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Holm, Morten; Riise Johansen, Thomas

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ORIGINAL ARTICLE

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The Big 4 effect for new audit services: The case of the Danish COVID-19 fixed-cost business-support scheme

Morten Holm | **Thomas Riise Johansen**

Copenhagen Business School, Frederiksberg, Denmark

Correspondence
Morten Holm, Copenhagen Business School, Solbjerg Plads 3, 2000 Frederiksberg, Denmark.
Email: mh.acc@cbs.dk

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This study investigates the Big 4 effect for a new-to-the-world audit service. Based on unique data from the Danish COVID-19 fixed cost support scheme we analyse differences in audit fees and two measures of audit quality across Big 4 and non-Big 4 engagements. Our findings suggest that firms engaging with Big 4 auditors experience more successful outcomes in the application process and are willing to pay a Big 4 premium for comparable assurance services. Clients of Big 4 auditors are, on average, more likely to receive full compensation, and experience fewer rejections during the application process than clients of non-Big 4 auditors. This research has implications for policymakers and companies.

KEYWORDS
audit market, public accounting firms

1 | INTRODUCTION

Is a 'Big 4 effect' present when a new-to-the-world audit service for privately held firms emerges? A consensus regarding the market for financial statement audits holds that Big 4 audit firms charge a premium for annual audit services (Hay & Knechel, 2017), but this premium is especially visible for publicly listed firms (Vanstraelen & Schelleman, 2017). Furthermore, whether this premium reflects differences in audit quality remains a matter of ongoing debate (DeFond et al., 2017; DeFond & Zhang, 2014; Lawrence et al., 2011). For private firm audits, prior studies report mixed results on the Big 4 effect (e.g., Bauwhede & Willekens, 2004; Chen et al., 2023; Van Tendeloo & Vanstraelen, 2008). A recent study, however, documents that a Big 4 effect for financial statement audits driven by material audit quality exists and can be explained by Big 4 audit firms' greater capacities for recruitment, enhanced learning opportunities and stronger incentives/monitoring (Che et al., 2020). Whether these capacities generate a Big 4 effect for new-to-the-world audit services, however, has hardly been analysed, most likely because significant new audit markets rarely emerge and data on the pricing and quality of new audit services is scarce. New insights into this matter are needed, for example to qualify the debate over the upcoming mandatory sustainability assurance following the implementation of the European sustainability reporting directive (EU., 2022).

We investigate the Big 4 effect for a new-to-the-world audit service by exploring the Danish government intervention during the COVID-19 pandemic. The breakout of the COVID-19 pandemic and subsequent lockdowns shocked economies around the world and governments were forced to support companies financially to avoid major economic crises (European Commission, 2021; IESBA & FRC, 2021). In Denmark, companies across sectors were offered financial aid to cover their fixed costs during the lockdown. Access to this support scheme required each firm to submit an application, including an independent auditor's report. Given the great number of applications submitted by private firms, the support scheme created a significant market for auditors—a new market which attracted keen government attention, substantial regulatory scrutiny and frequent changes in applicable rules and regulations over a relatively short time span.

The Danish COVID-19 support scheme provides tangible, real outcomes of the auditing process in the form of reimbursements that

were approved and paid out by the Danish authorities. Support-scheme applications were submitted to and assessed by the Danish Business Authority, which further selected some applications for deeper scrutiny. While financial statement users focus primarily on financial performance, users (authorities) of applications and related audit reports are concerned primarily with whether an applicant can be supported and whether the information submitted with the application has been prepared according to guidelines. We therefore consider application outcomes a unique opportunity to observe the quality of a new assurance service.

Auditors attest applications for compliance with support-scheme regulations, including whether the reported value for each item is trustworthy but also whether classification is reliable and, not least, whether the included cost items are eligible for support. Moreover, information about audit firms and audit fees is not publicly available but rather available exclusively to the Danish Business Authority, which processed the applications in accordance with rulings issued by the Danish parliament. We argue that the degree to which firms receive full or reduced levels of reimbursement is a valid and unique proxy for material audit quality because firms' applications are processed by a government agency that is obliged to act in accordance with national law and because auditors' knowledge of and the ways in which they respond to the evolving Danish COVID-19 support scheme during the application period affects the application process considerably and may vary across Big 4 and non-Big 4 audit firms.

We hypothesize that Big 4 auditors, given their robust knowledge-sharing, stricter risk-management practices, and highly developed knowledge bases, deliver higher audit quality for this new-to-the-world audit service, thereby generating more favorable application outcomes than non-Big 4 auditors. We also expect to find that client firms are willing to pay a Big 4 audit-fee premium for this service. In line with literature on the Big 4 effect, we expect this effect to be present primarily because the service is new and because of the risk associated with frequently modified regulations and related interpretation as well as public scrutiny. This suggests higher quality, the better knowledge and risk management systems. On the other hand, there are also circumstances that may eliminate a Big 4 effect. First, this new audit service is mainly provided for small and medium-sized companies and may therefore not be a highly attractive revenue-generating service. Further, in light of above-mentioned risks, this may disincentivize Big 4 to be in the market. Descriptive results, however, show that most clients obtaining financial statement audits from a Big 4 firm, also obtain the new service from the same Big 4 firm. Second, the audit procedures required for the new audit service are mainly substantive testing with relatively less emphasis on risk and control scoping and use of audit technologies. This may counteract a Big 4 effect on both quality and fees. Third, the intended user of the new audit service is the government, which also scrutinize applications. While this provides incentives for quality service for those seeking to protect reputation, i.e. the large audit firms, it may eliminate a Big 4 effect on fees, assuming that Big 4 firms do not want to stand out as greedy when the service is a significant public interest service offered to companies in financial distress or close to the state of distress.

We were granted access to application data from the Danish Business Authority and gathered a large sample of COVID-19 fixed-cost support applications from all participating companies during the period of the first support scheme (April–October 2020).[1] Due to the significant differences in client characteristics across Big 4 and non-Big 4 engagements as well as an uneven market structure (14% market share to Big 4), we conduct propensity score matched (PSM) sample analyses in line with Lawrence et al. (2011) and DeFond et al. (2017). Based on these analyses we provide evidence in support of our hypotheses. First, we document the existence of a Big 4 audit fee premium. Second, we show that clients of Big 4 auditors experience greater success rates in that they are significantly more likely to receive full compensation, and significantly less likely to have their application rejected one or more times by the Danish Business Authority during the application process than clients of non-Big 4 auditors. Third, we document differences in compensation received following first rejections or withdrawals of applications.[2] We find some evidence that Big 4 clients receive, on average, *higher* amounts in compensation after a first rejection, whereas clients of non-Big 4 audit firms receive *lower* amounts in compensation when their first applications are turned down. We interpret this as evidence of differences in the capacity to learn from a rejection and/or a greater likelihood that Big 4 auditors withdraw an application if they estimate that it is beneficial to a client.

We perform several additional analyses to test the robustness of our findings. First, we investigate whether our results are sensitive to PSM design choices (DeFond et al., 2017). We perform PSM with and without replacement, vary the caliper width, vary the treated-to-control ratio and introduce a non-linear term in the PSM model. None of these analyses suggest that our findings are sensitive to our PSM design choices, and the analyses thus corroborate our main results. We also investigate whether our results persist when comparing engagements from Big 4 with engagements from 'second-tier' audit firms. Re-running our tests on the subsample of Big 4 and second-tier audit firms does lead to qualitatively similar results. This further strengthens our claim that we are in fact documenting a Big 4 effect. Another concern when investigating Big 4 effects is endogeneity associated with auditor selection. To mitigate this issue, we exploit the special feature in this market that some small firms are exempt from having their financial statements audited. Having no 'regular' financial statement auditor, means that these firms' auditor selection process for the COVID-19 support-

[1]The Danish Business Authority ('Erhvervsstyrelsen') is a governmental body associated with the Danish Ministry of Industry, Business and Financial Affairs that oversees and monitors Danish businesses.

[2]Our dataset includes one indicator for non-reimbursement. We are not able to determine whether an application is rejected by the authorities or is withdrawn by a firm. We conducted an interview with the Danish Business Authority, which indicates that, in the majority of cases, non-reimbursement reflects the rejection of an application. Thus, we refer to rejections primarily if an observation indicates that there was no reimbursement. We are however aware that firms might choose to withdraw applications and submit revised versions if they or their auditors become aware of missing items or changed conditions.

scheme application attestations was, to a greater extent, exogenously determined. We re-run our main models for the subsample of firms with no regular financial statement auditor. Again, we find similar results as in our main tests. Finally, we explore whether the documented differences in application outcomes across Big 4 and non-Big 4 auditors can be attributed to perceived or material differences in audit quality. In these additional analyses we find no indication that the Danish Business Authority spent less time on Big 4 applications as one would expect if the authorities used audit firm size as a signal for screening applications (perception). Moreover, large audit firms (i.e., Big 4 and second-tier) were at least as likely to be selected for inspection by the authorities in the aftermath of the COVID-19 support scheme. Thus, we find no indication that authorities were making decisions based on audit quality perception generated by auditor size.

Our study makes two main contributions to the literature. First, it establishes that the Big 4 premium prevails in a new-to-the-world audit service offered to private firms. While prior research has found mixed results regarding the Big 4 premium for private firm engagements (Chaney et al., 2004; Che et al., 2020; Clatworthy et al., 2009; Vanstraelen & Schelleman, 2017), this study clearly documents that the premium extends to a new assurance service. Second, the study shows that the premium is associated with higher audit quality. We take advantage of a rather unique opportunity in audit research to observe real outcomes (application successes) that are influenced by auditors. Big 4 clients are more successful when submitting applications to the fixed-cost reimbursement scheme as they obtain higher reimbursement amounts and experience fewer rejections. Bae et al. (2021) suggest that Big 4 audit firms are more focused on managing audit engagements of publicly listed companies than other assurance engagements and the Big 4 audit firm advantages derived from systems and processes would therefore be less likely to generate a Big 4 effect. As stated above, there are also other circumstances that may offset a Big 4 effect. We do, however, observe a Big 4 effect for a new-to-the-world audit service and this is likely to be explained by stronger human resources as well as more effective knowledge sharing and risk management practices. Given the sudden introduction of the support-scheme, the ongoing modifications to regulation and the public scrutiny, it seems plausible that effective systems would generate a quality advantage. We believe that these findings are relevant to ongoing discussions on provider choice in the European sustainability assurance regulation, as this regulation, including reporting and assurance standards, is likewise subject to on-going development and interpretation and as this field is subject to considerable public awareness.

As such, the study supports the effectiveness of Big 4 capacities for delivering a new service performed through a large number of smaller engagements with private firms and not only their effectiveness at conducting audits for large companies (Duh et al., 2020; Huang et al., 2023). The finding that Big 4 firms absorb knowledge and have the capacity to support delivery of this new audit service and adjust within-firm practices more effectively than smaller audit firms bears implications for policymakers and companies.

2 | BACKGROUND AND HYPOTHESIS DEVELOPMENT

2.1 | The Danish government-backed COVID-19 fixed-cost business-support scheme

In response to the first COVID-19 lockdown in March 2020, the Danish Parliament passed legislation which provided the legal basis for a business-support scheme whereby businesses that stood to experience significant sales declines under lockdown could apply for reimbursement of up to 4 months' worth of fixed costs. To be eligible for the scheme, businesses were required to document sales declines of more than 40% under sales in the corresponding period in the previous year. While this support scheme was subsequently extended and revised several times, we focus on the initial scheme for which applications were submitted from April through October 2020.

The scheme required every applying business to engage a certified auditor to attest the application with a statement conveying a reasonable (high) level of assurance in accordance with ISA 805 (IAASB, 2018). Auditor choice was not restricted to financial statement auditors, but most businesses chose their own financial statement auditors (where applicable) to attest their applications. In our sample, 93% of applicant firms had their applications attested by their regular financial statement auditors.[3] The Danish Business Authority issued guidelines for auditors.[4] Auditors focused primarily on obtaining evidence for the firm's fixed cost and sales in the application period and for the firm's actual sales for the corresponding period. This entailed a focus on especially occurrence and cutoff of fixed cost and sales (because of possible overstatement of fixed cost in the application period and of sales in the corresponding period), but also on completeness of sales in the application period (because of possible understatement of sales in the application period). As the service was an audit, and not agreed-upon-procedures, the audit procedures were not specified in any regulation, but could be expected to involve basic risk assessment procedures and substantive procedures, including analytical procedures and test of details. The latter would likely entail inspection of invoices, contracts and the extent to which application items (especially for the corresponding period) were consistent with entries in the general ledger. It was stipulated that only an auditor's fee for attestation work was eligible for reimbursement. Thus, any advisory work was excluded from reimbursement and there was a cap of DKK 20,000 as the maximum audit fee for which companies could be reimbursed.

Subsequent analysis shows that 8.3% of all active Danish businesses received support under the fixed-cost support scheme (DST, 2021). The industries with the highest proportion of supported businesses were food and beverage operations (e.g., restaurants),

[3]This number is based on firms that report the names of their auditors. This information is not disclosed in 36% of our sample.

[4]The guidelines were revised on several occasions during the study period, as the Danish Government issued eight rulings from March through October 2020. The amendments were primarily refinements, definitions and extended deadlines and as such did not fundamentally alter the scope of the audit work. There were however ongoing regulatory changes that auditors had to monitor.

hotels, and fitness centers, where more than 60% of all businesses were supported.

In months during which the first applications were submitted, there were significant professional debates, demonstrating that auditors were concerned about the risk involved in providing assurance on applications. A special issue of the monthly magazine published by the Danish association of auditors (FSR–Danish Auditors) was devoted to the support scheme, the assurance provided by auditors, and the potential for fraud—and therefore the risk—associated with applications (Beck & Engelund, 2020; Brink-Olsen et al., 2020; Gath & Jepsen, 2020; Kønigsfeldt, 2020). Both the chair and the CEO of the Danish association of auditors highlighted that auditors' role in the fixed-cost support scheme was important and that auditors should be ready to perform this assurance service 'in the public interest' (Gath & Jepsen, 2020). They did, however, also note that there were great risks involved, because this service was new, the audit practice had only a short period of time to be developed and because several businesses were financially distressed (Beck & Engelund, 2020; Gath & Jepsen, 2020).

In the same issue of the auditor association's magazine, the fraud concern was confirmed by a representative of the Danish association of lawyers specializing in insolvency and reorganization law. They announced that forthcoming bankruptcy estates would focus on support-scheme fraud (Kønigsfeldt, 2020). It was further highlighted that there was great public awareness whether businesses were eligible for support and that auditors should be aware that all three dimensions of the fraud triangle were likely to be present, stressing the importance of audit evidence and documentation (Beck & Engelund, 2020; Brink-Olsen et al., 2020). This point was accompanied by a concern related to disciplinary processes that might come into play if audit oversight inspections later identified shortcomings in support-scheme audits (Beck & Engelund, 2020; Brink-Olsen et al., 2020). The Danish oversight authority later performed inspections focusing on the new service (Erhvervsstyrelsen, 2021). While there is no information indicating how many Big 4 engagements that were inspected, it is stated that the authorities inspected engagements in four firms from the group of eight audit firms that also audit public interest entities. The Big 4 firms are part of this group. The other firms in this group are BDO, Beierholm (affiliated with the HLB network), Grant Thornton and RSM. We later refer to the other firms as 'Next 4' or 'second-tier' audit firms. As a result of these inspections, the authorities initiated disciplinary cases related to 19 engagements. None of the disciplinary cases was related to engagements provided by the eight largest audit firms (Erhvervsstyrelsen, 2021, p. 11). About 1 year later several of these cases were subject to sanctions by the Danish disciplinary tribunal for auditors (Madsen, 2023). The sanctions were applied because of insufficient work performed, lack of documentation or incorrect audit opinions.

In sum, the months running from April through October 2020 constitute a rather intense period for auditors who worked on attestation of support-scheme applications. Alongside audit work, they had to monitor regulatory changes and interpret guidelines for a new service, and, as seen in the professional debates, the profession considered risks related to reputation, litigation and disciplinary sanctions.

2.2 | Hypothesis development

A great number of audit fee studies have documented a Big 4 audit fee premium (Hay & Knechel, 2017). The vast majority of these studies focus on publicly listed companies, and a few studies address audits in private firms, but there have been no studies of a fee premium for services other than financial statement audits. Chaney et al. (2004) are not able to identify the existence of the Big 4 premium in private firms, but later research questions the research design (Clatworthy et al., 2009; Lennox et al., 2012). Based on this critique, Clatworthy et al. (2009), in a study of the Big 4 premium in UK private firms, document such a premium. Similarly, Che et al. (2020) find a private firm audit fee increase in the long run when non-Big 4 audit partners switch to Big 4 firms. Thus, although this premium may be less prevalent in private than in publicly listed firms (Vanstraelen & Schelleman, 2017), it is reasonable to expect to observe a Big 4 premium in a private firm context.

The public disclosure of audit fees, which in most jurisdictions is required for listed companies, has reduced variation in audit fees (Craswell & Francis, 1999; Dye, 1991; Francis & Wang, 2005). This effect of fee disclosures has also been demonstrated in a private-firm setting (Averhals et al., 2020). In a market with no history of pricing decisions and no public exposure of fees, however, fees are likely to be more widely dispersed and a lack of pricing information for market actors creates more space for abnormal audit pricing. Two circumstances may offset a Big 4 premium. First, the emphasis on substantive, and rather simple, audit procedures suggests that this service does not require highly-skilled auditors and therefore takes away some of the conditions that could underly a Big 4 premium. Second, the service was introduced under public scrutiny, clients were often in financial distress and applications were reviewed by government. These are circumstances that might hold auditors, especially Big 4, back from charging fees at a level where they would risk appearing as greedy.

Despite these factors we expect the Big 4 premium to prevail in this newly emerged assurance market and therefore hypothesize:

> **H1.** Big 4 audit firms charge higher fees than non-Big 4 audit firms for COVID-19 fixed-cost reimbursement engagements.

A Big 4 fee premium may exist because of the need to signal quality (perceived quality) or because of actual quality differences (Hay & Knechel, 2017). Previous research has, to some extent, supported the existence of material quality differences in financial statement audits between Big 4 and non-Big 4 audits. Che et al. (2020) find evidence of a Big 4 effect on audit quality in private-firm audits in Norway and other studies have likewise found less earnings management among Big 4 private-firm clients (Ajona et al., 2008; Van Tendeloo &

Vanstraelen, 2008). Van Tendeloo and Vanstraelen (2008) observe quality differences only in countries that feature significant monitoring by tax authorities. Other studies, however, have found that financial reporting quality does not differ between large and smaller audit firms (Bauwhede & Willekens, 2004; Gaeremynck et al., 2008).

The debate on whether there is a Big 4 effect on quality has recently involved a focus on whether differences in client characteristics explain the Big 4 effect. Lawrence et al. (2011) challenge the proposition that Big 4 firms deliver higher quality than non-Big 4 firms and suggest that client size and other client characteristics explain the quality differences. In contrast, DeFond et al. (2017) suggest it is too early to rule out the Big 4 effect as the effect generally persist across most research design choices. For private firm audits, Chen et al. (2023) have also been attentive to the implications of client characteristics and observe differences between Big 4 and non-Big 4 audit firms even after considering client characteristics. Chen et al. (2023) find that Big 4 clients are associated with lower audit quality as these clients are more likely to engage in income-decreasing earnings management. They do, however, also find that Big 4 clients are associated with less income-increasing earnings management. According to Chen et al. (2023), this indicates that Big 4 audit firms adjust audit quality strategically.

These tensions and somewhat mixed results in prior studies on financial statement audits are, to some extent, related to the fact that disentangling Big 4 effects and client characteristics is difficult (DeFond et al., 2017; Lawrence et al., 2011).

We note that few studies have examined quality differences between Big 4 and non-Big 4 firms for other assurance services. Some studies have, however, considered a Big 4 effect in studies of assurance on non-financial reports. Research on integrated reports, for example, find that report quality and credibility is higher among Big 4 assurance providers (Caglio et al., 2020; Maroun, 2019). Similarly, Martínez-Ferrero et al. (2018) suggest that sustainability assurance provided by Big 4 firms is more likely to identify misstatements in sustainability reports. As both auditors from accounting firms and consultants provide assurance services on non-financial reports and as there are few non-Big 4 audit firms in the market, however, it must also be noted that it is difficult to disentangle quality differences between Big 4 and non-Big 4 firms (e.g., Caglio et al., 2020). In addition, Lu et al. (2023) have examined provider choice for financial statement audit and sustainability assurance, observing a positive spillover effect on financial audit quality from sharing auditors across assurance engagements.

Three differences in audit firm characteristics might explain material quality differences between Big 4 and non-Big 4 audit firms. First, Big 4 firms are perceived as enjoying advantages that help them attract and retain talent (Kerckhofs et al., 2021) and may therefore be expected generally to employ better auditors at all ranks (Che et al., 2020). Thus, stronger human resources capacities in Big 4 firms are expected to generate quality differences between Big 4 and non-Big 4 firms.

Second, Big 4 firms emphasize training, professional support and knowledge sharing and find opportunities to achieve effectiveness in such practices more easily because they have more resources from which to draw (Che et al., 2020). Duh et al. (2020) identify mechanisms by which audit firm professionals share knowledge, including reviewing work papers, brainstorming at the team level, consulting formally or informally and providing on-the-job training. Other mechanisms include engaging with specialists, mentoring, providing feedback, and conducting performance evaluations (Dierynck et al., 2024). Auditors in larger audit firms find better opportunities to draw on audit firm-level expertise and consultations and there are more frequent interactions between a more diverse group of audit partners and audit staff (Huang et al., 2023). In contrast, individual auditors in smaller audit firms rely more heavily on their own competence and knowledge (Langli & Svanström, 2014; Vanstraelen & Schelleman, 2017). Prior research has demonstrated that knowledge sharing in audit firms has a positive impact on audit quality (Che et al., 2020; Duh et al., 2020; Huang et al., 2023).

Third, Big 4 firms exercise stricter risk management and monitoring over assurance engagements. They do so because they have more abundant resources and more refined expertise and because they have stronger incentives to manage reputational and litigation risk (Che et al., 2020). The Danish Big 4 audit firms, as well as those operating in many other countries, are subject to more intense public oversight, including more frequent external inspections of audit files than occurs in oversight of smaller audit firms. Therefore, Big 4 firms deploy more effective quality and risk management systems which guide and monitor individual audit partners.

Although superior quality in Big 4 audit firms is expected, there are conditions which might challenge quality differentiation. Despite seemingly comprehensive systems, it might be difficult to oversee and manage large numbers of smaller assurance engagements, with firm-level systems leaving room for significant audit partner discretion related to work effort and pricing. It is also expected that Big 4 audit firms strategically devote less attention and work effort to private firm engagements than to listed clients, suggesting that risk management varies across engagements (Bae et al., 2021). Furthermore, the fact that the audit work for this new service is rather simple may counteract the quality-effect of stronger human resources capacities. In addition, the introduction of a new service, extensive demand for which arises suddenly in the context of a crisis, might be a 'shock' to audit firm systems. As such, it might take time for knowledge and risk management systems to absorb the new service and generate the quality and consistency associated with differences between Big 4 and non-Big 4 firms.

In general, though, many smaller audit firms are not subject to intense institutional scrutiny, experience little or no internal monitoring or coordination and have less reason to worry about reputational effects than Big 4 auditors (Che et al., 2020). Thus, smaller audit firms have weaker incentives to provide high audit quality (Langli & Svanström, 2014). Given these differences, we predict that we will observe quality differences between Big 4 and non-Big 4 audit firms. When auditors attest reimbursement applications, audit quality is indicated by the success with which companies obtain reimbursement. Firms that are granted higher reimbursement amounts and experience

TABLE 1 Sample.

Panel A: Sample selection		
	Total cases	**Big 4 cases**
All government-backed COVID-19 fixed cost support applications in 2020	34,223	
1. Less: Applications submitted after October 31	−1002	
2. Less: Open applications (decision pending)	−419	
3. Less: Rejected applications that are eventually accepted	−2598	
4. Less: Applications where audit fee and/or fixed cost amount equals zero	−2219	
5. Less: Firm-level exclusion criteria	−13,776	
6. Less: Applications from financial institutions, utilities or accounting firms	−344	
Sample incl. rejections	13,865	1930
7. Less: Applications that were ultimately rejected (= no reimbursement)	−580	
Main sample of accepted applications	13,285	1849
8. Less: Secondary applications (where multiple applications for same firm)	−408	
Net sample of firms with minimum one accepted application	12,877	1737

Panel B: Sample distribution by month						
	Sample incl. rejections		**Main sample of accepted applications**		**Net sample of firms with one accepted application**	
Months	**Frequency**	**%-split**	**Frequency**	**%-split**	**Frequency**	**%-split**
April	994	7.2%	983	7.4%	983	7.6%
May	2340	16.9%	2315	17.4%	2315	18.0%
June	2236	16.1%	2186	16.5%	2186	17.0%
July	1447	10.4%	1406	10.6%	1405	10.9%
August	1180	8.5%	1139	8.6%	1096	8.5%
September	5343	38.5%	4986	37.5%	4679	36.3%
October	325	2.3%	270	2.0%	213	1.7%
Total	13,865	100.0%	13,285	100.0%	12,877	100.0%

fewer rejected applications experience more successful application outcomes, and the extent of that success is related to the effort and expertise of the involved audit firms.

Based on these considerations, our second hypothesis can be stated as follows:

> **H2.** Clients of Big 4 audit firms experience more successful application outcomes than clients of non-Big 4 audit firms for COVID-19 fixed-cost reimbursement engagements.

3 | DATA, SAMPLE SELECTION AND RESEARCH METHOD

We obtain data on audit fees, fixed-cost reimbursements and other information related to the government-backed COVID-19 fixed-cost business-support scheme from firms' applications submitted to the Danish government. Each application includes an auditor statement. In January 2021, the Danish Business Authority granted the authors access to applications in accordance with the Danish Public Information Act. These data were merged with accounting data and industry information obtained from Experian and hand-collected audit partner data from the Danish Auditor Register administered by The Danish Business Authority.

We outline our sample construction in Table 1. A total of 34,223 government-backed COVID-19 fixed-cost business-support applications were submitted during the period running from April through December 2020. First, we exclude applications received after 31 October 2020. This date was the deadline for the broad, cross-sectional government-backed fixed-cost support scheme. After this date the scope of the programme was narrowed substantially to support industries that were hit most severely by the COVID-19 pandemic, such as travel/tourist-related services. Second, we eliminate applications with decisions pending at the time of our data extract. Third, as it was possible to reapply after rejection, we consolidate rejected applications into one observation for each firm where the ultimate outcome (accepted or rejected) is determined. This enables us to analyse the entire process from the date of the first application to the date of the final decision by the authorities, which enables us to identify the number of rejections/withdrawals incurred during the process. Fourth, we exclude applications where the audit fee or the fixed-cost amount applied for is zero or missing. Fifth, we restrict our sample to applications from limited liability companies that issue

financial statements covering 12 months and where no information is missing for total assets, net income or shareholders' equity. We also exclude one publicly listed firm. Sixth, we exclude applications from holding companies, financial services firms, utilities and firms that operate in other regulated industries, auditing and accounting firms and firms that lack industry codes. This yields a gross sample of 13,865 applications including 1930 cases attested by a Big 4 audit firm.

Next, we take two additional steps. First, we create a sample of accepted applications, omitting cases where a firm eventually ends up with no reimbursement ($N = 13,285$ including 1849 cases attested by a Big 4 audit firm). This tactic enables us to analyse the reimbursement rate achieved, that is, the percentage of the applied amount that is eventually reimbursed.[5] Based on this we create another sample where we eliminate all but the first accepted application per firm ($N = 12,877$ including 1737 cases attested by a Big 4 audit firm). Audit fee reimbursement was capped at DKK 20,000 by the authorities and the fee reimbursements applied for in secondary applications may thus be underestimated in the data, which creates noise in audit fee models. We therefore use this sample for the audit fee tests and use the sample including all accepted applications ($N = 13,285$) for the remaining audit quality tests.

As is evident from Table 1, Panel A the share of Big 4 attested applications is low in our samples (~14%). Additionally, the applications attested by Big 4 auditors are substantially different in terms of client-characteristics than applications attested by non-Big 4 auditors as Big 4 engagements seem to be larger and more complex (see summary statistics comparison in Table 3. To mitigate the risk that these differences in client-characteristics are driving our results (see Lawrence et al., 2011), we deploy a PSM research design where we first match Big 4 engagements with non-Big 4 engagements based on all client-level control variables including industry fixed effects (following Shipman et al., 2017) and, subsequently, run our main models on this propensity score matched sample.[6] We implement a caliper width of 0.5 to reduce the likelihood that we identify poor matches and improve the covariate balance (Shipman et al., 2017). Moreover, we perform a matching procedure without replacement in our main tests to retain the highest possible representativeness of the control group (DeFond et al., 2017) and conduct one-to-one matching so that one control observation is included for each treated observation. Later, we test the sensitivity of these assumptions in additional analyses and robustness tests (see Section 6).

To assess how well the Big 4 and non-Big 4 groups are balanced across covariates in our propensity score matched sample, we report the differences in means in Table 2. There are no significant differences between Big 4 and non-Big 4 groups except for the two size-related variables *LN_FCAPPLIED* and *LN_ASSETS* but the difference narrows substantially from 1.153 in the full sample to 0.226 in the matched sample for *LN_FCAPPLIED* and from 1.483 to 0.244 for *LN_ASSETS* (see Table 3). Despite these size differences we consider the matched sample reasonably balanced given the context.

We estimate regression models to investigate differences in audit fees and audit quality between Big 4 and non-Big 4 audit firms in the propensity score matched sample. We use audit fees from applications to investigate whether a Big 4 premium is present for this new-to-the-world audit service in this particular market consisting of small and medium-sized privately held firms. We take the natural logarithm of the fee, a common practice with audit fee models. We establish two measures of audit quality based on the outcomes of the COVID-19 fixed-cost applications: First, we use the fixed-cost reimbursement paid out by the authorities relative to the total reimbursement originally applied for by a given firm. If this variable equals '1' the firm received full reimbursement whereas scores below '1' reflect the fact that the firm was not entitled to the reimbursement for which it applied and therefore did not receive the full amount. This variable may take values above '1' if a firm withdraws the original application and submits a new, revised application. We also compute an indicator variable that equals '1' if the reimbursement was 100% or more of the original amount applied for and '0' otherwise; second, we use the number of rejections/withdrawals a firm receives/makes during the application process. If the firm's first application is accepted this variable takes the value '0'.

The way in which applications were registered by the Danish Business Authority makes it impossible to distinguish between rejections and withdrawals. Therefore, it is important to note that our variable *REJECTIONS* reflects either irregularities that lead to rejections by the authorities or voluntary withdrawals by firms. We acknowledge that this is a limitation of the data and the number of 'rejections' should therefore be interpreted with caution. We argue however that an application that is accepted without further ado can be regarded as entailing higher audit quality than a comparable application that is either rejected or withdrawn. We also compute an indicator variable that equals '1' if there is at least one rejection during the process associated with a specific application and '0' if the application is accepted without further ado.

Our focal independent variable, *AUDFIRM_BIG4*, is an indicator variable that takes the value of '1' if an application was attested by a Big 4 auditor and '0' otherwise. We control for a vector of independent variables that capture client, auditor and engagement attributes (Hay et al., 2006) that are adapted to the Danish COVID-19 business support context.

It is important to control for client attributes when investigating Big 4 effects (DeFond et al., 2017; Lawrence et al., 2011). In our models we therefore incorporate the range of client characteristics used in the PSM model including measures of client size, profitability, risk, governance, oversight, (Lawrence et al., 2011; Van Tendeloo & Vanstraelen, 2008) assurance type on the financial statements, and industry factors. To proxy for size we apply the natural logarithm of firm total assets (*LN_ASSETS*) and to proxy for profitability and risk we include a dummy variable that is equal to '1' if the firm incurred a loss

[5]Another way of achieving this end would be to set the reimbursed amount to equal '0' for applications that are ultimately rejected. We tested this version as well and the (untabulated) results are identical to our main results.

[6]We do not include application-process-related covariates (*APP_PROCESSTIME* and *APP_FIRST*) or audit partner characteristics in the matching procedure, as our main concern is to mitigate confounding effects of client characteristics in the audit firm selection process.

TABLE 2 Assessment of propensity score matched sample quality via covariate balancing tests.

	Big 4 engagements			Non-Big 4 engagements			
	N	Mean	Std. dev.	*N*	Mean	Std. dev.	Diff. in means
LN_FCAPPLIED	1804	12.657	1.504	1804	12.431	1.282	0.226*
LN_ASSETS	1804	15.946	1.852	1804	15.702	1.563	0.244*
LOSS	1804	0.285	0.452	1804	0.284	0.451	0.001
LEVERAGE	1804	0.707	0.355	1804	0.709	0.362	−0.002
BANKDEBT	1804	0.422	0.494	1804	0.432	0.495	−0.010
GROUP	1804	0.854	0.353	1804	0.844	0.363	0.010
ACCAUDIT_ASSUR	1804	0.820	0.384	1804	0.809	0.393	0.011
ACCAUDIT_NO	1804	0.029	0.167	1804	0.038	0.192	−0.009
MONTH	1804	7.762	1.594	1804	7.747	1.665	0.015

*Significance differences at the 1% level using a two-tailed *t* test.

TABLE 3 Descriptive statistics.

	Non-Big 4 engagements					Big 4 engagements					
Variables	*N*	Mean	Q1	Median	Q3	*N*	Q1	Median	Q3	Std. dev.	Difference
LN_AUDFEE	11,436	9.430	9.210	9.492	9.770	1849	9.649	9.903	10.019	0.476	0.450*
REIMBURSEMENT	11,432	0.986	0.941	1.000	1.000	1849	0.950	1.000	1.000	0.859	−0.001
REIMBURSE_FULL	11,432	0.552	0.000	1.000	1.000	1849	0.000	1.000	1.000	0.496	0.013
REJECTIONS	11,436	0.038	0.000	0.000	0.000	1849	0.000	0.000	0.000	0.176	−0.006
REJECTED	11,436	0.035	0.000	0.000	0.000	1849	0.000	0.000	0.000	0.176	−0.003
APP_PROCESSTIME	11,436	23.267	6.720	15.149	36.053	1849	10.072	24.060	44.796	21.573	5.561*
APP_FIRST	11,436	0.974	1.000	1.000	1.000	1849	1.000	1.000	1.000	0.239	−0.035*
LN_FCAPPLIED	11,436	11.539	10.754	11.411	12.214	1849	11.507	12.567	13.638	1.542	1.153*
LN_ASSETS	11,436	14.516	13.536	14.497	15.452	1849	14.763	15.820	17.142	1.894	1.483*
LOSS	11,436	0.272	0.000	0.000	1.000	1849	0.000	0.000	1.000	0.451	0.011
LEVERAGE	11,426	0.871	0.464	0.687	0.912	1848	0.461	0.672	0.874	0.750	−0.119*
BANKDEBT	11,436	0.403	0.000	0.000	1.000	1849	0.000	0.000	1.000	0.494	0.018
GROUP	11,436	0.717	0.000	1.000	1.000	1849	1.000	1.000	1.000	0.351	0.140*
PARTNER_CAPITAL	11,417	0.237	0.000	0.000	0.000	1830	0.000	0.000	1.000	0.452	0.050*
PARTNER_YRS	11,425	20.427	11.000	21.000	29.000	1833	7.000	13.000	20.000	8.889	−6.455*
PARTNER_FEMALE	11,425	0.073	0.000	0.000	0.000	1833	0.000	0.000	0.000	0.310	0.035*
ACCAUDIT_ASSUR	11,436	0.465	0.000	0.000	1.000	1849	1.000	1.000	1.000	0.382	0.358*
ACCAUDIT_COMPIL	11,436	0.377	0.000	0.000	1.000	1849	0.000	0.000	0.000	0.356	−0.228*
ACCAUDIT_NO	11,436	0.158	0.000	0.000	0.000	1849	0.000	0.000	0.000	0.165	−0.130*
MONTH	11,436	7.062	5.000	7.000	9.000	1849	6.000	9.000	9.000	1.585	0.719*

Note: Table 3 reports descriptive statistics for each variable used in the analysis for Big 4 and Non-Big 4 engagements. *LEVERAGE* is winsorized at the 1st and 95th percentiles in the models. Difference in means are reported in the final column. Refer to Appendix A for variable definitions.
*Significance differences at the 1% level using a two-tailed *t* test.

in the latest fiscal period and '0' otherwise (*LOSS*) as well as leverage measured as book liabilities to assets (*LEVERAGE*). Following Chen et al. (2023), we expect that differences between Big 4 and non-Big 4 firms are less pronounced for companies that are part of a business group (see also Bonacchi et al., 2019). For external oversight, we note that all audit engagements in Denmark are subject to similar regulatory oversight and that the oversight practiced by tax authorities is also very similar. External oversight therefore mainly relates to relationships with banks and other lenders. Opportunities to develop proxies of governance and oversight are more limited in private firms, but due to the high importance of these client characteristics we include a measure for group company oversight that indicates whether the firm is part of a business group (*GROUP*) and a measure that indicates whether the firm has interest-bearing debt (*BANKDEBT*).

Additionally, we control for the type of auditor report and the associated assurance level for the auditor report on the annual audit of the firm's financial statements. We develop an indicator variable that equals '1' if the firm received an audit with assurance (full audit or review) of their latest financial accounts, and '0' otherwise (*ACCAUDIT_ASSUR)* and an indicator variable that equals '1' if a firm did not receive any kind of assurance or compilation report of their latest financial accounts, and '0' otherwise (*ACCOUDIT_NO)*. The default category is thus firms that received a compilation report regarding their latest financial accounts. These indicator variables capture additional information about the complexity of a client's operations over and above firm and application size. Finally, we include industry fixed effects in all models.

Additionally, we control for audit partner characteristics, i.e., audit partner gender (Ittonen et al., 2013), whether a partner is from the capital region of Copenhagen (Johansen & Pettersson, 2013) and the number of years an auditor has been practicing (experience). We are unable to control for other audit partner characteristics that have been investigated in prior research such as partner age and industry specialization (e.g., Chin & Chi, 2009; Johansen & Pettersson, 2013) because of data restrictions. Regarding audit partner age, however, we expect the auditor experience variable to be highly correlated with audit partner age.

Finally, we control for engagement attributes, that is, factors related to the individual applications. Most importantly, we include the natural logarithm of the total amount of fixed cost reimbursement applied for by a firm. This variable proxies for the size and complexity of the application process as larger applications are expected to generate more work for auditors. Additionally, we incorporate the time that elapses from the date an application was submitted to the decision date, which reflects the scope of the application (*APP_PROCESSTIME*). We also control for whether an observed application is the first a firm submits (*APP_FIRST*). Finally, we include the month in which an application was submitted (April–October) to capture busy season effects (Heo et al., 2021) and pricing dynamics over time.

4 | DESCRIPTIVE STATISTICS

In Table 3 we report descriptive statistics for the variables used in the analyses, split between Big 4 and non-Big 4 engagements. As discussed in Section 3, Big 4 attestations involve significantly larger and more complex engagements, as expected. The median processing time for applications from Big 4 engagements is 24 days, while it is 15 days for non-Big 4 engagements. Only 46% of non-Big 4 engagements involve firms that normally obtain assurance on their financial

TABLE 4 Pearson correlation matrix.

	Variables	1	2	3	4	5	6
1	*AUDFIRM_BIG4*						
2	*LN_AUDFEE*	**0.320***					
3	*REIMBURSEMENT*	−0.000	−0.007				
4	*D_REIMBURSE_FULL*	0.009	**−0.090***	**0.081***			
5	*REJECTIONS*	−0.010	**−0.022***	**0.100***	**−0.030***		
6	*D_REJECTED*	−0.006	**−0.022***	**0.113***	**−0.027***	**0.968***	
5	*APP_PROCESSTIME*	**0.087***	0.004	−0.003	−0.020	−0.008	−0.012
6	*APP_FIRST*	**−0.070***	**0.104***	0.006	**−0.028***	**−0.053***	**−0.057***
7	*LN_FCAPPLIED*	**0.323***	**0.503***	−0.005	**−0.227***	0.008	0.012
8	*LN_ASSETS*	**0.305***	**0.457***	0.003	**−0.097***	**−0.034***	**−0.034***
9	*LOSS*	0.009	−0.013	**0.031***	−0.011	**0.075***	**0.079***
10	*LEVERAGE*	**−0.032***	**−0.035***	0.017	**−0.029***	**0.042***	**0.042***
11	*D_BANKDEBT*	0.013	**0.137***	0.010	**−0.055***	−0.009	−0.012
12	*D_GROUP*	**0.110***	**0.115***	−0.001	**−0.029***	0.009	0.006
13	*PARTNER_CAPITAL*	**0.040***	**0.069***	0.011	**−0.023***	0.013	0.017
14	*PARTNER_YRS*	**−0.208***	**−0.228***	0.017	−0.014	**0.028***	**0.026***
15	*PARTNER_FEMALE*	**0.045***	−0.006	−0.004	0.008	−0.003	−0.003
16	*ACCAUDIT_ASSUR*	**0.248***	**0.337***	0.003	**−0.072***	−0.022	−0.021
17	*ACCAUDIT_COMPIL*	**−0.166***	**−0.176***	−0.007	**0.032***	0.000	0.002
18	*ACCAUDIT_NO*	**−0.129***	**−0.245***	0.005	**0.059***	**0.031***	**0.027***
19	*MONTH*	**0.138***	**0.077***	−0.001	**0.301***	**0.071***	**0.066***

Note: Table 4 presents Pearson correlation coefficients below the diagonal for focal variable's mutual bivariate correlations and their correlations with control variables for the net sample of accepted applications. Refer to Appendix A for variable definitions.
*Significance at the 1% level (in bold).

statements whereas 82% of the Big 4 engagements involve firms that receive assurance on their regular financial statements. This further indicates that Big 4 engagements are likely to be more complex than non-Big 4 engagements. All this favors the decision to deploy a PSM design.

The characteristics of the audit partners involved in the engagements also differ between Big 4 and non-Big 4 applications. Big 4 engagements, on average, tend to involve more female partners and more partners from the capital region of Copenhagen. Non-Big 4 partners do, however, have greater experience (a median of 21 years vs. a median of 13 years for Big 4 partners).

In Table 4 we report Pearson correlation coefficients for the variables used in our analyses. Although we observe that the audit quality proxies are not significantly correlated with *AUDFIRM_BIG4* it is important to keep in mind that these are bivariate correlations and that we need to take client-, audit partner and engagement characteristics into account as well before we can make any conclusions concerning our hypotheses.

5 | MAIN EMPIRICAL RESULTS

5.1 | Big 4 effect on audit fees

In Table 5 we report the main results of our OLS (Column 1) and logit (Column 2) regression models with *LH_AUDFEE* and *AUDFEE_HI* as our dependent variables. We observe that the coefficient on *AUDFIRM_BIG4* is positive and statistically significant ($p < 0.01$) in both models. Moreover, the odds ratio (untabulated) for *AUDFIRM_BIG4* in the logit model (column 2) is 3.5, suggesting that client firms who engaged Big 4 auditors for the COVID-19 fixed-cost support-scheme attestations were more than three times as likely to pay fees that exceeded the threshold for audit fee reimbursement than firms who engaged non-Big 4 auditors in similar engagements. These findings support our hypothesis that a Big 4 audit fee premium is present in this new-to-the-world audit service market (*H1*). We note that control variables generally behave as expected. Firms pay higher fees for larger engagements, i.e., where a higher amount of fixed-cost reimbursement is

TABLE 5 Big 4 auditor effect on audit fees.

Variables	(1) LN_AUDFEE	(2) AUDFEE_HI
INTERCEPT	7.2925*** (37.53)	−20.2261 (0.21)
AUDFIRM_BIG4	0.1647*** (11.80)	1.2587*** (109.50)
APP_PROCESSTIME	−0.0004 (−1.14)	−0.0022 (0.50)
LN_FCAPPLIED	0.1439*** (16.17)	0.7404*** (94.12)
LN_ASSETS	0.0341*** (4.43)	0.3306*** (25.76)
LOSS	0.0641*** (3.84)	0.2331* (2.74)
LEVERAGE	−0.0229 (−1.02)	−0.1606 (0.64)
BANKDEBT	−0.0035 (−0.23)	0.0226 (0.03)
GROUP	0.0088 (0.43)	−0.0528 (0.08)
PARTNER_CAPITAL	0.0710*** (4.20)	0.1374 (1.00)
PARTNER_YRS	−0.0027*** (−3.61)	−0.0051 (0.62)
PARTNER_FEMALE	0.0367 (1.49)	−0.0554 (0.08)
ACCAUDIT_ASSUR	−0.0098 (−0.45)	0.2634 (1.19)
ACCAUDIT_NO	−0.0420 (−1.02)	0.0355 (0.00)
MONTH	0.0254*** (5.34)	0.1412*** (11.99)
Model	OLS	Logit
Industry FE	YES	YES
N	3358	3358
Adj./pseudo R^2	0.334	0.315

Note: In Table 5 we report the results of estimating an OLS regression model with (1) *LN_AUDFEE* as the dependent variable and a logit regression model with (2) *AUDFEE_HI* as the dependent variables using the propensity score matched sample. All models include four-digit NACE code industry fixed effects. *t* statistics (1) and Wald χ^2 statistics (2) are reported in parentheses. Refer to Appendix A for variable definitions.
*Significance at the 10% level using a two-tailed test.
**Significance at the 5% level using a two-tailed test.
***Significance at the 1% level using a two-tailed test.

TABLE 6 Big 4 auditor effect on reimbursement rate and likelihood of full reimbursement.

Variables	(1) REIMBURSEMENT	(2) REIMBURSE_FULL
INTERCEPT	1.1961*** (17.44)	6.4870 (0.02)
AUDFIRM_BIG4	0.0033 (0.74)	0.2424*** (9.07)
APP_PROCESSTIME	−0.0006*** (−5.15)	−0.0137*** (39.39)
APP_FIRST	−0.0009 (−0.09)	−0.3692** (3.91)
LN_FCAPPLIED	−0.0220*** (−7.94)	−0.4271*** (67.65)
LN_ASSETS	0.0104*** (4.34)	0.0670 (2.30)
LOSS	−0.0044 (−0.84)	−0.0651 (0.46)
LEVERAGE	−0.0068 (−0.98)	−0.1704 (1.80)
BANKDEBT	0.0036 (0.73)	−0.1233 (1.97)
GROUP	−0.0092 (−1.47)	−0.0757 (0.43)
PARTNER_CAPITAL	−0.0037 (−0.71)	0.1146 (1.46)
PARTNER_YRS	−0.0005** (−2.21)	−0.0135*** (10.47)
PARTNER_FEMALE	−0.0049 (−0.63)	−0.2543* (3.35)
ACCAUDIT_ASSUR	−0.0052 (−0.75)	0.0255 (0.04)
ACCAUDIT_NO	0.0286** (2.17)	0.4107 (2.64)
MONTH	0.0065*** (4.25)	0.2950*** (107.60)
Model	OLS	Logit
Industry FE	YES	YES
N	3584	3584
Adj./pseudo R^2	0.067	0.223

Note: In Table 6 we report the results of estimating (1) an OLS regression models with *REIMBURSEMENT* as the dependent variable and (2) a logit regression model with *REIMBURSE_FULL* as the dependent variable using the propensity score matched sample. All models include four-digit NACE code industry fixed effects. *t* statistics (1) and Wald χ^2 statistics (2) are reported in parentheses. Refer to Appendix A for variable definitions.
*Significance at the 10% level using a two-tailed test.
**Significance at the 5% level using a two-tailed test.
***Significance at the 1% level using a two-tailed test.

applied for (*LN_FCAPPLIED*); larger firms (*LN_ASSETS*) pay higher fees, as do unprofitable firms (*LOSS*). Finally, it is worth noting that fees generally increase over the time period running from April through October (*MONTH*), suggesting that auditors generally may have underestimated the scope and/or risk of the work early on.

5.2 | Big 4 effect on reimbursement outcomes

In Table 6 we report the main results derived with our OLS (Column 1) and logit (Column 2) regression models with *REIMBURSEMENT* and *REIMBURSE_FULL* as our dependent variables, where we test whether client firms who engage Big 4 auditors for the COVID-19 fixed-cost support scheme enjoy more successful application outcomes measured by the amount of reimbursement received. We observe a positive and statistically significant coefficient on *AUDFIRM_BIG4* in column (2) where *REIMBURSE_FULL* is the dependent variable ($p < 0.01$) but not in column (1) where *REIMBURSEMENT* is the dependent variable. The odds ratio (untabulated) for *AUDFIRM_BIG4* in the logit model (column 2) is 1.27, suggesting that client firms who engaged Big 4 auditors, on average, were 27% more likely to receive compensation that equals or exceeds the amount of compensation they originally applied for. The results support our second hypothesis (*H2*) that firms who engage Big 4 audit firms for the COVID-19 support-scheme attestation experience more successful application outcomes than firms engaging non-Big 4 auditors.

TABLE 7 Big 4 auditor effect on number of rejections and the likelihood of rejection/withdrawal.

Variables	(1) REJECTIONS	(2) REJECTED
INTERCEPT	0.1618 (1.36)	−3.3651 (0.07)
AUDFIRM_BIG4	**−0.0180** (−2.36)**	**−0.4133** (4.22)**
APP_PROCESSTIME	−0.0007*** (−3.49)	−0.0101* (3.67)
APP_FIRST	−0.0519*** (−2.92)	−0.6284* (2.74)
LN_FCAPPLIED	0.0205*** (4.27)	0.0044 (0.00)
LN_ASSETS	−0.0126*** (−3.03)	−0.0144 (0.02)
LOSS	0.0374*** (4.12)	0.7492*** (13.06)
LEVERAGE	0.0026 (0.21)	0.1431 (0.25)
BANKDEBT	0.0047 (0.56)	−0.2067 (0.90)
GROUP	0.0045 (0.42)	−0.0935 (0.13)
PARTNER_CAPITAL	0.0005 (0.05)	0.1512 (0.47)
PARTNER_YRS	0.0010** (2.50)	0.0074 (0.59)
PARTNER_FEMALE	−0.0202 (−1.50)	−0.4138 (1.19)
ACCAUDIT_ASSUR	−0.0112 (−0.93)	−0.2336 (0.65)
ACCAUDIT_NO	0.0349 (1.53)	0.5329 (1.47)
MONTH	0.0147*** (5.57)	0.1236* (3.17)
Model	OLS	Logit
Industry FE	YES	YES
N	3584	3584
Adj./pseudo R^2	0.033	0.038

Note: In Table 7 we report the results of estimating (1) an OLS regression models with *REJECTIONS* as the dependent variable and (2) a logit regression model with *REJECTED* as the dependent variables using the propensity score matched sample. All models include four-digit NACE code industry fixed effects. *t* statistics (1) and Wald χ^2 statistics (2) are reported in parentheses. Refer to Appendix A for variable definitions.
*Significance at the 10% level using a two-tailed test.
**Significance at the 5% level using a two-tailed test.
***Significance at the 1% level using a two-tailed test.

5.3 | Big 4 effect on rejections/withdrawals

In Table 7 we report the main results derived from our OLS (Column 1) and logit (Column 2) regression models with *REJECTIONS* and

TABLE 8 Differences in reimbursement across Big 4 and Non-Big 4 engagements conditional on rejection/withdrawal.

Variables	(1) REIMBURSEMENT	(2) REIMBURSE_FULL
INTERCEPT	1.2026***(17.52)	6.5018(0.02)
AUDFIRM_BIG4	0.0015(0.33)	0.2167***(7.00)
REJECTED	−0.0282*(−1.93)	−0.9211***(11.86)
*AUDFIRM_BIG4 * REJECTED*	0.0502**(2.18)	0.4324(1.02)
APP_PROCESSTIME	−0.0006***(−5.22)	−0.0142***(42.23)
APP_FIRST	−0.0005(−0.05)	−0.3973**(4.50)
LN_FCAPPLIED	−0.0219***(−7.89)	−0.4151***(63.30)
LN_ASSETS	0.0103***(4.30)	0.0592(1.78)
LOSS	−0.0039(−0.74)	−0.0351(0.13)
LEVERAGE	−0.0069(−0.99)	−0.1680(1.74)
BANKDEBT	0.0039(0.80)	−0.1232(1.96)
GROUP	−0.0091(−1.45)	−0.0775(0.45)
PARTNER_CAPITAL	−0.0036(−0.68)	0.1182(1.54)
PARTNER_YRS	−0.0005**(−2.10)	−0.0129***(9.53)
PARTNER_FEMALE	−0.0050(−0.65)	−0.2622*(3.53)
ACCAUDIT_ASSUR	−0.0058(−0.84)	0.0101(0.01)
ACCAUDIT_NO	0.0291**(2.21)	0.4356*(2.96)
MONTH	0.0067***(4.38)	0.3053***(113.24)
Model	OLS	Logit
Industry FE	YES	YES
N	3584	3584
Adj./pseudo R^2	0.068	0.226

Note: In Table 8, Column (1) we report the results of estimating an OLS regression model with *REIMBURSEMENT* as the dependent variable while including the interaction term between *AUDFIRM_BIG4* and *REJECTED* using the propensity score matched sample. In Column (2) we report the results of estimating a logistic regression model with *REIMBURSE_FULL* as the dependent variable while including the same interaction term as in (1) using the propensity score matched sample. All models include four-digit NACE code industry fixed effects. *t* statistics (1) and *Wald* χ^2 statistics (2) are reported in parentheses. Refer to Appendix A for variable definitions.
*Significance at the 10% level using a two-tailed test.
**Significance at the 5% level using a two-tailed test.
***Significance at the 1% level using a two-tailed test.

TABLE 9 Sensitivity to PSM assumptions for models *without* replacement.

Panel A: caliper width = 0.1								
Variables	**(1)** ***LN_AUDFEE***	**(2)** ***AUDFEE_HI***	**(3)** ***REIMBURSE-MENT***	**(4)** ***REIMBURSE_FULL***	**(5)** ***REJECTIONS***	**(6)** ***REJECTED***	**(7)** ***REIMBURSE-MENT***	**(8)** ***REIMBURSE_FULL***
AUDFIRM_BIG4	0.1705***	1.2535***	0.0039	0.2729***	−0.0201**	−0.4136*	0.0029	0.2557***
	(12.33)	(94.12)	(0.84)	(10.22)	(−2.53)	(3.57)	(0.62)	(8.67)
REJECTED							−0.0103	−0.7305***
							(−0.68)	(6.9422)
*AUDFIRM_BIG4 * REJECTED*							0.0301	0.1779
							(1.19)	(0.1421)
N	3026	3026	3152	3152	3152	3152	3152	3152
Adj./pseudo R^2	0.322	0.288	0.062	0.221	0.040	0.079	0.062	0.223
Panel B: Caliper width = 0.3								
Variables	**(1)** ***LN_AUDFEE***	**(2)** ***AUDFEE_HI***	**(3)** ***REIMBURSE-MENT***	**(4)** ***REIMBURSE_FULL***	**(5)** ***REJECTIONS***	**(6)** ***REJECTED***	**(7)** ***REIMBURSE-MENT***	**(8)** ***REIMBURSE_FULL***
AUDFIRM_BIG4	0.1656***	1.2562***	0.0029	0.2424***	−0.0197**	−0.3849*	0.0009	0.2131***
	(11.85)	(107.19)	(0.64)	(8.92)	(−2.55)	(3.33)	(0.21)	(6.67)
REJECTED							−0.0283*	−0.9103***
							(−1.93)	(11.60)
*AUDFIRM_BIG4 * REJECTED*							0.0546**	0.5331
N	3304	3304	3511	3511	3511		(2.31)	(1.48)
						3511	3511	3511
Adj./pseudo R^2	0.318	0.304	0.067	0.224	0.033	0.084	0.068	0.227
Panel C: Caliper width = 0.7								
Variables	**(1)** ***LN_AUDFEE***	**(2)** ***AUDFEE_HI***	**(3)** ***REIMBURSE-MENT***	**(4)** ***REIMBURSE_FULL***	**(5)** ***REJECTIONS***	**(6)** ***REJECTED***	**(7)** ***REIMBURSE-MENT***	**(8)** ***REIMBURSE_FULL***
AUDFIRM_BIG4	0.1659***	1.2579***	0.0030	0.2357***	−0.0178**	−0.4140**	0.0012	0.2105***
	(11.89)	(110.36)	(0.68)	(4.25)	(−2.33)	(4.25)	(0.27)	(6.64)
REJECTED							−0.0286**	−0.9232***
							(−1.96)	(11.93)
*AUDFIRM_BIG4 * REJECTED*							0.0493**	0.4191
							(2.17)	(0.97)

TABLE 9 (Continued)

Panel C: Caliper width = 0.7								
Variables	**(1) *LN_AUDFEE***	**(2) *AUDFEE_HI***	**(3) *REIMBURSE-MENT***	**(4) *REIMBURSE_FULL***	**(5) *REJECTIONS***	**(6) *REJECTED***	**(7) *REIMBURSE-MENT***	**(8) *REIMBURSE_FULL***
N	3390	3390	3612	3612	3612	3612	3612	3612
Adj./pseudo R^2	0.350	0.318	0.067	0.040	0.034	0.040	0.068	0.227
Panel D: Treated to control ratio = 1:2								
Variables	**(1) *LN_AUDFEE***	**(2) *AUDFEE_HI***	**(3) *REIMBURSE-MENT***	**(4) *REIMBURSE_FULL***	**(5) *REJECTIONS***	**(6) *REJECTED***	**(7) *REIMBURSE-MENT***	**(8) *REIMBURSE_FULL***
AUDFIRM_BIG4	0.1633***	1.1272***	0.0066*	0.2880***	−0.0145**	−0.2778	0.0043	0.2684***
	(13.76)	(120.28)	(1.71)	(16.53)	(−2.17)	(2.20)	(1.10)	(13.95)
REJECTED							−0.0385***	−0.7370***
							(−3.45)	(13.44)
*AUDFIRM_BIG4 * REJECTED*							0.0674***	0.4024
							(3.28)	(1.10)
N	4727	4727	4997	4997	4997	4997	4997	4997
Adj./pseudo R^2	0.344	0.267	0.068	0.196	0.039	0.078	0.070	0.199
Panel E: Treated to control ratio = 1:3								
Variables	**(1) *LN_AUDFEE***	**(2) *AUDFEE_HI***	**(3) *REIMBURSE-MENT***	**(4) *REIMBURSE_FULL***	**(5) *REJECTIONS***	**(6) *REJECTED***	**(7) *REIMBURSE-MENT***	**(8) *REIMBURSE_FULL***
AUDFIRM_BIG4	0.1629***	1.1358***	0.0065*	0.2631***	−0.0125**	−0.2362	0.0047	0.2469***
	(14.14)	(131.77)	(1.79)	(14.97)	(−1.98)	(1.72)	(1.29)	(12.85)
REJECTED							−0.0250***	−0.6371***
							(−2.59)	(12.93)
*AUDFIRM_BIG4 * REJECTED*							0.0542***	0.3671
							(2.79)	(0.96)
N	5865	5865	6156	6156	6156	6156	6156	6156
Adj./pseudo R^2	0.335	0.248	0.067	0.190	0.031	0.066	0.069	0.192
Panel F: Non-linear term in PSM model (LN_FCAPPLIED^2)								
Variables	**(1) *LN_AUDFEE***	**(2) *AUDFEE_HI***	**(3) *REIMBURSE-MENT***	**(4) *REIMBURSE_FULL***	**(5) *REJECTIONS***	**(6) *REJECTED***	**(7) *REIMBURSE-MENT***	**(8) *REIMBURSE_FULL***
AUDFIRM_BIG4	0.1673***	1.2781***	0.0077*	0.1866**	−0.0125*	−0.2205	0.0040	0.1486*
	(12.22)	(109.18)	(1.71)	(5.27)	(−1.68)	(1.15)	(0.88)	(3.22)

(Continues)

TABLE 9 (Continued)

Panel F: Non-linear term in PSM model (LN_FCAPPLIED^2)								
Variables	(1) *LN_AUDFEE*	(2) *AUDFEE_HI*	(3) *REIMBURSE-MENT*	(4) *REIMBURSE_FULL*	(5) *REJECTIONS*	(6) *REJECTED*	(7) *REIMBURSE-MENT*	(8) *REIMBURSE_FULL*
REJECTED							−0.0777***	−1.3476***
							(−4.99)	(19.54)
*AUDFIRM_BIG4 * REJECTED*							0.0996***	0.9223**
							(4.18)	(4.16)
N	3322	3322	3540	3540	3540	3540	3540	3540
Adj./pseudo R^2	0.343	0.311	0.059	0.226	0.030	0.049	0.066	0.231

Note: In Table 9 we present the results of re-running the main models from Tables 5–8 for different subsamples generated based on different PSM assumptions regarding caliper width (Panels A–C), Treated to control ratio (Panels D and E) and the inclusion of non-linear terms in the PSM model (Panel F). All PSM models in this table are *without* replacement. All models include all control variables included in the respective models presented in Tables 5–8 and four-digit NACE code industry fixed effects. *t* statistics and *Wald* χ^2 statistics are reported in parentheses. Refer to Appendix A for variable definitions.

*Significance at the 10% level using a two-tailed test.

**Significance at the 5% level using a two-tailed test.

***Significance at the 1% level using a two-tailed test.

REJECTED as our dependent variables, testing whether client firms who engaged Big 4 auditors for the COVID-19 fixed-cost support-scheme attestations experienced more successful application outcomes as measured by their rejection and/or application-withdrawal rates. We observe a negative and statistically significant coefficient on *AUDFIRM_BIG4* (Column 1) where *REJECTIONS* is the dependent variable ($p < 0.05$) and (column 2) where *REJECTED* is the dependent variable ($p < 0.05$). The odds ratio (untabulated) for *AUDFIRM_BIG4* in the logit model (Column 2) is 0.66, suggesting that client firms who engaged Big 4 auditors were 34% less likely to be rejected and/or find themselves having to withdraw their applications during the application process. These results provide further support for Hypothesis *H2* that firms who engage Big 4 audit firms for the COVID-19 support-scheme attestation experience more successful application outcomes than firms engaging non-Big 4 auditors.

5.4 | Big 4 effect on reimbursement outcomes conditional on rejections/withdrawals

Finally, we investigate the impact of being rejected during the application process on the final outcome in the form of the reimbursement amount received. If an application is first rejected and eventually accepted one of two things is the case: (a) the firm involved included fixed-cost items to which it was not entitled for reimbursement on the application and the final reimbursement is thus lower than what was originally applied for, indicating low audit quality; or (b) the firm withdrew the application or it was rejected based on a technicality that did not impact the reimbursement amount and therefore received 100% or more of what it originally applied for. This indicates higher audit quality. If audit quality is higher for Big 4 audit engagements, we would expect these engagements to be in line with outcome (b), that is, the 100% + reimbursement after rejection, whereas non-Big 4 audit engagements would be more likely to be in line with outcome (a), that is, the <100% reimbursement after rejection.

We test this conjecture by adding the interaction term *AUDFIRM_BIG4*REJECTED* to our model with *REIMBURSEMENT* (OLS regression) and *REIMBURSE_FULL* (logit regression) as our dependent variables. The results are reported in Table 8. We observe that the first-order effect of Big 4 audit engagements prevails in the model reported in Column (2), as the positive coefficient on *AUDFIRM_BIG4* is statistically significant. We also observe that there is a positive and statistically significant coefficient on the interaction term, in the OLS (Column 1) but not in the logit (Column 2) regression model. We interpret these findings as indicative evidence that firms who engage Big 4 auditors may receive, at the end of the day, higher reimbursements for applications that were originally rejected and/or withdrawn in the first round(s). Moreover, the significant negative first-order effect of *REJECTED* in both models indicates that non-Big 4 engagements eventually receive lower reimbursements than originally applied for if they are rejected during the application process. This evidence suggests that Big 4 auditors add value by learning from rejections and/or

TABLE 10 Sensitivity to PSM assumptions for models *with* replacement.

Panel A: caliper width = 0.1								
Variables	**(1)** ***LN_AUDFEE***	**(2)** ***AUDFEE_HI***	**(3)** ***REIMBURSE-MENT***	**(4)** ***REIMBURSE_FULL***	**(5)** ***REJECTIONS***	**(6)** ***REJECTED***	**(7)** ***REIMBURSE-MENT***	**(8)** ***REIMBURSE_FULL***
AUDFIRM_BIG4	0.1657***	1.2682***	0.0014	0.2083**	−0.0203***	−0.3967*	0.0008	0.1947**
	(12.76)	(105.93)	(0.29)	(6.22)	(−2.58)	(3.49)	(0.17)	(5.26)
REJECTED							−0.0017	−0.5980**
							(−0.12)	(5.07)
*AUDFIRM_BIG4 * REJECTED*							0.0169	0.0945
							(0.73)	(0.05)
N	3368	3368	3590	3590	3590	3590	3590	3590
Adj./pseudo R^2	0.438	0.351	0.102	0.261	0.067	0.104	0.102	0.262
Panel B: Caliper width = 0.3								
Variables	**(1)** ***LN_AUDFEE***	**(2)** ***AUDFEE_HI***	**(3)** ***REIMBURSE-MENT***	**(4)** ***REIMBURSE_FULL***	**(5)** ***REJECTIONS***	**(6)** ***REJECTED***	**(7)** ***REIMBURSE-MENT***	**(8)** ***REIMBURSE_FULL***
AUDFIRM_BIG4	0.1643***	1.2629***	0.0016	0.2094**	−0.0201**	−0.3965*	0.0011	0.1961**
	(12.64)	(105.24)	(0.35)	(6.29)	(−2.57)	(3.49)	(0.23)	(5.34)
REJECTED							−0.0017	−0.5923**
							(−0.12)	(4.97)
*AUDFIRM_BIG4 * REJECTED*							0.0168	0.0945
							(0.73)	(0.05)
N	3380	3380	3606	3606	3606	3606	3606	3606
Adj./pseudo R^2	0.445	0.356	0.104	0.263	0.068	0.104	0.104	0.264
Panel C: Caliper width = 0.5								
Variables	**(1)** ***LN_AUDFEE***	**(2)** ***AUDFEE_HI***	**(3)** ***REIMBURSE-MENT***	**(4)** ***REIMBURSE_FULL***	**(5)** ***REJECTIONS***	**(6)** ***REJECTED***	**(7)** ***REIMBURSE-MENT***	**(8)** ***REIMBURSE_FULL***
AUDFIRM_BIG4	0.1646***	1.2626***	0.0016	0.2096**	−0.0201**	−0.4029*	0.0011	0.1964**
	(12.67)	(105.18)	(0.36)	(6.31)	(−2.57)	(3.60)	(0.24)	(5.35)
REJECTED							−0.0016	−0.5922**
							(−0.11)	(4.97)
*AUDFIRM_BIG4 * REJECTED*							0.0017	0.0943
							(0.74)	(0.05)

(Continues)

TABLE 10 (Continued)

Panel C: Caliper width = 0.5								
Variables	(1) *LN_AUDFEE*	(2) *AUDFEE_HI*	(3) *REIMBURSE-MENT*	(4) *REIMBURSE_FULL*	(5) *REJECTIONS*	(6) *REJECTED*	(7) *REIMBURSE-MENT*	(8) *REIMBURSE_FULL*
N	3386	3386	3610	3610	3610	3610	3610	3610
Adj./pseudo R^2	0.448	0.357	0.105	0.264	0.069	0.104	0.104	0.265
Panel D: Treated to control ratio = 1:2								
Variables	(1) *LN_AUDFEE*	(2) *AUDFEE_HI*	(3) *REIMBURSE-MENT*	(4) *REIMBURSE_FULL*	(5) *REJECTIONS*	(6) *REJECTED*	(7) *REIMBURSE-MENT*	(8) *REIMBURSE_FULL*
AUDFIRM_BIG4	0.1654***	1.3337***	0.0100**	0.2343***	−0.0139**	−0.1292	0.0048	0.2074***
	(13.31)	(163.23)	(2.56)	(10.88)	(−1.96)	(0.47)	(1.21)	(8.27)
REJECTED							−0.1074***	−1.0267***
							(−10.15)	(24.24)
*AUDFIRM_BIG4 * REJECTED*							0.1309***	0.7324*
							(6.47)	(3.53)
N	5180	5180	5504	5504	5504	5504	5504	5504
Adj./pseudo R^2	0.441	0.367	0.133	0.264	0.173	0.123	0.150	0.268
Panel E: Treated to control ratio = 1:3								
Variables	(1) *LN_AUDFEE*	(2) *AUDFEE_HI*	(3) *REIMBURSE-MENT*	(4) *REIMBURSE_FULL*	(5) *REJECTIONS*	(6) *REJECTED*	(7) *REIMBURSE-MENT*	(8) *REIMBURSE_FULL*
AUDFIRM_BIG4	0.1607***	1.2681***	0.0087**	0.2544***	−0.0130**	−0.1289	0.0041	0.2257***
	(13.26)	(178.46)	(2.41)	(14.91)	(−1.96)	(0.55)	(1.12)	(11.38)
REJECTED							−0.0971***	−1.1010***
							(−11.39)	(43.01)
*AUDFIRM_BIG4 * REJECTED*							0.1181***	0.8024**
							(6.19)	(4.62)
N	6912	6912	7350	7350	7350	7350	7350	7350
Adj./pseudo R^2	0.423	0.360	0.156	0.255	0.180	0.119	0.172	0.260
Panel F: Non-linear term in PSM model (LN_FCAPPLIED^2)								
Variables	(1) *LN_AUDFEE*	(2) *AUDFEE_HI*	(3) *REIMBURSE-MENT*	(4) *REIMBURSE_FULL*	(5) *REJECTIONS*	(6) *REJECTED*	(7) *REIMBURSE-MENT*	(8) *REIMBURSE_FULL*
AUDFIRM_BIG4	0.1702***	1.4283***	0.0127***	0.2671***	−0.0161**	−0.2947	0.0060	0.2377***
	(12.43)	(126.94)	(2.77)	(10.07)	(−2.12)	(1.67)	(1.30)	(7.70)
REJECTED							−0.1329***	−1.0630***
							(−8.74)	(11.58)

TABLE 10 (Continued)

Panel F: Non-linear term in PSM model (LN_FCAPPLIED^2)								
Variables	(1) *LN_AUDFEE*	(2) *AUDFEE_HI*	(3) *REIMBURSE-MENT*	(4) *REIMBURSE_FULL*	(5) *REJECTIONS*	(6) *REJECTED*	(7) *REIMBURSE-MENT*	(8) *REIMBURSE_FULL*
*AUDFIRM_BIG4 * REJECTED*							0.1543***	0.6787
							(6.70)	(2.25)
N	3438	3438	3665	3665	3665	3665	3665	3665
Adj./pseudo R^2	0.454	0.376	0.086	0.282	0.101	0.115	0.106	0.285

Note: In Table 10 we present the results of re-running the main models from Tables 5–8 for different subsamples generated based on different PSM assumptions regarding caliper width (Panels A–C). Treated to control ratio (Panels D and E) and the inclusion of non-linear terms in the PSM model (Panel F). All PSM models in this table are *with* replacement. All models include all control variables included in the respective models presented in Tables 5–8 and four-digit NACE code industry fixed effects. *t* statistics and *Wald* χ^2 statistics are reported in parentheses. Refer to Appendix A for variable definitions.

*Significance at the 10% level using a two-tailed test.

**Significance at the 5% level using a two-tailed test.

***Significance at the 1% level using a two-tailed test.

withdrawing applications if firms are entitled to higher reimbursement amounts (e.g., due to sudden rules changes) leading to more successful application outcomes for firms. This further supports Hypothesis *H2*.

6 | ADDITIONAL ANALYSES AND ROBUSTNESS TESTS

6.1 | PSM sensitivity analysis

DeFond et al. (2017) demonstrate how the results when investigating Big 4 effects in auditing research may be affected by PSM's sensitivity to its design choices (i.e., assumptions). Inspired by DeFond et al. (2017) we test the sensitivity of our results to the following PSM design choices: (a) with or without replacement; (b) different caliper width; (c) different treated-to-control ratios; (d) inclusion of a non-linear term in the PSM model.

The results of the models without replacement are reported in Table 9 and the results with replacement are reported in Table 10. Generally, these results are qualitatively similar to our main findings. There are no sign changes in any of the tests. In a few instances the results are slightly weaker (e.g., *REJECTED* models [Column 6] in the 1:2 and 1:3 treated-to-control ratio tests and the test with a non-linear term as reported in Tables 9 and 10, Panels D–F) but there are also instances where results are stronger (e.g., *REIMBURSE_FULL* interaction models [Column 8] in the 1:2 and 1:3 treated-to-control ratio tests with replacement as reported in Table 10, Panels D and E) than our main results.

Thus, we find no evidence that our findings are sensitive to the PSM design choices. These analyses corroborate our main results.

6.2 | Big 4 vs. second-tier subsample analysis

Prior research on the Big 4 effect shows that there is little difference in audit quality when Big 4 engagements are compared to 'second-tier' audit firms' audit engagements rather than all non-Big 4 audit engagements (Boone et al., 2010). To explore whether our results are a result of the specific institutional characteristics of the Big 4 audit firms or if our findings apply more broadly to the second-tier audit firms we perform subsample analyses of engagements that are restricted to having one of the large audit firms to attest their application. The amount of Big 4 and second-tier firms is roughly the same in this subsample with 44% Big 4 engagements and 56% second-tier engagements.

The results of these subsample analyses are reported in Table 11. We observe that the results are stronger for reimbursement, weaker for rejections/withdrawals and stronger for the interaction models. As the *REIMBURSEMENT* model in column (7) shows, for example, a Big 4 application would receive a *higher* reimbursement rate after one or more rejections/withdrawals in the process as the sum of the three coefficients of interest is positive, whereas a second-tier application

TABLE 11 Big 4 and second-tier auditor subsample analyses.

Variables	(1) LN_AUDFEE	(2) AUDFEE_HI	(3) REIMBURSEMENT	(4) REIMBURSE_FULL	(5) REJECTIONS	(6) REJECTED	(7) REIMBURSE-MENT	(8) REIMBURSE_FULL
INTERCEPT	7.3739	−21.3021	1.1294***	5.5677	0.1136	−13.85	1.1342***	5.5871
	(53.29)	(0.31)	(22.76)	(0.01)	(1.53)	(0.09)	(22.85)	(0.01)
AUDFIRM_BIG4	**0.1279*** **	**1.1977*** **	**0.0128*** **	**0.3831*** **	**−0.0097**	**−0.2775**	**0.0111** **	**0.3717*** **
	(10.29)	**(84.42)**	**(2.96)**	**(20.92)**	**(−1.50)**	**(1.33)**	**(2.54)**	**(19.22)**
REJECTED							**−0.0358** **	**−0.6772** **
							(−2.28)	**(4.97)**
AUDFIRM_BIG4 * REJECTED							**0.0568** **	**0.2723**
							(2.48)	**(0.37)**
APP_PROCESSTIME	0.0000	−0.0031	−0.0005***	−0.0179***	−0.0003**	−0.0174***	−0.0005***	−0.0182***
	(0.07)	(0.89)	(−4.93)	(65.34)	(−2.15)	(7.77)	(−4.97)	(67.06)
APP_FIRST			0.0006	−0.0679	−0.0776***	−1.7812***	0.0002	−0.1075
			(0.06)	(0.12)	(−5.05)	(20.55)	(0.02)	(0.30)
LN_FCAPPLIED	0.1524***	0.8577***	−0.0150***	−0.4061***	0.0171***	0.6722***	−0.0015***	−0.3988***
	(20.64)	(115.86)	(−5.96)	(66.11)	(4.55)	(26.16)	(−5.95)	(63.25)
LN_ASSETS	0.0300***	0.2896***	0.006***	0.0541	−0.0110***	−0.4021***	0.0060***	0.0491
	(4.91)	(19.67)	(2.87)	(1.76)	(−3.50)	(17.23)	(2.84)	(1.44)
LOSS	0.0386***	0.2129	0.0019	0.0632	0.0230***	0.7731***	0.0022	0.0764
	(2.82)	(2.24)	(0.41)	(0.48)	(3.24)	(11.76)	(0.47)	(0.70)
LEVERAGE	0.0157	0.1062	−0.0060	−0.1545	−0.0040	0.0075	−0.0060	−0.1561
	(0.90)	(0.30)	(−0.99)	(1.77)	(−0.45)	(0.00)	(−1.00)	(1.80)
BANKDEBT	0.0157	0.0920	0.0039	−0.1120	0.0015	0.0596	0.0043	−0.1096
	(1.26)	(0.52)	(0.91)	(1.85)	(0.24)	(0.07)	(1.00)	(1.77)
GROUP	0.0100	−0.2552	−0.0068	−0.0165	−0.0032	−0.1652	−0.0068	−0.0159
	(0.70)	(2.33)	(−1.36)	(0.03)	(−0.43)	(0.39)	(−1.37)	(0.03)
PARTNER_CAPITAL	0.0433***	0.0325	−0.0109**	0.0733	0.0087	0.2625	−0.0011**	0.0793
	(2.99)	(0.05)	(−2.18)	(0.59)	(1.16)	(1.04)	(−2.14)	(0.69)
PARTNER_YRS	−0.0021***	−0.0044	−0.0005**	−0.0179***	0.0002	0.0025	−0.0005**	−0.0178***
	(−3.36)	(0.40)	(−2.29)	(17.73)	(0.65)	(0.05)	(−2.19)	(17.32)
PARTNER_FEMALE	−0.0112	−0.0413	−0.0044	−0.1446	−0.0084	−0.3697	−0.0043	−0.1512
	(−0.56)	(0.04)	(−0.63)	(1.16)	(−0.80)	(0.79)	(−0.62)	(1.26)
ACCAUDIT_ASSUR	−0.0361**	−0.1533	−0.0042	0.0456	0.0098	0.4511	−0.0040	0.0498
	(−2.28)	(0.55)	(−0.76)	(0.18)	(1.19)	(1.98)	(−0.73)	(0.22)
ACCAUDIT_NO	−0.0685**	−0.3206	0.0114	0.2335	−0.0054	−0.0025	0.0112	0.2352

TABLE 11 (Continued)

Variables	(1) *LN_AUDFEE*	(2) *AUDFEE_HI*	(3) *REIMBURSEMENT*	(4) *REIMBURSE_FULL*	(5) *REJECTIONS*	(6) *REJECTED*	(7) *REIMBURSE-MENT*	(8) *REIMBURSE_FULL*
	(−2.32)	(0.37)	(1.10)	(1.31)	(−0.35)	(0.00)	(1.08)	(1.33)
MONTH	0.0143***	0.1293***	0.0100***	0.4351***	0.0095	0.3851	0.0101***	0.4418***
	(3.66)	(9.69)	(7.29)	(249.41)	(4.63)	(0.08)	(7.40)	(253.36)
Model	OLS	Logit	OLS	Logit	OLS	Logit	OLS	Logit
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
N	3985	3985	4180	4180	4180	4180	4180	4180
Adj./pseudo R^2	0.419	0.322	0.060	0.260	0.008	0.073	0.061	0.261

Note: In Table 11 we present the results of re-running the main models from Tables 5–8 for the subsample of engagements where the audit firm is 'PIE' auditor, that is, either Big 4 or second-tier. All models include four-digit NACE code industry fixed effects. *t* statistics and Wald χ^2 statistics are reported in parentheses. Refer to Appendix A for variable definitions.

*Significance at the 10% level using a two-tailed test.

**Significance at the 5% level using a two-tailed test.

***Significance at the 1% level using a two-tailed test.

would receive a *lower* reimbursement rate after one or more rejections/withdrawals as reflected in the significant negative coefficient on the *REJECTED* term.

We interpret this as further evidence that the effect we find is in fact a Big 4 effect and that even though the number of rejections does not seem to differ between Big 4 and non-Big 4 there are very different consequences regarding the amount of reimbursement received in general as well as *when* an application is rejected.

6.3 | Mitigating auditor selection endogeneity

A feature of our research setting is that most firms in our sample are already engaged with 'regular auditors' who perform financial statement audits on an annual basis. Comparing Big 4 and non-Big 4 clients who choose their regular auditors for the COVID-19 fixed-cost support-scheme attestation prompts consideration of endogeneity issues in COVID-19 auditor selection.[7]

To mitigate this issue, we exploit the fact that some of the firms in our sample ($N = 1{,}852$) are exempt from having their financial statements audited and therefore have no regular auditors in place. For any of these firms the choice of an auditor for the COVID-19 fixed-cost support-scheme attestation is, to a greater extent, exogenously determined. Only the smallest firms qualify for exemption from auditing of financial statements, which is advantageous because this constitutes a more homogeneous subsample of firms.

We re-run all models except the interaction models for this subsample of engagements and present the results in Table 12.[8] First, we note that the coefficient on *AUDFIRM_BIG4* is positive and statistically significant in the audit fee models, Models (1) and (2), as expected and the (untabulated) odds ratio in the logit model is 8.75, which indicates stronger economic significance than in the main models. For reimbursement rates we observe a similar pattern as in the PSM sample: The coefficient on *AUDFIRM_BIG4* is positive and statistically significant in the logit model with the binary dependent variable, *REIMBURSE_FULL* (Column 4), but not significant in the OLS regression model with the continuous dependent variable *REIMBURSEMENT* (Column 3). The (untabulated) odds ratio on *AUDFIRM_BIG4* in the logit reimbursement model (Column 4) is 2.67 which, again, indicates stronger economic significance. The coefficient on *AUDFIRM_BIG4* is not statistically significant in any of the rejection models. This may be explained by the low number of rejections (87) in this subsample.

These results corroborate our main findings. The higher odds ratios for the audit fee (Column 2) and reimbursement (Column 4) logit models strengthen the support for our hypotheses whereas the non-significant results for the continuous reimbursement-model and the rejection-models weakens that support slightly.

[7]We are able to identify only 443 engagements where a firm switches auditor for the COVID-19 attestation engagements. Moreover, these firms may have specific reasons for not using their regular financial statement auditors, which is another source of endogeneity. Therefore, it is not feasible to analyse this subsample of 'switchers'.

[8]The combination of a Big 4 auditor and rejection is very rare in this subsample (2) and therefore it is not feasible to run the interaction models.

TABLE 12 Subsample analysis of the Big 4 effect on audit fees, reimbursement and rejections/withdrawals for firms with no regular financial statement audits.

Variables	(1) LN_AUDFEE	(2) AUDFEE_HI	(3) REIMBURSEMENT	(4) REIMBURSE_FULL	(5) REJECTIONS	(6) REJECTED
INTERCEPT	7.2479***	−24.1973	1.1475***	5.4876	−0.1863	−9.3844
	(32.65)	(0.31)	(17.53)	(0.01)	(−1.25)	(0.70)
AUDFIRM_BIG4	0.1961***	2.1693**	0.0232	0.9803**	−0.0084	0.0494
	(3.17)	(4.19)	(1.35)	(6.05)	(−0.21)	(0.00)
APP_PROCESSTIME	0.0009**	0.0057	−0.0001	−0.0050**	−0.0003	−0.0117*
	(2.13)	(0.13)	(−0.65)	(5.19)	(−1.07)	(3.43)
APP_FIRST			−0.0186	−0.2803	0.0109	−0.1231
			(−0.79)	(0.30)	(0.20)	(0.02)
LN_FCAPPLIED	0.1567***	0.4193	−0.0140***	−0.3269***	0.0126	0.3299*
	(10.47)	(0.42)	(−3.40)	(15.95)	(1.35)	(3.23)*
LN_ASSETS	0.0217***	0.2679	0.0034	0.0507	−0.0067	−0.1471
	(2.59)	(0.52)	(1.43)	(1.15)	(−1.26)	(2.49)
LOSS	0.0204	−1.5899*	0.0057	−0.1517	0.0412***	1.0043***
	(0.86)	(2.74)	(0.86)	(1.34)	(2.74)	(13.91)
LEVERAGE	0.0424	2.0459**	−0.0011	0.1880	0.0173	0.2047
	(1.65)	(6.60)	(−0.16)	(1.76)	(1.06)	(0.46)
BANKDEBT	−0.0524**	0.7092	−0.0052	−0.2385*	−0.0192	−0.6676*
	(−2.03)	(0.96)	(−0.72)	(2.78)	(−1.17)	(3.43)
GROUP	0.0224	−1.0566	−0.0035	−0.0922	0.0114	0.1769
	(1.06)	(2.70)	(−0.60)	(0.62)	(0.85)	(0.44)
PARTNER_CAPITAL	0.0292	−0.0686	0.0060	0.0919	−0.0142	−0.2412
	(1.32)	(0.01)	(0.97)	(0.57)	(−1.01)	(0.76)
PARTNER_YRS	−0.0104***	0.0175	−0.0001	0.0089*	0.0009	0.0205*
	(−11.63)	(0.32)	(−0.46)	(3.25)	(1.55)	(3.45)
PARTNER_FEMALE	−0.0219	−9.2711	−0.0112	−0.2173	0.0139	0.2820
	(−0.51)	(0.02)	(−0.94)	(0.82)	(0.51)	(0.38)
MONTH	0.0380***	0.5654**	0.0048***	0.2678***	0.0184***	0.4003***
	(6.32)	(5.57)	(2.87)	(63.95)	(4.80)	(21.52)
Model	OLS	Logit	OLS	Logit	OLS	Logit
Industry FE	YES	YES	YES	YES	YES	YES
N	1826	1826	1852	1852	1852	1852
Adj./pseudo R^2	0.225	0.053	0.004	0.208	0.000	0.102

Note: In Table 12 we present the results of re-running the main models from Tables 5–7 for the subsample of firms with no regular financial statement audits. All models include four-digit NACE code industry fixed effects. *t* statistics and *Wald* χ^2 statistics are reported in parentheses. Refer to Appendix A for variable definitions.

*Significance at the 10% level using a two-tailed test.

**Significance at the 5% level using a two-tailed test.

***Significance at the 1% level using a two-tailed test.

6.4 | Perceived or actual audit quality?

It is possible that authorities relied on whether a firm engaged a Big 4 auditor as an indicator of high audit quality. This reliance might have been driven by the intense time pressure faced by the authorities while processing thousands of applications within a short timeframe. If the authorities perceive Big 4 attestation as a signal of superior audit quality, the differences observed might be perceived rather than actual differences in audit quality between Big 4 and non-Big 4 engagements.

To gain further insights into this matter, we analyse the processing time from submission of application to final approval by the authorities. If the authorities indeed consider Big 4 attestation as a marker of high audit quality, we expect to observe significantly

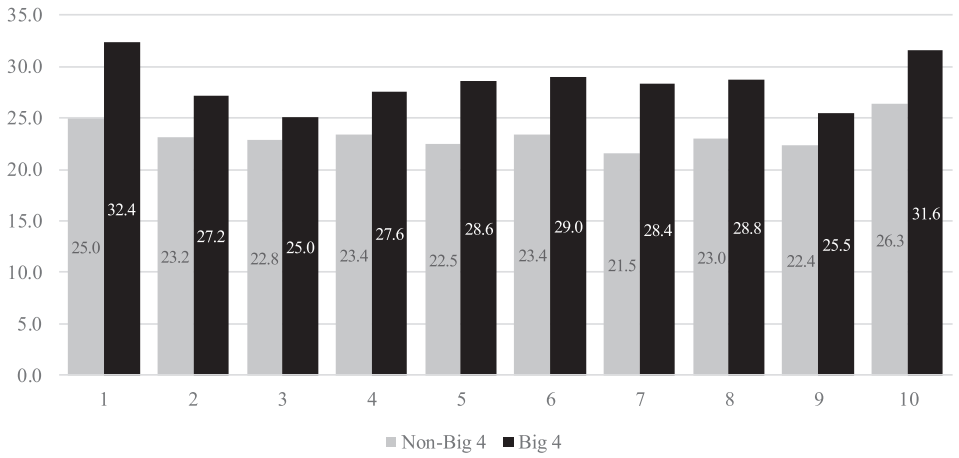

FIGURE 1 Application process time in days for Big 4 versus Non-Big 4 engagements across application size deciles.

shorter processing times for applications involving Big 4 auditors in order for the authorities to save time in this busy period.

We investigate variations in application process time between Big 4 and non-Big 4 audited engagements. To ensure comparability, we categorize applications into size deciles based on the fixed cost reimbursement requested by firms (i.e., application size).

The results are reported in Figure 1. The chart reveals a significant difference in application process time. Specifically, non-Big 4 applications consistently exhibit *shorter* processing times across most application size deciles. Interestingly, there is no single decile where the application process time for Big 4 engagements is shorter than that for non-Big 4 engagements. This finding contradicts the expectation that authorities would use Big 4 attestation as a 'screening mechanism' for perceived audit quality.

Further, we examine differences in processing time across other client characteristics than application size that can be expected to influence application process time, that is, firm size (assets), profitability status (loss-making vs. profitable), bank debt presence (vs. no bank debt), group affiliation and the type of audit conducted for regular financial statements.

Untabulated results show that the same pattern persists across these other client characteristics.

To reinforce our conclusions, we re-run our main regression model with *APP_PROCESS* as the dependent variable, controlling for the same set of variables. The (untabulated) results continue to support our initial findings, with the coefficient on *AUDFIRM_BIG4* being positive and statistically significant ($p < 0.05$).

Finally, as mentioned in Section 2.1, large audit firms were as likely to be selected for inspection in the aftermath of the COVID-19 fixed cost support scheme as smaller audit firms. If the Danish Business Authority was relying on perception of differences in audit quality across larger and smaller audit firms, one would have expected that they focused on inspecting the smaller audit firms.

In summary, our analysis does not indicate that authorities screened applications based on perceived quality differences between Big 4 and non-Big 4 auditors.

7 | CONCLUSION

In this study we provide empirical evidence on the Big 4 effect on audit fees and audit quality for a new-to-the-world audit service. Research on the Big 4 effect for services other than financial statement audits is rare. We utilize the context of the COVID-19 fixed-cost support-scheme introduced by the Danish government during the first wave of the COVID-19 pandemic from April through October 2020 to investigate this issue. Attestation by auditors with a reasonable (high) level of assurance was mandatory for this particular support programme. This setting offers the opportunity to analyse institutional differences between audit firms in a unique situation where the sudden introduction of the scheme created a new, significant market for auditors under considerable public scrutiny and where pricing and assurance activities were conducted without history dependence and with limited external benchmarks.

We conducted our empirical tests using a sample of COVID-19 fixed-cost support-scheme applications. The results of our PSM analyses show how firms that engage with Big 4 auditors experience more successful application outcomes than those choosing non-Big 4 auditors in the sense that they are more likely to receive full reimbursement and less likely to have their applications rejected by the authorities. Moreover, we document how a Big 4 audit fee premium for comparable assurance services prevails in this new market.

We contribute to research on the Big 4 premium. We are, however, not able to obtain fee data for the regular financial statement audit. Without this data we cannot rule out that the observed premium is somewhat affected by pricing in the financial statement audit. If fee data across different services becomes available, future research should explore issues of joint versus service-specific fee premiums.

We further contribute with evidence on Big 4 quality-driven effects based on 'real outcomes' (i.e., application success) in a new service setting where users (authorities) are focused intensively on examining the information (application) which is attested. We expect that the effectiveness of Big 4 systems generates the quality effect, but one limitation is that we cannot identify which systems and processes—for example, human resource systems, professional

support, knowledge sharing or risk management—that generate the effect. Nevertheless, the findings may have implications for other settings where new assurance services are introduced and where regulation, and its interpretations, is in the making or changed while services are being implemented. The upcoming mandatory sustainability assurance in Europe appears as such a setting, where policymakers further encourage market participation by assurance providers other than Big 4 firms, including other audit firms as well as non-audit firms (e.g., engineering and certification firms). Future research could explore quality differences involving alternative assurance providers and further seek to understand the contribution of different systems and processes.

The additional analyses and robustness tests we performed did not show any sign that our results are sensitive to PSM design choices or that endogeneity in the form of auditor selection is an issue (although, we cannot completely rule out that auditor selection may play some part in explaining our results). In a similar vein it is also very difficult to disentangle perceived and material audit quality differences between Big 4 and non-Big 4 auditors and future research is warranted to delve deeper into these issues.

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DATA AVAILABILITY STATEMENT

The research data that support the study's findings are not shared. The data contain personal information and are not publicly available.

ETHICS STATEMENT

The research project was approved by the Ethics Council of Copenhagen Business School and complies with the ethics guidelines.

ORCID

Morten Holm https://orcid.org/0000-0002-6275-9755

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AUTHOR BIOGRAPHIES

Morten Holm range of topics across auditing, financial reporting and managerial accounting.

Thomas Riise Johansen is FSR Endowed Professor in auditing at the Department of Accounting, Copenhagen Business School. His current research interests include auditing, public oversight of auditors, sustainability accounting and sustainability assurance.

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APPENDIX A: VARIABLE DEFINITIONS

Variables		Definition
Dependent variables		
AUDFEE_HI	=	Indicator variable that equals '1' if the audit fee for the engagement exceeded the government reimbursement threshold of DKK 20,000 and '0' otherwise.
LN_AUDFEE	=	The natural logarithm of the total fee in DKK charged by an auditor for audit services concerning application for government-backed COVID-19 fixed cost business support as reported to the Danish business authority in the application.
REIMBURSEMENT	=	The reimbursed amount relative to the amount of reimbursement applied for.
REIMBURSE_FULL	=	Indicator variable that equals '1' if a firm received reimbursement that equals 100% or more of the amount of reimbursement applied for and '0' otherwise.
REJECTIONS	=	The number of times the application was either rejected by the authorities or withdrawn by a firm.
REJECTED	=	Indicator variable that equals '1' if the application was rejected one or more times before eventually being accepted and '0' otherwise.
Independent variables		
ACCAUDIT_ASSUR	=	Indicator variable that equals '1' if a firm received an audit with assurance (full audit or review) of their latest financial accounts, and '0' otherwise.
ACCAUDIT_COMPIL	=	Indicator variable that equals '1' if a firm received a compilation report regarding their latest financial accounts, and '0' otherwise.
ACCAUDIT_NO	=	Indicator variable that equals '1' if a firm is not audited, and '0' otherwise.
APP_FIRST	=	Indicator variable that equals '1' if the application is the first application for COVID-19 fixed cost reimbursement submitted by a firm and '0' otherwise.
APP_PROCESSTIME	=	The total number of days spanning from the application is first submitted to the Danish business authority to the date when the application is accepted.
ASSETS	=	Total assets in latest financial year
AUDFIRM_BIG4	=	Indicator variable that equals '1' if the auditor belongs to one of the Big4 audit firms and '0' otherwise.
AUDITOR_NEW	=	Indicator variable that equals '1' if a firm selects a different auditor for the COVID-19 engagement that is different from the auditor who conducts the annual audits of a firm's financial statements and '0' otherwise.
BANKDEBT	=	Indicator variable that equals '1' if the firm has debt to banks or other financial institutions and '0' otherwise.
FCAPPLIED	=	The total fixed cost reimbursement applied for by a firm as reported to the Danish business authority in the application.
GROUP	=	Indicator variable that equals '1' if the firm has any intra-group debt, receivables or payables and '0' otherwise.
LN_FCAPPLIED	=	The natural logarithm of FCAPPLIED
LN_ASSETS	=	The natural logarithm of ASSETS
LOSS	=	Indicator variable that equals '1' if net income in the most recent fiscal year is less than zero, and '0' otherwise.
LEVERAGE	=	Total liabilities relative to total assets in latest fin. Year
MONTH	=	Categorical variable of the month in which the application was received by the Danish Busines authority increasing with time from April = 0 to October = 7.
PARTNER_CAPITAL	=	Indicator variable that equals '1' if the audit partner's residential address is in the capital area of Copenhagen and '0' otherwise.
PARTNER_FEMALE	=	Indicator variable that equals '1' if the audit partner is female and '0' otherwise.
PARTNER_YRS	=	The total number of years since the audit partner received her authorization and was registered as in the Danish auditor register.