examine partner availability and experience. Offices with relatively few constraints on partner availability are better able to provide service continuity and, if confronted with audit quality issues at or by some of their clients, they are better able to address these concerns and rotate partners prematurely when necessary. We proxy for office-level constraints by the mean number of SEC issuer clients per partner currently serviced out of a particular office. Offices with high clients-to-partner ratios indicate that partner availability is likely more constrained in case of

unscheduled partner rotations.<sup>17</sup> Similarly, newer, less experienced partners may face more pushback when they confront their clients with audit quality issues. These younger partners might also be more prone to errors because of lack of experience. We measure partner experience by the number of years since they have been granted partnership at the firm. In line with these arguments, we find that partners working at less constrained offices and with less experience are more likely to rotate early when audit quality issues arise (columns 3 to 6).

Finally, we examine the role of gender for early partner rotations. We determine partners' gender based on their first names using the classification in <https://genderize.io>. We find that the likelihood of female audit partners being rotated early is almost (more than) double that of male partners following years with restated financials (PCAOB Part I findings).<sup>18</sup> We obtain the results after controlling for planned early rotations like in the case of parental leaves that could lead to temporary reassignments. Thus, audit quality issues appear to have more serious consequences for female partners, in line with findings in other fields and settings (e.g., Goldin and Rouse, 2000; Bertrand and Hallock, 2001; Egan, Matvos, and Seru, 2018). However, these results need to be cautiously interpreted because we are not matching male and female partners on other characteristics and have only 142 unexplained early rotations with female partners out of 1,138 such events.<sup>19</sup>

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<sup>17</sup> As another proxy for office-level constraints, we use the number of ongoing unexplained non-mandatory rotations among the clients serviced out of an office (with below median numbers reflecting less constrained audit offices) and find very similar results to those tabulated.

<sup>18</sup> For *Restated Financials*, the unexplained rotation coefficient for female partners is not significant at conventional levels (i.e., two-sided  $p$ -value of 0.109). If in column (7) of Table 4 we replace the client fixed effects with industry fixed effects, the coefficient for female partners becomes significant with a  $p$ -value of 0.046 (untabulated).

<sup>19</sup> As with the analyses in Table 2, we re-estimate all specifications in Tables 3 and 4 with logit and Poisson models. The results (untabulated) are very similar to those reported in the tables, and none of the inferences change.

## 4. PARTNER-LEVEL ANALYSES

Our second set of empirical tests examines potential career consequences of early partner rotations. Specifically, we investigate whether the structure of partners' client portfolio as well as their job assignments and job evaluations change after early partner rotations. Building on the insights from Section 3, we focus on *unexplained* non-mandatory rotations. This focus allows us to reexamine the link between audit quality issues and early rotations from a different angle. It also sheds light on the question whether early rotations can serve as a disciplinary device or incentive tool for audit firms because they affect the future career trajectory of audit partners.

### 4.1. Research Design

The unit of analysis for the empirical tests in this section is an engagement partner in a year. This structure gives rise to a partner-year panel, as illustrated in Figure 2. We trace each individual lead partner of one of the Big 6 audit firms over the years 2008 to 2014. The PCAOB dataset allows us to keep track of whether and when engagement partners were involved in regular five-year and in early (less than five-year) rotations at one of their clients. In addition, we augment the partner panel with year-specific partner attributes (e.g., number of clients, years of experience) or audit engagement attributes (e.g., audit hours under management; audit fees). Importantly, the panel lets us compare the years that follow a partner's initial regular (mandated) as well as initial (unexplained) early rotation that occurred during our sample period. As the figure shows, we use this information to create a series of binary indicator variables that mark the first year (*Year  $t$* ), the second year (*Year  $[t+1]$* ), the third year (*Year  $[t+2]$* ) and all *Later Years* following either these mandatory (marked with the subscript *MR*) or non-mandatory (*NMR*) turnover events.

To examine the career progression after (early) partner rotations, we include these indicators as main independent variables of interest in the following OLS regression model:

$$\begin{aligned}
\text{Partner Attribute}_{p,t} = & \beta_0 + \beta_1 \text{Year } t_{MR,p,t} + \beta_2 \text{Year } [t+1]_{MR,p,t} + \beta_3 \text{Year } [t+2]_{MR,p,t} \\
& + \beta_4 \text{Later Years}_{MR,p,t} + \alpha_1 \text{Year } t_{NMR,p,t} + \alpha_2 \text{Year } [t+1]_{NMR,p,t} + \alpha_3 \text{Year } [t+2]_{NMR,p,t} \\
& + \alpha_4 \text{Later Years}_{NMR,p,t} + \sum \beta_k \text{Fixed Effects}_{p,t} + \varepsilon_{p,t}.
\end{aligned} \tag{3}$$

We describe the selection of partner characteristics and client attributes of partner  $p$  in year  $t$  that we use as dependent variables in Section 4.2. The coefficients  $\beta_1$  to  $\beta_4$  measure the incremental values of the partner attributes in the years following mandatory rotations relative to the pre-rotation years; the coefficients  $\alpha_1$  to  $\alpha_4$  measure the same effects after early rotations. In the analyses that follow, we estimate these  $\alpha$  coefficients separately for non-mandatory rotations that can be explained by retirements, promotions, office switches, or temporary leaves (*expl*) and the remaining, unexplained non-mandatory rotations (*unexpl*). That is, we include a total of eight  $\alpha$  coefficients—four for each type of early rotation—but only tabulate the coefficients for the unexplained early rotations.<sup>20</sup> The model includes fixed effects for individual partners (P), the number of years of partner experience (PE), and audit firm-by-fiscal year (AF×Y), which account for unobserved, time invariant partner characteristics (e.g., gender), general expertise that accumulates over time, and time trends that may vary by audit firm. We assess the statistical significance of the coefficient estimates using robust standard errors clustered by audit partner.

## 4.2. Sample Composition and Description

The sample comprises a maximum of 18,997 partner-year observations with PCAOB data and accounting data available and covers the years 2008 to 2014. We construct the partner-year panel using the same partner name-audit firm matching technique as for the client-year panel (see Footnote 3). The data contains 4,501 unique partners. Of those, 1,156 (25.6%) have data in all

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<sup>20</sup> The coefficients for the explainable early rotations are difficult to interpret as, for instance, they should not be identified for the years after partner retirements and insignificant if a partner switches offices or takes a sabbatical for personal reasons.

seven sample years, 513 (11.4%) have some gap in the middle of their time series, and the rest has no observations at the beginning and/or end of the time series. We do not fill in gaps in the time series because we have no attribute data for these years.<sup>21</sup> Across all partners, 51 percent experience at least one mandatory rotation and 18 (15) percent are part of at least one (unexplained) early partner rotation over the seven-year sample period. The average partner has 9.2 years of experience, oversees 1.7 SEC issuer and 5.3 non-issuer clients, and manages 20,869 audit hours for clients. 21 percent of partners are female based on a classification of their first names, and they represent 17 percent of the partner-year observations.

Table 5 provides a breakdown of the partner-year panel by years of partner experience. In Panel A, we list several characteristics of the audit partner such as the number of SEC issuer and non-SEC issuer clients (e.g., not-for-profit or private entities), the number of audit hours under management, and a partner's utilization, which indicates the proportion of time spent on billable client work. The panel also reports partner ratings that audit firms internally assign to their partners on an annual basis and transmit to the PCAOB. Higher ratings on a (normalized) scale of 1 to 5 indicate higher perceived performance. In column (6), we indicate the proportion of a partner's clients in a year that were subject to audit firms' internal inspection process. On average, 12 percent of all audits are internally inspected and receive an inspection rating every year.<sup>22</sup> On a by-partner basis, we find that partners typically have at least one of their client audits inspected every other

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<sup>21</sup> Aside from common career events that we describe elsewhere (e.g., retirements, temporary leaves, etc.), another reason for gaps in the data could be that audit firms only provide data for partners who are subject to PCAOB oversight (i.e., serve as engagement or review partners for SEC issuer clients). Consequently, we may be unable to observe partners who are reassigned exclusively to non-SEC issuer clients in a particular year. Thus, our estimates of the career consequences following unexplained non-mandatory rotations below are likely conservative because they rely on data from partners who perform at least some client work for SEC issuers.

<sup>22</sup> The internal inspection ratings are informed by the audit firms' internal inspections of specific client audits. They are separately submitted to the PCAOB and, like the partner ratings, are used to manage the partnership and evaluate partners. We use them as an indicator to measure the occurrence of internal inspections to better understand the association between rotations and partner monitoring.

year (untabulated). The panel suggests that more experienced partners generally handle fewer clients and spend less time on billable client work but manage more audit hours. The partner ratings reveal a slight upward trend, as does the proportion of internal inspections, which is particularly low for partners with five or less years of experience.

Panel B reports descriptive statistics on attributes of partners' SEC issuer clients. Because this analysis requires that we match client firms with Compustat and Audit Analytics, the number of partner-years with data available is down to a maximum of 10,918 observations. We aggregate the client characteristics by partner-year. For instance, *Audit Fees* represents the sum of audit fees over all SEC issuer clients of a partner in a year. In column (2), we report the proportion of high-risk clients in a year based on audit firms' internal risk rating systems. Clients that receive a (normalized) score of 4 or 5 (out of 5) are perceived as high risk, which typically goes along with higher audit fees (Gipper et al., 2021). In the last column, we tabulate the proportion of partners' clients reporting negative income before extraordinary items in a year. The panel shows that, with more experience, partners generate higher audit fees from larger, more profitable clients. In the early years, aside from being smaller, their clients exhibit higher growth rates and are more likely to report losses. Perceived client risk does not change much with partner experience.

We use several of the attributes reported in Table 5 as dependent variables in the partner-year regressions and provide details on the variable definitions and data sources in Appendix A.

#### **4.3. Career Progression Following Early Partner Rotations**

In this section, we provide evidence on the career consequences of (early) partner rotation for the involved lead engagement partners. Table 6 reports results from estimating Eq. (3) using various attributes of partners' client portfolio as dependent variables. We only tabulate coefficients for the series of year indicators following the initial mandatory rotation and the initial unexplained



non-mandatory rotation. The table also reports differences in the first-year coefficients between the two types of rotations and indicates statistical significance based on *F*-tests.

After an unexplained early rotation, partners see a reduction of the total number of clients they oversee. The coefficient on *Year tNMR\_unexpl* in column (3) is negative and significant. This reduction seems primarily driven by a loss of public issuers registered with the SEC as the negative and highly significant coefficients in column (1) indicate. The loss of public clients is in part compensated by new private or not-for-profit clients. The coefficients in column (2) are positive but only significant in year 3 after early rotations. The coefficients for *Sales Revenue* and *High-Risk Clients* are largely insignificant, but when we compare them in the first year after an early rotation to mandatory rotations, the clients are substantially smaller and less risky. These patterns starkly contrast with the changes in portfolio structure that we find following the initial mandatory rotation. Partners expand their client portfolio by gaining more clients (column 3). In particular, the number of *SEC Issuer Clients* increases significantly in the first three years after mandatory rotations (column 1). These clients are larger (as measured by *Sales Revenue*) and, at least initially, have higher perceived audit risks.

We repeat these analyses for various attributes of partners' job performance as the dependent variables and report results in Table 7. Partners involved in unexplained early rotations are associated with substantive drops in audit hours under management in the years that follow the event. All the respective coefficients in column (1) are negative and in the first three years the drop is significant. Similarly, audit fees generated from SEC issuer clients decline as can be seen in column (2). In the year immediately following the early turnover, partner utilization drops dramatically and so do partner ratings assigned by the audit firm. At the same time, the likelihood of internal inspections goes up (column 5). These are all signs of negative perceived job

performance. In contrast, after mandatory rotations, audit hours under management, generated audit fees as well as partner utilization steadily increase. All the respective coefficients are positive and generally significant in columns (1) to (3). Partner ratings are not associated with the time periods after mandatory rotations, but the propensity of internal inspections decreases.

In sum, our evidence suggests that unexplained early partner rotations have negative career consequences. Partners facing such rotations are assigned fewer and smaller, less important clients, which in turn reduces their contribution to the overall revenue generated by the audit business. Their supervisory responsibilities decline (measured by audit hours under management) and the quality of their audit work—at least initially—is viewed more skeptically. In contrast, the career trajectory following regularly scheduled mandatory rotations seems in line with engagement partners advancing within the audit firms. Overall, this evidence suggests that early rotations could play an important disciplinary or incentive role for audit firms.

## **5. CONCLUSION**

This paper provides an analysis of the determinants and career consequences of early partner rotations for a large cross-section of U.S. publicly listed audit clients and audit partners at the Big 6 audit firms over the years 2008 to 2014. We start with the observation that early partner rotations are surprisingly frequent events. In 37 percent of our 4,000 within-audit firm rotations, the lead partner leaves before the five-year tenure limit. Of those, 78 percent cannot be explained by common life events like retirements, promotions, office switches, or parental leaves. We examine audit quality issues as a potential source of dissonance in the client-partner relationship that could lead to early turnover. Consistent with this reason, we find that firms are more likely to misstate their financials and the PCAOB is more likely to find severe audit deficiencies in the year before early rotations. These audit quality concerns are more pronounced for large, important clients,

when the local office in charge of the audit is less constrained and for newer, less experienced partners. We also find that female partners are more likely to be rotated off early in connection with audit quality issues. In an analysis of partners' career trajectory over time, we find that early rotations not explained by common life events are associated with negative changes in their client portfolios. Partners are assigned to fewer SEC issuer clients, manage fewer audit hours, receive lower individual ratings, and are more likely to be internally inspected after being rotated early.

Based on the combined evidence from our client-year and partner-level analyses, the following narrative emerges: Audit quality concerns play an important role for early partner rotations in the U.S. Audit firms appear to use early rotations to address audit quality issues that emerge within an engagement. Consistent with this interpretation, early rotations for audit quality reasons have negative effects on partners' future careers, both in terms of their client assignments and management responsibilities. These negative career consequences, in turn, should provide incentives to partners to maintain audit quality. More broadly, the evidence on early rotations connects with and reinforces findings in Gipper et al. (2021) suggesting that audit firms carefully manage audit quality around mandatory rotations and use early rotations as a tool to address audit quality issues and limit audit risks.

Our evidence is subject to several caveats. First, we acknowledge that several of our partitioning variables could exhibit substantial noise. For instance, it is difficult to measure rotations that occur for ordinary life events. That said, our audit quality proxies are more direct and do not rely on traditional accruals-based proxies. Second, our findings that audit quality plays a key role for early reassignments of partners does not necessarily imply that the source of the issue is poor partner performance. For instance, we cannot fully rule out that partners are removed because they unearth financial reporting problems and demand that clients address these problems

but clients instead request the replacement of these recalcitrant partners. There is anecdotal evidence to this effect (e.g., Greising, 2002). But our findings, particularly with respect to the timing of the early rotations, suggest that audit firms acquiescing to client pressures and switching strict partners are not the norm—at least when it comes to severe audit quality issues. Third, the 2017 mandate to disclose partner names could alter the incentives for non-mandatory rotations. During our sample period, investors and the public could not see early rotations. But now that the identity of the partner is known through disclosure on Form AP, audit firms and clients likely need to provide explanations for premature partner switches to investors. Our findings indicate that common life events such as retirements, promotions, and other personal reasons seem to account for a relatively small proportion of early rotations, so that more substantive explanations are likely needed. Lastly, we acknowledge that our results on gender disparity in early rotations have relatively low statistical significance. However, we note that the low power of these tests could itself reflect gender inequalities, considering the low count of female partners in the data. At a minimum, our results imply that more research on the role of gender for audit partners and their careers is needed.

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## APPENDIX A

### Variable Definitions

**Panel A: Partner Rotation Variables\***

Variable Name	Definition
<i>Non-mandatory Rotation</i> (indicator)	We set the binary indicator equal to ‘1’ if the incumbent partner on the engagement in year $t$ is about to leave and does so before the end of the mandatory 5-year rotation cycle, and ‘0’ otherwise. That is, the non-mandatory rotation takes place after the audit’s conclusion for the current fiscal year $t$ and before the beginning of the new auditing period in year $t+1$ . Because we require information from two adjacent years to identify early rotations, the variable is coded identically to the <i>Year before Non-mandatory Rotation</i> variable.
<i>Year before Non-mandatory Rotation</i> (indicator)	We set the binary indicator equal to ‘1’ in year $t$ marking the final year on the engagement before the partner leaves short of the mandatory 5-year rotation cycle (i.e., during years one through four of her tenure), and ‘0’ otherwise.
<i>Year before Non-mandatory Rotation</i> <sub>expl</sub> and <i>Year before Non-mandatory Rotation</i> <sub>unexpl</sub> (indicator)	In some analyses, we partition the variable <i>Year before Non-mandatory Rotation</i> into two groups: years before explainable non-mandatory rotations (as indicated by the subscript <i>expl</i> ) and all the other, unexplained non-mandatory rotations (as indicated by the subscript <i>unexpl</i> ). We classify as explainable non-mandatory rotations when the partner either (i) drops from the dataset after more than 15 years, (ii) has a title change to a higher position or leadership role, (iii) switches location to a different office, (iv) leaves, but rotates back after one or two years, or (v) fills in for one or two years for another partner who subsequently rotates back.
<i>Year after Non-mandatory Rotation</i> (indicator)	We set the binary indicator equal to ‘1’ in year $t$ marking the first year on the engagement after the previous partner has left short of the mandatory 5-year rotation cycle, and ‘0’ otherwise. This variable overlaps with <i>Tenure Year 1</i> of the partner tenure year fixed effects.
<i>Year</i> $t_{NMR\_expl/unexpl}$ , <i>Year</i> $[t+1]_{NMR\_expl/unexpl}$ , <i>Year</i> $[t+2]_{NMR\_expl/unexpl}$ , and <i>Later Years</i> <sub>NMR_expl/unexpl</sub> (indicators)	Years after initial non-mandatory rotation per partner: We create a series of four binary indicators set equal to ‘1’ in <i>Year</i> $t$ marking the first year, <i>Year</i> $[t+1]$ marking the second year, <i>Year</i> $[t+2]$ marking the third year, and all <i>Later Years</i> , respectively, of partner $p$ following the end of her initial rotation cycle that falls short of the 5-year mandate during our sample period, and ‘0’ otherwise. We code up these variables separately for explainable and unexplained non-mandatory rotations (as indicated by the subscripts <i>expl</i> and <i>unexpl</i> ).
<i>Year before Mandatory Rotation</i> (indicator)	We set the binary indicator equal to ‘1’ in year $t$ marking the final year on the engagement before the partner leaves at the end of the mandatory 5-year rotation cycle (i.e., during year five of her tenure), and ‘0’ otherwise. This variable overlaps with <i>Tenure Year 5</i> of the partner tenure year fixed effects.
<i>Year</i> $t_{MR}$ , <i>Year</i> $[t+1]_{MR}$ , <i>Year</i> $[t+2]_{MR}$ , and <i>Later Years</i> <sub>MR</sub> (indicators)	Years after initial mandatory rotation per partner: We create a series of four binary indicators set equal to ‘1’ in <i>Year</i> $t$ marking the first year, <i>Year</i> $[t+1]$ marking the second year, <i>Year</i> $[t+2]$ marking the third year, and all <i>Later Years</i> , respectively, of partner $p$ following her initial mandatory 5-year rotation cycle that ends during our sample period, and ‘0’ otherwise.
<i>Year before Audit Firm Switch</i> (indicator)	We set the binary indicator equal to ‘1’ in year $t$ if the client firm switches its audit firm in the next year. Data source: Audit Analytics.



**Panel B: Client Firm Characteristics\*\***

Variable Name	Definition
<i>Stock Returns</i> (%)	Sum of daily stock returns (RET) over client <i>i</i> 's fiscal year, that is, from fiscal year-end <i>t</i> -1 to fiscal year-end <i>t</i> (DATADATE). Data source: Return data are from CRSP.
<i>Return on Assets</i> (ratio)	Income before Extraordinary Items (IB) / ((Total Assets (AT) + Total Assets <sub><i>t</i>-1</sub> )/2).
<i>Sales Growth</i> (%)	(Revenue (REVT) – Revenue <sub><i>t</i>-1</sub> ) / Revenue <sub><i>t</i>-1</sub> .
<i>Loss Firm</i> (indicator)	We set the binary indicator equal to '1' in year <i>t</i> if Income before Extraordinary Items (IB) is negative, and '0' otherwise.
<i>Total Assets</i> (\$ million)	Total Assets (AT)
<i>Financial Leverage</i> (ratio)	Total Long-Term Debt (DLC + DLTT) / ((Total Assets (AT) + Total Assets <sub><i>t</i>-1</sub> )/2).
<i>Book-to-Market</i> (ratio)	Total Common Equity (CEQ) / Market value. Market value is equal to the share price at fiscal year-end <i>t</i> (PRCC_F) multiplied by the number of total shares outstanding (CSHO).
<i>Sales Revenue</i> (\$ million)	Revenue (REVT). We use the mean of this variable for all of partner <i>p</i> 's SEC issuer clients in year <i>t</i> in the partner-year analyses.

**Panel C: Audit Engagement Characteristics\***

Variable Name	Definition
<i>Audit Hours</i> (hours)	Total number of auditing hours, including both staff and partner hours, performed for client <i>i</i> in year <i>t</i> . In the partner-year analyses, we use the total audit hours of all of partner <i>p</i> 's SEC issuer and non-SEC issuer clients in year <i>t</i> , as submitted to the PCAOB.
<i>Audit Fees</i> (\$ thousand)	Total fees for auditing ( <i>MATCHFY_SUM_AUDFEES</i> ) and audit related activities ( <i>MATCHFY_SUM_AUDREL_FEES</i> ) paid by client <i>i</i> in year <i>t</i> . We use the sum of this variable for all of partner <i>p</i> 's SEC issuer clients in year <i>t</i> in the partner-year analyses. Data source: Audit Analytics.
<i>Utilization</i> (%)	The proportion of time that partner <i>p</i> dedicates to billable client work (as opposed to, e.g., administrative work) out of her total available time in year <i>t</i> . For instance, a <i>Utilization</i> ratio of 60% indicates that a partner spends (and reports to the audit firm) 33 hours on billable client work out of an expected 55-hours work week.
<i>Partner Hours</i> (hours)	Total hours that the engagement partner performed for client <i>i</i> in year <i>t</i> . Before 2012, this data item was not available and we measure <i>Partner Hours</i> as the total hours that all partners performed for client <i>i</i> in year <i>t</i> (i.e., engagement partner, review partner, IT partner, tax partner, specialist partner, etc.).
<i>Partner Experience</i> (years)	We compute a partner's experience in year <i>t</i> as the calendar year <i>t</i> minus the year she was granted partnership at the firm. The latter is submitted to the PCAOB.
<i>Partner Rating</i> (score)	The variable is the normalized version of the partner rating that the audit firms assign to partner <i>p</i> in year <i>t</i> , and ranges from 1 to 5. Each audit firm has its own rating system. To make ratings comparable, we group each audit firm's rating classes into five categories and then assign a score of 3 to the modal category. For instance, if most partners of audit firm <i>i</i> fall into the second category, we assign them a score of 3, and the partners in the adjacent categories receive a score of 2 and 4, respectively. Higher values indicate higher perceived performance.
<i>Partner Retirement</i> (indicator)	We set the binary indicator equal to '1' in year <i>t</i> at partner <i>p</i> 's last-year client <i>i</i> if partner <i>p</i> drops from the client-year dataset after more than 15 years of <i>Partner Experience</i> , and '0' otherwise. Note that this drop always coincides with a partner rotation at client <i>i</i> that takes place between years <i>t</i> -1 and <i>t</i> .

<i>Partner Promotion</i> (indicator)	We set the binary indicator equal to ‘1’ in year $t$ at partner $p$ ’s last-year client $i$ if partner $p$ displays a title change relative to the previous year, and ‘0’ otherwise. Partner titles are submitted to the PCAOB on an annual basis.
<i>Partner Office Move</i> (indicator)	We set the binary indicator equal to ‘1’ in year $t$ at partner $p$ ’s last-year client $i$ if partner $p$ switches location to a different office relative to the previous year, and ‘0’ otherwise.
<i>Temporary Leave</i> (indicator)	We set the binary indicator equal to ‘1’ in year $t$ following a non-mandatory rotation at client $i$ if last year’s partner $p$ leaves her position, but rotates back after one or two years, and ‘0’ otherwise.
<i>Temporary Replacement</i> (indicator)	We set the binary indicator equal to ‘1’ in year $t$ following a non-mandatory rotation at client $i$ if last year’s partner $p$ has filled in for one or two years for another partner who subsequently rotates back, and ‘0’ otherwise. Note that, by construction, this variable is tied to <i>Temporary Leave</i> as it marks the subsequent non-mandatory rotation, when the previous partner rotates back.
<i>SEC Issuer Clients</i> (#)	Number of publicly traded issuers registered with the SEC for which partner $p$ acts as engagement partner in year $t$ . In the client-year analyses, if we cannot match partner $p$ to specific data submitted to the PCAOB, we use the count of occurrences of partner $p$ in year $t$ instead.
<i>Non-SEC Issuer Clients</i> (#)	Number of not-for-profit or private entities (not registered with the SEC) for which partner $p$ acts as engagement partner in year $t$ .
<i>Total Partner Clients</i> (#)	Total number of clients (public, not-for-profit, or private) for which partner $p$ acts as engagement partner in year $t$ .
<i>High-Risk Clients</i> (%)	First, we set a binary indicator equal to ‘1’ in year $t$ if client $i$ has a (normalized) <i>Client Risk Rating</i> of 4 or 5 (out of 5), and ‘0’ otherwise. Each audit firm has its own rating system. To make ratings comparable, we normalize them by dividing them into rank ordered quintiles per audit firm. Higher values indicate higher perceived audit risks. Second, we compute the percentage of partner $p$ ’s high-risk clients out of all her clients in year $t$ in the partner-year analyses.

**Panel D: Proxies for Audit Quality\***

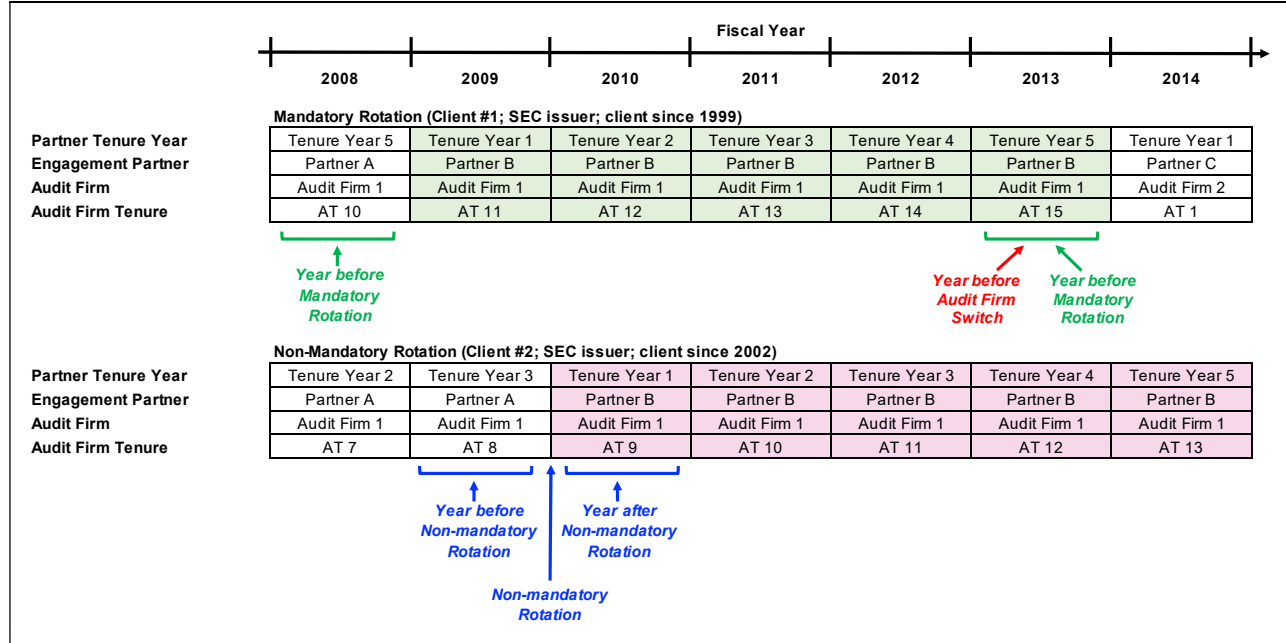
<b>Variable Name</b>	<b>Definition</b>
<i>Restated Financials</i> (indicator)	We set the binary indicator equal to ‘1’ in year $t$ if subsequently the client’s audited annual financial statements (10-K) for fiscal year $t$ are restated, and ‘0’ otherwise. We exclude quarterly restatements (except for the fourth quarter) when coding this variable. Data source: Audit Analytics.
<i>Audit Firm Inspection Finding</i> (indicator)	We set the binary indicator equal to ‘1’ in year $t$ if an audit firm’s internal inspections resulted in some type of finding, and ‘0’ otherwise. Audit firms review audits internally and report the results, that is, no finding, minor finding(s) (e.g., add additional documentation), and major finding(s) (e.g., failed to perform sufficient audit work) to the PCAOB. This variable is only coded for client-years that were subject to audit firms’ internal inspections.
<i>Internal Inspections</i> (%)	First, we set a binary indicator equal to ‘1’ in year $t$ if client $i$ was subject to an audit firm’s internal inspection, and ‘0’ otherwise. Second, we compute the percentage of partner $p$ ’s internally-inspected clients out of all her clients in year $t$ in the partner-year analyses.

<i>PCAOB Part I Finding</i> (indicator)	We set the binary indicator equal to ‘1’ in year $t$ if the PCAOB inspections of clients’ audits of fiscal year $t$ resulted in any Part I findings (i.e., disclosed anonymously in the audit firm’s publicly available inspection report), and ‘0’ otherwise. The PCAOB inspection will include a Part I finding when the work performed by the auditor does not support the opinion. This variable is only coded for client-years that were subject to PCAOB inspections.
<i>PCAOB Part II Finding</i> (indicator)	We set the binary indicator equal to ‘1’ in year $t$ if the PCAOB inspections of clients’ audits of fiscal year $t$ resulted in any findings that contributed to the content of an audit firm’s Part II report (i.e., describing deficiencies of the audit firm’s overall system of quality control), and ‘0’ otherwise. This variable is only coded for client-years that were subject to PCAOB inspections. In some analyses, we are also using the log-transformed sum of the number of Part I and Part II findings (plus 1) as dependent variable.
<i>Severe (Non-severe) Inspection Finding</i> (indicator)	We set the <i>Severe Inspection Finding</i> binary indicator to ‘1’ in year $t$ if the PCAOB concludes from the inspection that (i) both financial statements and internal control opinions were unsupported by the audit work <i>or</i> (ii) the client firm had likely GAAP deficiencies that could result in material misstatements in years not inspected by the PCAOB. The <i>Non-Severe Inspection Finding</i> indicator equals ‘1’ for any other inspection finding. We note that, in practice, the PCAOB does not distinguish the severity of an inspection finding. This variable is only coded for client-years that were subject to PCAOB inspections.

\* Unless indicated otherwise, all data are proprietary and submitted to the PCAOB by the respective audit firms.

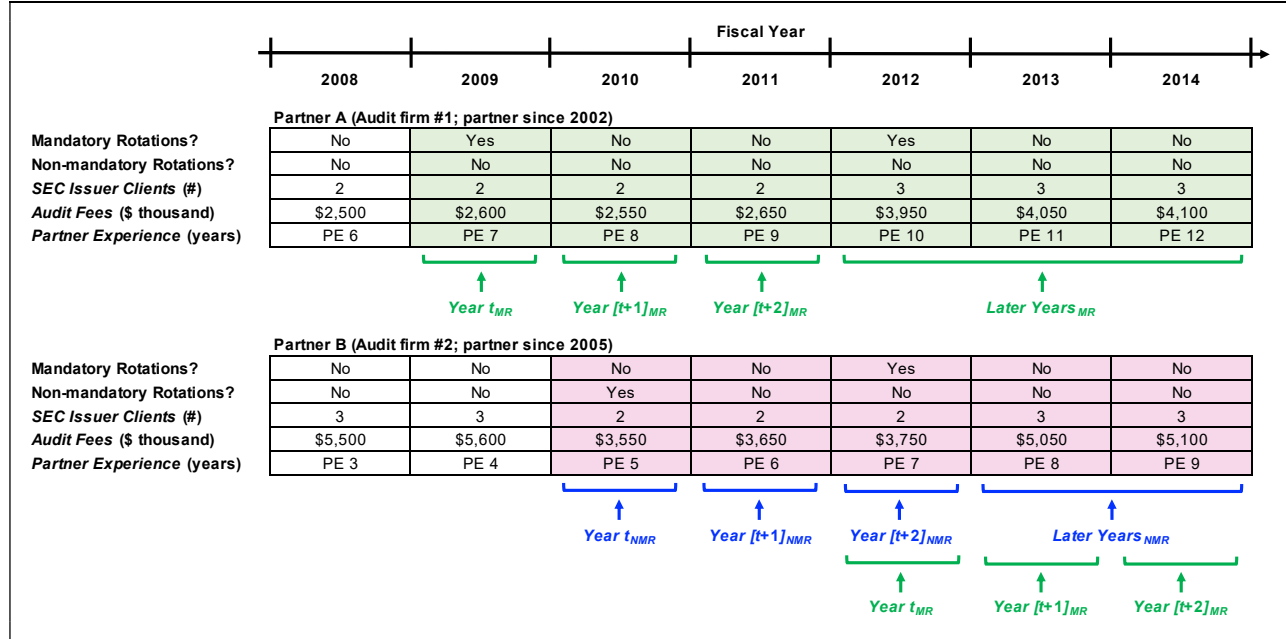
\*\* All price and accounting data are from Compustat (we indicate Compustat variable names in parentheses). We measure the data at the end of fiscal year  $t$  of client  $i$ , if not indicated otherwise. For details on the following client-specific control variables (which we do not tabulate) see Gipper, Hail, and Leuz (2021): *Absolute Accruals*, *Altman Z-Score*, *Cash Flow from Operations*, *Cash Flow Volatility*, *Market Value*, *M&A Firm*, and *Restructuring Firm*.

**FIGURE 1**  
**Data Structure for Client-Year Panel**



The figure illustrates the data structure for our client-year panel analyses. The unit of observation is an audit client relationship in a year. We trace this relationship over time and create indicator variables for the *Year before Mandatory Rotation* (i.e., engagements with partner rotation after five years of partner tenure), *Year before (after) Non-mandatory Rotation* (i.e., engagements with partner rotation before the end of the 5-year term limit) and *Year before Audit Firm Switch*. *Non-mandatory Rotation* is an indicator variable marking the early transition from one engagement partner to the next. Depending on the specification, we include fixed effects for partner tenure years (TY; *Tenure Year 3* serves as base period), SIC two-digit industry (I), individual clients (C), audit firm-by-fiscal year (AF×Y), or audit firm tenure (AT). All variable definitions are in Appendix A.

**FIGURE 2**  
**Data Structure for Partner-Year Panel**



The figure illustrates the data structure for our partner-year panel analyses. The unit of observation is an engagement partner in a year. We trace this individual over time and create indicator variables for the first year ( $Year t$ ), second year ( $Year [t+1]$ ), third year ( $Year [t+2]$ ), and all *Later Years* after her initial mandatory 5-year rotation cycle (*MR*) and/or her initial rotation cycle that falls short of the 5-year mandate (*NMR*) during the sample period. We define these indicator variables based on all SEC issuer clients in a partner's client portfolio that we observe in the client-year panel. For example, partner B of audit firm #2 has up to three SEC issuer clients over the sample period. She undergoes an early rotation at the beginning of 2010 with one of her clients (which she loses) and a mandatory rotation at the beginning of 2012 with another client (which she replaces with a new client). In 2013, she also adds another client. We aggregate the audit engagement attributes over all clients of an individual partner  $p$  in year  $t$ . For example, the *Audit Fees* of partner B in 2009 are the sum of this partner's three SEC issuer clients in that year. We include fixed effects for individual partners (P), the number of years of partner experience (PE), and audit firm-by-fiscal year (AF×Y). All variable definitions are in Appendix A.

**TABLE 1**  
**Sample Composition and Descriptive Statistics for Client-Year Panel**

**Panel A: Number of Mandatory and (Unexplained) Non-Mandatory Partner Rotations by Year**

Fiscal Year	Mandatory Rotations		Non-mandatory Rotations		Unexplained Non-mandatory Rotations		Audit Firm Switches		Total Observations
	N	%	N	%	N	%	N	%	
2008	496	20%	176	7%	134	6%	25	1%	2,423
2009	408	15%	234	9%	176	7%	20	1%	2,655
2010	335	12%	286	11%	233	9%	37	1%	2,686
2011	293	11%	277	11%	222	8%	64	2%	2,622
2012	273	11%	287	11%	221	9%	93	4%	2,598
2013	399	16%	201	8%	152	6%	97	4%	2,566
2014	308	13%	n.a.		n.a.		95	4%	2,351
Total	2,512	14%	1,461	8%	1,138	6%	431	2%	17,901

Panel A reports the number of (within-audit firm) rotations of engagement partners and, separately, audit firm switches (which, by definition, also give rise to partner rotations) by fiscal year. The full sample comprises 17,901 client-year observations with PCAOB data and (main) control variables available. We code mandatory rotations as years when the outgoing partner is in her fifth year of tenure, and non-mandatory rotations as years when the outgoing partner is in her first through fourth year of tenure. We do not observe the number of non-mandatory rotations in 2014 because of lack of 2015 data. In some analyses, we partition the non-mandatory rotations into those that can be explained by scheduled retirements, promotions, office switches, or temporary leaves/replacements and all the other, unexplained non-mandatory rotations. We identify audit firm switches based on the opinion data in Audit Analytics. The panel also indicates the percentages out of the yearly total observations.

*(continued on next page)*

TABLE 1 (continued)

## Panel B: Descriptive Statistics for Main Variables Used in Client-Year Regressions

	N	Mean	Std. dev.	P25	Median	P75
Partner Rotation Variables:						
<i>Non-mandatory Rotation</i> (indicator)	17,901	0.082	0.274	0	0	0
<i>Year before Non-mandatory Rotation</i> (indicator)	17,901	0.082	0.274	0	0	0
<i>Year before Non-mandatory Rotation<sub>expl</sub></i> (ind.)	17,901	0.018	0.133	0	0	0
<i>Year before Non-mandatory Rotation<sub>unexpl</sub></i> (ind.)	17,901	0.064	0.244	0	0	0
<i>Year after Non-mandatory Rotation</i> (indicator)	17,901	0.086	0.280	0	0	0
<i>Year before Mandatory Rotation</i> (indicator)	17,901	0.143	0.351	0	0	0
<i>Year before Audit Firm Switch</i> (indicator)	17,901	0.024	0.154	0	0	0
Client Firm Characteristics:						
<i>Stock Returns</i> (%)	17,901	0.151	0.508	-0.082	0.157	0.384
<i>Return on Assets</i> (ratio)	17,901	0.003	0.158	-0.005	0.029	0.070
<i>Sales Growth</i> (%)	17,901	0.086	0.348	-0.042	0.047	0.149
<i>Loss Firm</i> (indicator)	17,901	0.271	0.444	0	0	1
<i>Total Assets</i> (\$ million)	17,901	12,674	89,059	362	1,380	4,816
<i>Financial Leverage</i> (ratio)	17,901	0.239	0.226	0.039	0.191	0.368
<i>Book-to-Market</i> (ratio)	17,901	0.636	0.681	0.288	0.522	0.851
Audit Engagement Characteristics:						
<i>Audit Hours</i> (hours)	17,837	10,887	13,157	3,719	6,526	12,376
<i>Partner Hours</i> (hours)	17,829	559	804	196	325	583
<i>Partner Experience</i> (years)	17,250	10.153	5.863	6	9	14
<i>SEC Issuer Clients</i> (#)	17,373	2.170	1.391	1	2	3
<i>Partner Retirement</i> (indicator)	17,901	0.027	0.163	0	0	0
<i>Partner Promotion</i> (indicator)	17,901	0.143	0.350	0	0	0
<i>Partner Office Move</i> (indicator)	17,901	0.023	0.151	0	0	0
<i>Temporary Leave</i> (indicator)	17,901	0.004	0.062	0	0	0
<i>Temporary Replacement</i> (indicator)	17,901	0.002	0.040	0	0	0
Proxies for Audit Quality:						
<i>Restated Financials</i> (indicator)	17,882	0.172	0.377	0	0	0
<i>Audit Firm Inspection Finding</i> (indicator)	1,803	0.261	0.439	0	0	1
<i>PCAOB Part I Finding</i> (indicator)	1,560	0.342	0.474	0	0	1
<i>PCAOB Part II Finding</i> (indicator)	1,560	0.518	0.500	0	1	1
<i>Severe Inspection Finding</i> (indicator)	1,560	0.226	0.419	0	0	0
<i>Non-severe Inspection Finding</i> (indicator)	1,560	0.341	0.474	0	0	1

All definitions for the variables reported in Panel B are in Appendix A.

**TABLE 2**  
**What Explains Non-mandatory Rotations?**

**Panel A: Client Firm and Audit Engagement Characteristics**

<b>Dependent Variable: Non-mandatory Rotation</b>	<b>(1) Client Performance</b>	<b>(2) Client Attributes</b>	<b>(3) Engagement Attributes</b>	<b>(4) Partner Attributes</b>
<i>Client Firm Characteristics:</i>				
<i>Stock Returns</i>	0.008 (1.58)	—	—	—
<i>Return on Assets</i>	-0.018 (-0.91)	—	—	—
<i>Sales Growth</i>	0.005 (0.71)	—	—	—
<i>Loss Firm</i>	-0.003 (-0.53)	—	—	—
<i>Ln(Total Assets)</i>	—	-0.004*** (-3.03)	—	—
<i>Financial Leverage</i>	—	-0.003 (-0.25)	—	—
<i>Book-to-Market</i>	—	0.003 (0.89)	—	—
<i>Audit Engagement Characteristics:</i>				
<i>Ln(Audit Hours)</i>	—	—	-0.002 (0.24)	—
<i>Ln(Partner Hours)</i>	—	—	-0.010* (-1.79)	—
<i>Partner Experience</i>	—	—	—	0.001*** (3.41)
<i>SEC Issuer Clients</i>	—	—	—	-0.013*** (-8.67)
Fixed Effects	TY, I, AF×Y	TY, I, AF×Y	TY, I, AF×Y	TY, I, AF×Y
R-squared	0.047	0.047	0.048	0.050
Observations	17,901	17,901	17,826	17,250

*(continued on next page)*



TABLE 2 (continued)

## Panel B: Career and Life Events of Audit Partners

Dependent Variable: <i>Non-mandatory Rotation</i>	(1)	(2)	(3)	(4)	(5)
<i>Partner Retirement</i>	0.188*** (9.92)	—	—	—	—
<i>Partner Promotion</i>	—	0.005 (0.74)	—	—	—
<i>Partner Office Move</i>	—	—	0.010 (0.67)	—	—
<i>Temporary Leave</i>	—	—	—	0.353*** (9.42)	—
<i>Temporary Replacement</i>	—	—	—	—	0.627*** (7.18)
Fixed Effects	TY, I, AF×Y	TY, I, AF×Y	TY, I, AF×Y	TY, I, AF×Y	TY, I, AF×Y
R-squared	0.059	0.047	0.047	0.053	0.055
Observations	17,901	17,901	17,901	17,901	17,901

The table reports OLS coefficient estimates and (in parentheses) *t*-statistics from regressions of a binary indicator variable marking the occurrence of an early partner rotation after the audit's conclusion for the current fiscal year *t* (*Non-mandatory Rotation*) on various potential explanatory factors. In Panel A, we report results for characteristics of the client firm (e.g., past performance or size) and the audit engagement (e.g., time spent on engagement or partner experience), all measured in year *t*. In Panel B, we report results for audit partner life events that can help explain why rotation cycles fall short of the 5-year mandate (e.g., scheduled retirements, promotions, office switches, or temporary leaves/replacements). We measure these life events in year *t*+1 and later use them to distinguish between explainable and unexplained non-mandatory rotations. All variable definitions are in Appendix A. We include fixed effects for partner tenure years (TY), SIC two-digit industry (I), and audit firm-by-fiscal year (AF×Y) in the model. We assess statistical significance based on robust standard errors clustered by client firm and indicate significance at the 1%, 5%, and 10% levels (two-tailed) with \*\*\*, \*\*, and \*.

**TABLE 3**  
**Audit Quality around Non-mandatory Rotations**

**Panel A: Distinction between Unexplained and Explainable Non-mandatory Rotations**

<b>Dependent Variables:</b>	<b>(1)</b> <i>Restated Financials</i>	<b>(2)</b> <i>PCAOB Part I Finding</i>	<b>(3)</b> <i>Audit Firm Inspection Finding</i>	<b>(4)</b> <i>Restated Financials</i>	<b>(5)</b> <i>PCAOB Part I Finding</i>	<b>(6)</b> <i>Audit Firm Inspection Finding</i>
Partner Rotation Variables:						
<i>Year before Non-mandatory Rotation</i>	0.022** (2.01)	0.055 (1.25)	-0.032 (-0.90)	—	—	—
<i>Year before Non-mandatory Rotation<sub>unexpl</sub></i>	—	—	—	0.023** (2.00)	0.101** (2.04)	-0.007 (-0.18)
<i>Year before Non-mandatory Rotation<sub>expl</sub></i>	—	—	—	0.016 (0.82)	-0.092 (-1.12)	-0.108* (-1.67)
Controls for Benchmark Periods:						
<i>Year after Non-mandatory Rotation</i>	0.005 (0.43)	0.016 (0.31)	-0.026 (-0.63)	0.005 (0.43)	0.014 (0.28)	-0.025 (-0.62)
<i>Year before Mandatory Rotation</i>	0.004 (0.51)	-0.028 (-0.61)	0.006 (0.15)	0.004 (0.51)	-0.029 (-0.62)	0.005 (0.13)
<i>Year before Audit Firm Switch</i>	0.031 (1.55)	0.119 (1.49)	-0.006 (-0.09)	0.031 (1.55)	0.117 (1.47)	-0.006 (-0.08)
Audit- and Client-specific Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	TY, C, AF×Y, AT	TY, AF×Y, AT	TY, AF×Y, AT	TY, C, AF×Y, AT	TY, AF×Y, AT	TY, AF×Y, AT
R-squared	0.511	0.143	0.226	0.511	0.146	0.226
Observations	17,882	1,560	1,803	17,882	1,560	1,803

*(continued on next page)*

TABLE 3 (continued)

## Panel B: Additional PCAOB Inspection Outcomes as Proxies for Audit Quality

Dependent Variables:	(1) <i>PCAOB Part II Finding</i>	(2) <i>Ln(1 + # Part I Findings + # Part II Findings)</i>	(3) <i>Severe Inspection Finding</i>	(4) <i>Non-severe Inspection Finding</i>
Partner Rotation Variables:				
<i>Year before Non-mandatory Rotation<sub>unexpl</sub></i>	0.070 (1.39)	0.233** (2.30)	0.166*** (3.53)	-0.063 (-1.34)
<i>Year before Non-mandatory Rotation<sub>expl</sub></i>	-0.114 (-1.37)	-0.117 (-0.72)	-0.032 (-0.44)	-0.061 (-0.78)
Benchmark Periods, Audit- and Client-specific Controls	Yes	Yes	Yes	Yes
Fixed Effects	TY, AF×Y, AT	TY, AF×Y, AT	TY, AF×Y, AT	TY, AF×Y, AT
R-squared	0.164	0.168	0.126	0.141
Observations	1,560	1,560	1,560	1,560

The table reports OLS coefficient estimates and (in parentheses) *t*-statistics from regressions of various audit quality proxies on a binary indicator variable marking the final year before the engagement partner leaves short of the regular mandatory 5-year rotation cycle (*Year before Non-mandatory Rotation*). In some specifications, we partition the non-mandatory rotations into those that can be explained by scheduled retirements, promotions, office switches, or temporary leaves/replacements (as indicated by the subscript *expl*) and all the other, unexplained non-mandatory rotations (*unexpl*). The table headings indicate the audit quality proxy for client *i* in year *t* that serves as dependent variable in the respective column. We include three separate binary indicators marking the year after a *Non-Mandatory Rotation*, the year before a *Mandatory Rotation* as well as the year prior to an *Audit Firm Switch*. All variable definitions are in Appendix A. The audit- and client-specific control variables are (see Gipper, Hail, and Leuz 2021 for details): *Client Risk Rating*, *Ln(Market Value)*, *Financial Leverage*, *Return on Assets* in years *t* and *t-1*, *Loss Firm*, *Cash Flow from Operations*, *Book-to-Market*, *Altman Z-Score*, *Sales Growth*, *Ln(Cash Flow Volatility)*, *Absolute Accruals*, *Restructuring Firm*, and *M&A Firm*. We include fixed effects for partner tenure years (TY), individual clients (C), audit firm-by-fiscal year (AF×Y), and audit firm tenure (AT) as indicated. We assess statistical significance based on robust standard errors clustered by client firm and indicate significance at the 1%, 5%, and 10% levels (two-tailed) with \*\*\*, \*\*, and \*.

**TABLE 4**  
**Cross-sectional Analyses of Audit Quality around Non-mandatory Rotations**

Dependent Variables:	Large [= A] vs. Small [= B] Clients		Less [= A] vs. More Constrained [= B] Audit Offices		Newer [= A] vs. Experienced [= B] Audit Partners		Female [= A] vs. Male [= B] Audit Partners	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>Restated Financials</i>	<i>PCAOB Part I Finding</i>	<i>Restated Financials</i>	<i>PCAOB Part I Finding</i>	<i>Restated Financials</i>	<i>PCAOB Part I Finding</i>	<i>Restated Financials</i>	<i>PCAOB Part I Finding</i>
Partner Rotation Variables:								
<i>Year before NMR<sub>unexpl</sub></i> [A]	0.030*	0.131**	0.033**	0.110*	0.051***	0.198**	0.046	0.267*
	(1.95)	(2.04)	(2.08)	(1.66)	(3.16)	(2.56)	(1.60)	(1.82)
<i>Year before NMR<sub>unexpl</sub></i> [B]	0.016	0.065	0.013	0.091	0.009	0.033	0.029**	0.100
	(1.00)	(0.87)	(0.88)	(1.27)	(0.58)	(0.40)	(2.25)	(1.62)
Difference:								
[A – B]	[0.014]	[0.066]	[0.020]	[0.019]	[0.042**]	[0.165]	[0.017]	[0.167]
<i>Year before NMR<sub>expl</sub></i> , Benchmark Periods, Audit- and Client- specific Controls								
	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects								
	TY, C, AF×Y, AT	TY, AF×Y, AT	TY, C, AF×Y, AT	TY, AF×Y, AT	TY, C, AF×Y, AT	TY, AF×Y, AT	TY, C, AF×Y, AT	TY, AF×Y, AT

The table reports OLS coefficient estimates and (in parentheses) *t*-statistics from regressions of audit quality on the year before unexplained non-mandatory rotations indicator (*Year before NMR<sub>unexpl</sub>*), split into two separate variables for groups A and B. The table headings indicate the audit quality proxy for client *i* in year *t* that serves as dependent variable in the respective column. We partition the variable *Year before NMR<sub>unexpl</sub>* into two groups based on the following criteria: (i) client firms with at or above median *Total Assets* (large = A) versus small clients; (ii) client firms that are serviced out of an office with below mean numbers of SEC issuer clients per partner (less constrained = A) versus more constrained offices; (iii) client firms with an engagement partner who has below median *Partner Experience* (newer = A) versus experienced partners; and (iv) client firms with female (= A) versus male engagement partners (based on a classification of partners' first names in <https://genderize.io>). We measure the partitioning criteria in the client-years leading up to an unexplained non-mandatory rotation. Throughout the table, we include (but do not report) the indicator for the year before explainable non-mandatory rotations (*Year before NMR<sub>expl</sub>*) plus the full set of controls for benchmark periods, audit- and client-specific attributes and fixed effects as in Table 3. We assess statistical significance based on robust standard errors clustered by client firm and indicate significance at the 1%, 5%, and 10% levels (two-tailed) with \*\*\*, \*\*, and \*. We also report the difference between coefficients for groups A and B and assess its statistical significance based on *F*-tests.

**TABLE 5**  
**Audit Partner Profiles by Years of Partner Experience**

**Panel A: Audit Partner Characteristics**

<i>Partner Experience (Years)</i>	<i>Observations (Partner- years)</i>	(1) <i>SEC Issuer Clients (#)</i>	(2) <i>Non-SEC Issuer Clients (#)</i>	(3) <i>Audit Hours (Hours)</i>	(4) <i>Utilization (%)</i>	(5) <i>Partner Rating (1 to 5)</i>	(6) <i>Internal Inspections (%)</i>
≤ 5	6,121	1.67	6.52	16,064	65.5	3.04	8.8
6 – 10	5,895	1.84	5.31	21,880	62.6	3.25	12.1
11 – 15	3,729	1.80	4.49	24,155	59.0	3.35	14.0
16 – 20	1,943	1.58	3.65	25,641	54.8	3.36	16.9
≥ 21	1,309	1.41	3.23	22,444	55.5	3.27	17.0
Total/Mean	18,997	1.72	5.25	20,869	61.5	3.23	12.2

**Panel B: SEC Issuer Client Characteristics**

<i>Partner Experience (Years)</i>	<i>Observations (Partner- years)</i>	(1) <i>Audit Fees (\$ Thousands)</i>	(2) <i>High-Risk Clients (%)</i>	(3) <i>Sales Revenue (\$ Millions)</i>	(4) <i>Sales Growth (%)</i>	(5) <i>Return on Assets (%)</i>	(6) <i>Loss Firms (%)</i>
≤ 5	2,633	2,019	14.3	1,129	11.0	-1.35	32.4
6 – 10	3,769	3,670	15.1	3,466	8.6	0.40	27.9
11 – 15	2,443	5,695	14.3	7,806	8.4	1.90	22.0
16 – 20	1,228	7,466	15.8	14,154	6.3	2.92	17.8
≥ 21	845	7,521	14.3	11,880	4.5	2.15	20.6
Total/Mean	10,918	4,449	14.8	5,727	8.6	0.73	26.0

The table reports descriptive statistics for the partner-year panel, including the number, means, or percentages of various audit partner characteristics (Panel A) and SEC issuer client firm characteristics (Panel B) by years of *Partner Experience*. The sample comprises up to 18,997 partner-year observations with PCAOB data and accounting data available. We aggregate the variables over all clients of an individual partner  $p$  in year  $t$ . For example, we sum the *Audit Fees* of a partner's SEC issuer clients in a year. All variable definitions are in Appendix A.

**TABLE 6**  
**Audit Partners' Client Portfolio Following Mandatory and (Unexplained) Non-Mandatory Rotations**

<b>Dependent Variables:</b>	<b>(1) SEC Issuer Clients</b>	<b>(2) Non-SEC Issuer Clients</b>	<b>(3) Total Partner Clients</b>	<b>(4) Ln(Sales Revenue)</b>	<b>(5) High-Risk Clients</b>
Years after Initial Mandatory Rotation:					
<i>Year t<sub>MR</sub></i>	0.167*** (5.60)	0.123 (1.12)	0.325*** (2.88)	0.046 (1.52)	0.022** (2.04)
<i>Year [t+1]<sub>MR</sub></i>	0.211*** (5.06)	0.234 (1.54)	0.434*** (2.78)	0.103** (1.97)	0.021 (1.44)
<i>Year [t+2]<sub>MR</sub></i>	0.218*** (4.01)	0.449** (2.25)	0.642*** (3.19)	0.147* (1.92)	0.022 (1.25)
<i>Later Years<sub>MR</sub></i>	-0.203*** (-3.00)	0.309 (1.22)	0.070 (0.27)	0.219** (2.01)	0.030 (1.32)
Years after Initial <i>NMR_unexpl</i> :					
<i>Year t<sub>NMR_unexpl</sub></i>	-0.386*** (-7.37)	0.072 (0.46)	-0.312* (-1.85)	-0.106 (-1.52)	-0.024 (-1.23)
<i>Year [t+1]<sub>NMR_unexpl</sub></i>	-0.232*** (-3.77)	0.213 (1.01)	0.015 (0.07)	-0.010 (-0.13)	-0.033 (-1.60)
<i>Year [t+2]<sub>NMR_unexpl</sub></i>	-0.188** (-2.43)	0.610** (2.31)	0.373 (1.41)	0.035 (0.38)	-0.008 (-0.31)
<i>Later Years<sub>NMR_unexpl</sub></i>	-0.068 (-0.74)	0.438 (1.34)	0.387 (1.17)	0.119 (1.06)	-0.071*** (-2.81)
Difference:					
<i>[Year t<sub>MR</sub> – Year t<sub>NMR_unexpl</sub>]</i>	[0.553***]	[0.051]	[0.637***]	[0.152**]	[0.046**]
Controls for Years after Initial <i>NMR_expl</i>	Yes	Yes	Yes	Yes	Yes
Fixed Effects	P, PE, AF×Y	P, PE, AF×Y	P, PE, AF×Y	P, PE, AF×Y	P, PE, AF×Y
R-squared	0.679	0.738	0.744	0.823	0.483
Observations	18,997	18,009	18,997	10,907	10,918

(continued on next page)

**TABLE 6 (continued)**

The table reports OLS coefficient estimates and (in parentheses) *t*-statistics from regressions of various partner client portfolio characteristics on a set of binary indicator variables marking the first year (*Year t*), second year (*Year [t+1]*), third year (*Year [t+2]*), and all *Later Years* after partner *p*'s initial mandatory 5-year rotation cycle (*MR*) and/or her initial unexplained rotation cycle that falls short of the 5-year mandate (*NMR\_unexpl*) during the sample period. We also include the same set of yearly indicators for non-mandatory rotations that can be explained by scheduled retirements, promotions, office switches, or temporary leaves/replacements (*NMR\_expl*), but do not report the coefficients. The baseline period for all coefficients are the years prior to the first rotation. The table headings indicate the dependent variables that we use in the respective columns. All variable definitions are in Appendix A. We include fixed effects for individual partners (*P*), the number of years of partner experience (*PE*), and audit firm-by-fiscal year (*AF×Y*). We assess statistical significance based on robust standard errors clustered by partner and indicate significance at the 1%, 5%, and 10% levels (two-tailed) with \*\*\*, \*\*, and \*. We also report the difference between select coefficients and assess its statistical significance based on *F*-tests.

**TABLE 7**  
**Audit Partners' Job Performance Following Mandatory and (Unexplained) Non-Mandatory Rotations**

<b>Dependent Variables:</b>	<b>(1)</b> <b>Ln(Audit Hours)</b>	<b>(2)</b> <b>Ln(Audit Fees)</b>	<b>(3)</b> <b>Utilization</b>	<b>(4)</b> <b>Partner Rating</b>	<b>(5)</b> <b>Internal Inspections</b>
Years after Initial Mandatory Rotation:					
<i>Year t<sub>MR</sub></i>	0.331*** (9.93)	0.085*** (4.40)	1.882*** (5.01)	0.007 (0.28)	-0.008** (-2.09)
<i>Year [t+1]<sub>MR</sub></i>	0.375*** (7.72)	0.136*** (4.22)	2.300*** (4.43)	-0.021 (-0.72)	-0.004 (-0.62)
<i>Year [t+2]<sub>MR</sub></i>	0.432*** (6.70)	0.158*** (3.44)	2.399*** (3.61)	-0.017 (-0.51)	-0.008 (-1.07)
<i>Later Years<sub>MR</sub></i>	0.326*** (3.72)	0.191*** (2.97)	0.701 (0.80)	0.026 (0.62)	0.006 (0.64)
Years after Initial <i>NMR_unexpl</i> :					
<i>Year t<sub>NMR_unexpl</sub></i>	-0.232*** (-3.96)	-0.302*** (-7.33)	-1.725*** (-2.60)	-0.083** (-2.08)	0.020** (2.49)
<i>Year [t+1]<sub>NMR_unexpl</sub></i>	-0.246*** (-3.38)	-0.191*** (-3.84)	0.578 (0.73)	-0.020 (-0.43)	0.008 (0.77)
<i>Year [t+2]<sub>NMR_unexpl</sub></i>	-0.265** (-2.58)	-0.221*** (-3.81)	0.985 (1.02)	-0.016 (-0.33)	-0.005 (-0.38)
<i>Later Years<sub>NMR_unexpl</sub></i>	-0.067 (-0.68)	-0.168** (-2.51)	0.144 (0.12)	0.047 (0.79)	-0.024* (-1.86)
Difference:					
<i>[Year t<sub>MR</sub> – Year t<sub>NMR_unexpl</sub>]</i>	[0.563***]	[0.387***]	[3.607***]	[0.090*]	[-0.028***]
Controls for Years after Initial <i>NMR_expl</i>	Yes	Yes	Yes	Yes	Yes
Fixed Effects	P, PE, AF×Y	P, PE, AF×Y	P, PE, AF×Y	P, PE, AF×Y	P, PE, AF×Y
R-squared	0.574	0.791	0.677	0.667	0.533
Observations	18,371	10,898	18,762	9,911	18,009

See the notes to Table 6, but with respect to various characteristics of partner *p*'s job performance in year *t* as the dependent variables.



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