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審計辦公室產能、審計相關特徵與審計定價#

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摘要

參採經濟學機會成本之觀念，本研究發現所使用之衡量審計辦公室產能之連續性變數—屬於正常審計工作之未使用產能(簡稱未使用產能)—與審計公費呈現負向關聯，且此變數相較於傳統的審計產能變數(亦即，受查客戶是否在 12 月結束其會計年度)，更能捕捉機會成本的變動性質。實證結果亦證實前述負向關聯，在新承接客戶部分是更強的。另外，本研究發現具備較佳產能管理能力(以辦公室規模做為代理變數)的審計辦公室，可以降低未使用產能所造成於尖峰及非尖峰時期的機會成本差異，因而使未使用產能與審計公費之關聯性消失。然而，本研究並未發現前述負向關聯之強度，在四大和非四大會計師事務所之客戶間有所差異，此可能代表決定審計辦公室產能管理能力之決定因素，係在辦公室規模，而非事務所品牌。

關鍵詞：機會成本、未使用產能、審計公費

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Audit Office Capacity, Audit-Related Characteristics, and Audit Pricing[#]

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Abstract

Referring to the economic concept of opportunity costs, this study finds that a continuous measure of audit office capacity—unused capacity pertaining to normal audit tasks—is negatively associated with audit fees, and this measure better captures the varying nature of opportunity costs than the traditional measure (i.e., whether a client firm ends its fiscal year in December) does. Empirical results also verify the negative association between unused capacity and audit fees is magnified for new clients. Further, I find that better capacity management capability, as proxied by large audit offices, can decrease the difference in opportunity costs caused by unused capacity between the peak/non-peak period, making the association between unused capacity and audit fees disappears. However, I find no evidence that the effect of unused capacity on audit fees is different between Big 4 and non-Big 4 auditees, which may suggest that it is the office size rather than the brand of audit firms that determines auditors' capacity management capabilities.

Keywords: Opportunity costs; Unused capacity; Audit fees

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1. Introduction

The pricing of audit fees reflects the properties of audit engagements, the strategies that audit firms adopt, and the possible quality of audit inputs and outputs. Therefore, understanding the pricing behavior of audit firms is a crucial research issue. In this study, the economic concept of opportunity costs is leveraged to explore whether a continuous measure developed in this study—unused capacity pertaining to normal audit tasks[1]—can better capture the association between opportunity costs and audit fees than the traditional measure (i.e., whether a client firm ends its fiscal year in December, *BUSY*) does, and to investigate whether any variables exist to moderate this relationship.

One motivation for this study stems from the observation that prior research seems to investigate the effect of an auditor's capacity on audit fees in an oversimplified manner. For example, when using a meta-analysis to evaluate the accumulated effects of the variable "busy season" on audit fees, Hay et al. (2006) point out that "An audit conducted during the busy season may be costlier if audit staff have to work overtime; alternatively, audit firms might offer discounted audit fees for work outside the busy season to use otherwise idle resources." Empirically, however, when considering the effect of the "busy season," prior U.S.-based studies generally set a binary variable indicating whether a client firm ends its fiscal year in December or on December 31 (e.g., Francis et al. 2005; Francis and Wang 2005; Ball et al. 2012; Numan and Willekens 2012; Chen et al. 2014; Doogar et al. 2015; Cairney and Stewart 2015; Chu et al. 2018).

The potential limitations of the above empirical practice are as follows. First, it is assumed that the busy season or the degree of seasonality of all audit firms is equally likely. This assumption holds only if a very high and stable proportion of client firms end their fiscal year in December (or on December 31). However, based on the initial sample size (n=116,382, see Table 1) during 2008–2020, Figure 1 reports that the proportion of U.S. SEC registrants (not limited to U.S. public companies) collected by Audit Analytics dataset ending their fiscal year in December (*BUSY*=1) ranges only from 60.45% (year 2010) to 64.30% (year 2019).[2]

[1] In this study, "unused capacity pertaining to normal audit tasks" and "unused capacity" will appear interchangeably.

[2] During 2008–2020, a decreasing trend of sample size in each year (except for 2020), together with a generally increasing trend of the percentage of firm-years ending their fiscal years in December (except for 2020) is found in Figure 1. The decreasing trend of sample size is consistent with the report of Gupta et al. (2021) that the drop-off in the number of public companies can be mostly attributed to M&A in

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Moreover, given that city offices function as the core decision unit of audit tasks within an audit firm (e.g., Wallman 1996; Francis et al. 2017), the "busy season" effect should more likely to be office-specific rather than firm-specific.[3] Practically, audit firms (especially large ones) in the U.S. operate as decentralized organizations consisting of semi-autonomous practice offices (Francis and Yu 2009; Seavey et al. 2018). Audit offices, bearing the role of the profit center or business unit, have substantial autonomy on its operations and make fee negotiations for each engagement in large part at the office and partner level under the oversight of audit firms (Hackenbrack et al. 2014).[4]

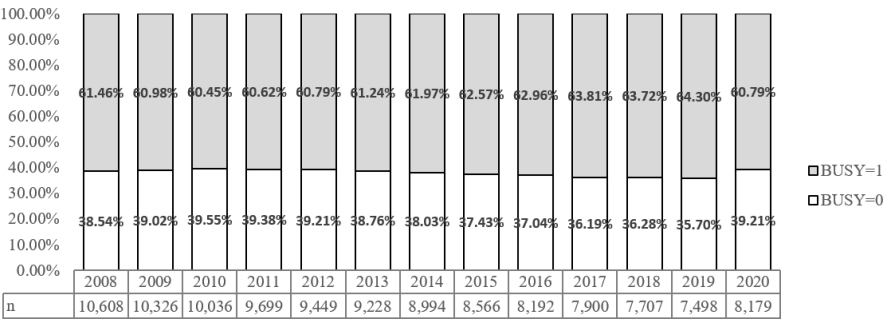


Figure 1 The proportion of client firms ending their fiscal year in December or not.

Data Source: *Audit Analytics* (n=116,382)

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some specific sectors such as banking and technology. A possible explanation for the increasing trend of the percentage of firm-years ending their fiscal years in December may be that the banking and technology firms "surviving after the M&A" are more likely to end their fiscal year in December. For example, for financial service firms (SIC code: 6000–6999) that account for 21,697 firm-years of the initial sample size (n=116,382), the sample size (percentage of firms ending fiscal years in December) is 2,038 (84.59%) in 2008, followed by a decreasing (increasing) trend of sample size (percentage of firms ending fiscal years in December), which culminates to 1,297 (89.28%) in 2019.

[3] I raise three concrete instances to highlight the biases of just using *BUSY* as the proxy for the "busy season" effect of city offices. First, for the five clients (i.e., Apple, Alphabet, Oracle, Intel, and HP) that paid the highest audit fees to EY in their San Jose office in 2015, only two ended their fiscal years in December, and the audit fee of HP ($65,700,000), which ends its fiscal year in October, is close to the sum of those four companies ($70,791,400). Second, in fiscal year 2011, the Minneapolis office of KPMG had 29 public client firms with audit fee data in the Audit Analytics dataset. Among them, 12 client firms ended their fiscal year in December (ranking #1). The sum of the audit fees for these 12 client firms was $6,035,769. However, although there were only two client firms ending their fiscal year in May, they had a total of $10,596,000 in audit fees. Third, in fiscal year 2008, the Seattle office of Grant Thornton had five public client firms. Among them, two client firms ended their fiscal year in December and two in September. However, the total audit fees for the former ($351,995) were much less than the latter ($1,270,757).

[4] After inquiring with two partners of Big 4 audit firms in Taiwan, the fee negotiation practice of Big 4 audit offices in Taiwan is similar to that of the U.S.

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Second, it is assumed that the premium ratio charged to compensate for opportunity costs in December is *fixed*. However, given that opportunity costs measure the alternative use of resources with the highest values (Samuelson and Nordhaus 2005), this assumption may be inconsistent with the *varying* magnitude of opportunity costs when a decision unit (in this study, an audit office) faces a *varying* magnitude of unused capacity pertaining to normal audit tasks, as suggested by Balakrishnan and Sivaramakrishnan (2002). For instance, when unused capacity is relatively high, a city office is less likely to exhaust it with valuable activities, such as training or bidding on new clients. The opportunity costs are, therefore, less than when the unused capacity is relatively low. Third, from an econometric perspective, dichotomizing what is in fact a continuous relationship will introduce a substantial loss of information and power of test (Irwin and McClelland 2003). Together, it seems warranted to develop better metrics to measure capacity of an audit office.

Another motivation for this study is to identify factors that can moderate the association between unused capacity and audit fees, which is rarely addressed in prior literature. I identify three potential moderating variables. First, de Villiers et al. (2014) argue and verify that when determinants of audit fees fluctuate, to avoid client defection, auditors will base their pricing on costs and adjust prices in a gradual and infrequent way, thus leading to sticky audit fees. However, this concern is reduced when bidding on new clients because those client firms *have already decided to change their auditors*. Therefore, the role of opportunity cost, among other cost drivers, should be timelier in pricing new client firms than continuing ones. For an audit fee *level* model[5] as used in this study, I hypothesize that the association between unused capacity and audit fees for new client firms is stronger than that of continuing client firms. Second, in the cross-sectional analyses of Section 5, it is argued that large audit offices, due to more resources (e.g., staff and money) being available and lower turnover rate of personnel (Francis and Yu 2009), generally have better capacity management capabilities to respond to capacity shortages by reallocating staff or obtaining external resources when the workload increases unexpectedly (Francis et al. 2017). For the same reason, they are more likely to shift some jobs between the peak period and the off-peak period. Therefore, large audit offices can reduce the opportunity costs caused by tight capacity during peak periods, and can increase the opportunity costs caused by slack capacity during non-peak periods. Thus, the peak period effect should be lower in large audit offices,

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[5] Note that the model used to test stickiness is an audit fee *change* model.

making the association between unused capacity and audit fees weaker or even absent. Third, prior studies have identified many differences between Big 4 and non-Big 4 audit firms (Choi et al. 2008; Carson et al. 2012; DeFond et al. 2017; Jiang et al. 2019), I therefore investigate whether a differential relationship exists between unused capacity and audit fees across auditees of Big 4 and non-Big 4 audit firms.

Modified from Ng et al.'s (2018a) construct of "resource constraint", two non-fixed metrics (*UNUSCAP1* and *UNUSCAP2*) are developed to compute unused capacity pertaining to normal audit tasks. *UNUSCAP1* is calculated by one minus "the current year's aggregate audit fees in a specific month for an audit office, divided by the current year's highest monthly aggregate audit fees for that audit office." When calculating *UNUSCAP1*, the audit fees of financial service firms are removed in both the numerator and the denominator from the above formula. When calculating *UNUSCAP2*, I not only remove the audit fees of financial service firms, but further dig into *office-industry* as the calculation unit. In practice, different industries have different reporting focuses, business models, auditing processes, and risks. Therefore, in *UNUSCAP1*, it is assumed that auditors within the same city office can support each other *without* entrance barriers between industries, *except for the financial industry*. In *UNUSCAP2*, it is assumed that auditors' manual support occurs only within SIC division[6] of the same city office.[7] The identification of "month" indicated above is based on the client firms' fiscal year-end month following the rule of *Compustat*. As detailed in Section 3, this study uses audit fees as a proxy for the most relevant resources and cost drivers of audit offices. This decision is made in light of prior studies that demonstrate the strong connection among audit fees, audit efforts, and audit hours. Further, firm sales are often used as the cost driver in sticky cost research (Anderson et al. 2003; Francis and Yu 2009;

[6] Standard Industrial Classification (SIC) division is a coarser industry taxonomy than SIC 2 digits. This choice, supported by Chu et al. (2018), reflects the fact that practically, many distinctions at the 2-digit industry level are irrelevant to auditors.

[7] Ng et al. (2018a) find different degrees of associations between "resource constraints" and audit fees under different levels of client firms' willingness to pay. Acknowledging the potential entrance barriers between industries when conducting audits best differentiates *UNUSCAP1* and *UNUSCAP2* from Ng et al.'s (2018a) resource constraint (for details, see the discussion in the first part of Subsection 6.2). I note that the major contribution of this study is *not* to create a new measure to capture an audit office's capacity. Rather, as described below, this paper contributes to literature by evidencing that unused capacity outperforms *BUSY* in capturing opportunity costs and by identifying moderating variables that are not investigated by prior studies, therefore advancing our understanding of audit offices' pricing behavior.

López and Peters 2012).

Empirical results show that the measure of unused capacity for city offices is negatively associated with audit fees, and this measure better captures the *varying* nature of opportunity costs than the traditional measure (i.e., *BUSY*) does. Specifically, using the audit fee model, a "horse race" test is conducted by putting *UNUSCAP* and *BUSY* together and finding that only the coefficient of *UNUSCAP* is significant. In addition, a subsample is identified in which audit offices earn the highest monthly aggregate audit fees other than December (based on the fiscal year-end month of their non-financial client firms). As expected, the coefficient of *BUSY* is not significant in this subsample. This finding is important because it provides evidence that a fiscal year-end month of December is not a necessary determinant of audit fees. Empirical results also verify the negative association between unused capacity and audit fees is magnified for new clients, and this finding is primarily driven by parallel auditor changes (i.e., from Big4 to Big4 or from non-Big4 to non-Big4).

As for the results of cross-sectional analyses, at least for continuing client firms of large audit offices[8], the association between *UNUSCAP* and audit fees turns insignificant. This finding is consistent with the argument that the better capacity management capability owned by large audit offices can decrease the difference in opportunity costs caused by unused capacity between the peak and non-peak period. In addition, no evidence is found that the effect of unused capacity on audit fees is different between Big 4 and non-Big 4 auditees. This may suggest that it is the office size rather than the brand of audit firms that determines auditors' capacity management capabilities, given that not all city offices of Big 4 audit firms are necessarily large in size.

Several robustness checks are conducted and are documented primarily in Section 6, which include: (1) using lagged values for some independent variables to check whether the empirical results still hold for *new clients*; (2) using a first-differenced method to verify whether audit offices also adjust audit fees of *continuing clients* according to changes in unused capacity; and (3) using client assets, client sales, and client firm numbers[9] respectively as the basis to recalculate

[8] Audit office size is measured by following Francis and Yu (2009), which is based on yearly audit fees earned by an audit office. I categorize the sample into three groups (i.e., Large Audit Office, Medium Audit Office, and Small Audit Office). The 75th percentile and 50th percentile are chosen as the thresholds.

[9] For the pros and cons of all these bases to calculate unused capacity, see Subsection 6.2 for details.

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unused capacity. Also, based on audit fees, assumptions inherent in *UNUSCAP1* and *UNUSCAP2* are relaxed to define a third metrics of unused capacity, *UNUSCAPR*. In short, the results of these checks are robust.

This paper contributes to auditing research in several ways. First, resorting to the basic economic concept of opportunity costs, two continuous metrics of unused capacity for audit offices are developed, in contrast with prior studies that merely use a *fixed effect* to proxy the *existence* (e.g., *BUSY*) or the *change* (i.e., change in major industry clients, Francis et al. 2017) of capacity. Evidence suggests that *UNUSCAP* not only represents an improvement in the measurement of audit offices' unused capacity, but also provides a better opportunity to investigate the pricing strategy at the *audit office level*, where prior studies have confirmed its key role in audit-related decisions and outcomes, such as the role of industry expertise and office size on audit quality and pricing (Francis et al. 2005; Francis and Yu 2009; Reichelt and Wang 2010; Choi et al. 2010).

Second, compared with continuing client firms, the stronger association between unused capacity and audit fees found in new client firms not only increases our understanding of the different pricing practices adopted by audit offices, but also corroborates the phenomenon of audit fee stickiness as found in de Villers et al. (2014). Third, new evidence is provided that "peak period effect," or a similar term called "busy season effect" in prior literature (Ng et al. 2018b), can be alleviated or even eliminated through better capacity management capabilities of audit offices. Fourth, this study adds insights into the work of Francis et al. (2017), who investigate the themes of reputation shock, contagion effect, and capacity. Francis et al. (2017) find that when an audit office loses (gains) a major industry client and concurrently loses (gains) its city-level status of industry leadership due to clients' pursuit of better audit quality, there is a subsequent decrease (increase) in audit fees for that office's other same-industry clients. They attribute these findings to the contagion effect caused by reputation shocks. Although their explanations are aligned with their empirical results, a change in the level of unused capacity may partly explain their findings, especially given the empirical results of our second metrics for unused capacity, *UNUSCAP2*, which is based on the office-industry level. Therefore, further studies may be warranted to explore this issue.

The remainder of this paper is organized as follows. In Section 2, I review relevant literature and develop the research hypotheses. Section 3 details the research design and the data. Section 4 presents the main empirical results. Section 5 includes two cross-sectional analyses. Section 6 presents the robustness checks, and Section 7 concludes and discusses future research directions.

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2. Literature and hypotheses

2.1 General relation between unused capacity and audit fees

Labor-intensive firms in the service industry, such as audit firms, cannot compensate for annual seasonality or short-term fluctuations through the building of inventories. Thus, the planning and efficient usage of capacity should be an important issue in revenue management (Metters et al. 2003). There are at least two reasons to infer the existence of unused capacity. First, some affordable degree of unused capacity must exist to address unexpected events or demand (Banker et al. 2014). Second, as the low and peak seasons are obvious in audit firms, it is not easy to remove all unused capacity.

The basic reasoning behind the association between audit offices' unused capacity and audit fees is as follows. The planning and deployment of capacity are complex tasks. When pricing its products, the long-run pricing objective of a firm is not only to cover its short-run relevant (marginal) costs, but also to recoup the capacity costs.[10] This may explain why survey evidence indicates that most manufacturing firms price their products by using full-costing (e.g., Noreen and Burgstahler 1997). As indicated by the proponents of activity-based costing, a better estimated full cost is a product's *long-run* marginal costs (Cooper and Kaplan 1992).

However, previous research also recognizes the role opportunity costs play in audit fee pricing. For example, Simunic (1980) argues that the cost components in his model should include all opportunity costs and therefore a provision for a normal profit. Thus, his audit fee model implicitly treats the *cost component* of audit fees as audit resources expended multiplied by *average* (i.e., the coefficient of a fee regression model) production plus the opportunity costs of a unit of audit work. Existing audit fee models, in contrast, generally assume a *fixed* premium in audit fees and control for this with a dummy variable, such as whether the client firms end their fiscal year in December or on December 31 (e.g., Francis et al. 2005; Francis and Wang 2005; Ball et al. 2012; Numan and Willekens 2012; Chen et al. 2014; Doogar et al. 2015; Cairney and Stewart 2015; Chu et al. 2018).

The above two approaches, although taking opportunity costs into account, are conceptually oversimplified and imprecise, because they ignore the *varying* nature

[10] Although there is no strict definition, capacity costs in this study generally refer to fixed costs that determine the capability an entity can provide. Note that even the salaries of auditors in regular working hours are fixed in the short-run.

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of opportunity costs. As Balakrishnan and Sivaramakrishnan (2002) suggest, "At the time of acquiring capacity, opportunity cost is the cash spent to acquire the resource. Once acquired, opportunity cost is a function of the resources' alternative uses, which *vary over time*." Theoretically, when there is no alternative use for specific capacity, the opportunity cost of that unused capacity is zero. On the contrary, when there are potential alternative uses for specific capacity, the opportunity cost is the alternative that has the highest contributions (Samuelson and Nordhaus 2005). Specifically, when unused capacity is relatively low, there should be a higher probability to use it up with valuable activities, such as training or bidding on new clients with fees much higher than production costs.[11] However, when unused capacity is relatively high, unused capacity has a lower probability of being consumed and therefore leads to contributions close or equal to zero.[12] Taken together, based on Balakrishnan and Sivaramakrishnan (2002) and economic reasoning, I expect the following association and propose the first research hypothesis.

Unused capacity $\xrightarrow{(-)}$ Opportunity costs $\xrightarrow{(+)}$ Audit fees

H_1: The varying (continuous) measure of unused capacity, which is negatively associated with audit fees, can better capture the relation between opportunity costs and audit fees than the traditional fixed capacity measure, BUSY (whether a client firm ends its fiscal year in December) does.

2.2 New vs. continuing audit engagements

Referring to economic theory, de Villiers et al. (2014) argue and verify that audit fees are sticky; i.e., in the short run, audit fees do not adjust proportionately to changes in their determinants.[13] They attribute their findings to the seller's imperfect information regarding market conditions when resetting prices in response to changes in cost drivers. Specifically, because the sellers (in this study, auditors) are not totally informed about how buyers (in this study, client firms) will react to

[11] From the perspective of opportunity costs, training can advance the competence of audit firm's professionals and increase future economic benefits (although it is not easy to gauge directly).

[12] In the most extreme case, the pricing may be in line with Simunic's (1980) statement that "An auditor's minimum supply price per unit of q [quantity of audit resources] is marginal cost."

[13] de Villiers et al. (2014) further find an asymmetry phenomenon: i.e., audit fees respond more quickly to increases than decreases in their determinants.

audit fee adjustments, to be wary of client defection, they will base their pricing on costs and adjust prices in a gradual and infrequent way (Bhaduri and Falkinger 1990).[14] They additionally argue and find that compared with continuing client firms, the degree of stickiness is lower for new client firms because "When a buyer approaches a new seller, the level of uncertainty is reduced, because it is now known that the buyer is considering a switch. Thus, one of the sources of market friction that cause price stickiness is removed and the price can thus be expected to more fully revert to the expected level." (de Villiers et al. 2014) According to the above reasoning, the role of opportunity cost, among other cost drivers, is timelier in pricing new client firms than continuing ones. For an audit fee *level* model[15] such as Equation (1), this will heighten the negative association between unused capacity and audit fees. I therefore propose the second hypothesis as follows:

H2: Compared with continuing client firms, the negative association between unused capacity pertaining to normal audit tasks and audit fees is stronger for new client firms.

3. Research design and data

3.1. Research model

The following audit fee model (Equation (1)) is used to examine H_1; i.e., the association between audit fees and unused capacity pertaining to normal audit tasks. Because the control variables for the model examining H_2 are the same as those of Equation (1), I will show the model and explain the difference when analyzing regression results in Section 4.[16]

[14] Even a large decrease in price will impose costs on sellers; e.g., buyers may be concerned about quality decreases (de Villiers et al. 2014).

[15] Note that the model used to test stickiness is an audit fee *change* model.

[16] The empirical results are consistent if I additionally control for auditor fixed effects or both auditor and city fixed effects.

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$$\begin{aligned} LNAF = {} & \alpha_0 + \alpha_1 UNUSCAP + \alpha_2 AUD_CHANGE + \alpha_3 LNTENURE + \alpha_4 LNTA \\ & + \alpha_5 GC + \alpha_6 SRSEGS + \alpha_7 FORGN + \alpha_8 RESTATE + \alpha_9 SI + \alpha_{10} MB \\ & + \alpha_{11} ROA + \alpha_{12} LOSS + \alpha_{13} STOCK_RET + \alpha_{14} DELTAROA + \alpha_{15} MW \\ & + \alpha_{16} BIG4 + \alpha_{17} CITYONLY + \alpha_{18} NATIONALONLY \\ & + \alpha_{19} JOINTLEADER + \alpha_{20} MERGER + \alpha_{21} REINTA + \alpha_{22} NEWFIN \\ & + \alpha_{23} NAFR + \alpha_{24} LEVERAGE + \alpha_{25} CR + \alpha_{26} CI \\ & + \sum YEAR + \sum INDUSTRY + \varepsilon \end{aligned} \quad (1)$$

The dependent variable, *LNAF*, denotes the natural log of audit fees for a firm in year *t*. Based on prior studies, the following variables are used to control for the determinants of audit fees (e.g., Numan and Willekens 2012; Huang et al. 2014; Doogar et al. 2015): auditor tenure (*AUD_CHANGE, LNTENURE*), size (*LNTA*), audit problems (*GC*), complexity (*SRSEGS, FORGN, RESTATE, SI, MB*), profitability (*ROA, LOSS, STOCK_RET, DELTAROA*), internal control (*MW*), audit quality (*BIG4, CITYONLY, NATIONALONLY, JOINTLEADER*), inherent risks (*MERGER, REINTA, NEWFIN*), non-audit services (*NAFR*), leverage (*LEVERAGE, CR*), and client importance (*CI*). In addition, I also control for the fixed effects of year (*YEAR*) and industry (*INDUSTRY*, per two-digit SIC code). Generally, control variables (I suppress them along with the intercept as "*CONTROLS*" in some tables of this study) represent the factors that affect efforts or audit risks, or both (DeFond and Zhang 2014). Definitions of the variables are provided in Appendix.[17]

The general idea of the variable of interest, *UNUSCAP* (unused capacity pertaining to normal audit tasks), is one minus the metrics below. The numerator is the current year's aggregate audit fees for a specific month of an audit office.[18] The

[17] Some audit fee studies investigate or control for auditor concentration to proxy for the degree of competition of a specific audit market, such as the Herfindahl index (e.g., Numan and Willekens 2012; Huang et al. 2016). In the audit fee models of this study, I do not control for the Herfindahl index (*HFDI*) for two reasons. First, *HFDI* is subject to many critiques from prior studies (e.g., Numan and Willekens 2012; Wang and Chui 2015), such as (1) *HFDI* cannot capture competition among audit suppliers, regardless of whether they are leaders vs. non-leaders or existing suppliers vs. potential entries; (2) *HFDI* assumes that all suppliers face equal competition pressure within an audit market (e.g., city or industry); (3) *HFDI* may capture other concepts, such as the investment opportunity set proposed by Cahan et al. (2008); and (4) the association between concentration and competition is sometimes unclear. Consistent with the above controversies, the empirical association between concentration and audit fees is also mixed in prior studies (negative in Pearson and Trompeter 1994 and Numan and Willekens 2012; positive in Kallapur et al. 2010 and Huang et al. 2016). Second, adding *HFDI* to the audit fee models of this study will not change the results and inferences. Incidentally, the coefficients of *HFDI* are all significantly negative.

[18] Following prior studies examining the associations between office size and audit quality (e.g.,

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denominator is the current year's highest monthly aggregate audit fees of that audit office. The identification of "month" indicated above is based on the client firms' fiscal year-end month following the rule of *Compustat*. For example, if the monthly aggregate audit fees of an audit office with client firms ending their fiscal year in current May are $5,000,000, and the highest monthly aggregate audit fees (e.g., in the current February) for that city office is $20,000,000, then the value of *UNUSCAP* is 1- ($5,000,000/$20,000,000) = 0.75. Please note that in this case, it does not mean that an audit office has unused capacity pertaining to normal audit tasks of 75% in May. Rather, that audit office has unused capacity pertaining to normal audit tasks of 75% *when that office audits client firms ending their fiscal years in May*. It should be noted that, when calculating the first metrics of unused capacity, *UNUSCAP1*, the audit fees of financial service firms are removed in both the numerator and the denominator from the above formula. When calculating the second metrics of unused capacity, *UNUSCAP2*, I not only remove the audit fees of financial service firms (the same as *UNUSCAP1*), but further dig into *office-industry* as the calculation unit; therefore, the value of *UNUSCAP2* is different for city offices auditing client firms of different industries. When defining an industry, I use the SIC division.[19] *UNUSCAP1* (*UNUSCAP2*) is employed to represent a specific office's (office-industry's) unused capacity during a specific month for reasons described in the following paragraph.

First, similar to Ng et al. (2018a), it is assumed that for an audit office, a specific fiscal year-end month with the highest aggregate audit fees retains the smallest unused capacity. Second, prior literature (e.g., Francis and Yu 2009; López and Peters 2012) emphasizes a strong connection between audit efforts and audit fees. Third, sales are commonly used as the observable driver for many costs (inclusive of labor costs, number of employees, and hours worked) in prior studies, such as the stream of sticky cost research (e.g., Anderson et al. 2003; Banker et al. 2014; Dierynck et al. 2012). Therefore, audit fees are used as the basis to estimate unused capacity pertaining to normal audit tasks.[20] Fourth, in practice, different

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Francis and Yu 2009), the extent of city offices is based on the column of "auditor city" in *Audit Analytics*. The empirical results are generally similar if I instead use MSA (Metropolitan Statistical Area) to define cities.

[19] Agriculture, Forestry and Fishing: 0100-0999; Mining: 1000-1499; Construction: 1500-1799; Manufacturing: 2000-3999; Transportation, Communications, Electric, Gas and Sanitary Service: 4000-4999; Wholesale Trade: 5000-5199; Retail Trade: 5200-5999; Finance, Insurance and Real Estate: 6000-6799; Services: 7000-8999; Public Administration: 9100-9729; Non-classifiable: 9900-9999.

[20] As Yu and Huang (2022) have argued, "We acknowledge that according to auditing theory and

industries have different reporting focuses, business models, auditing processes, and risks. For example, Maletta and Wright (1996) find significant differences in financial statement error incidence, magnitude, and method of detection across industries. In some special industries, such as the financial industry, the knowledge is very specific (e.g., assessing the adequacy of loan loss provisions) (Krishnan 2003). In practice, city offices often divide their operations *per* the client firm's industry. Therefore, two degrees of nuance are applied to measure unused capacity. In *UNUSCAP1*, it is assumed that auditors within the same city office can support each other without entrance barriers between industries *except for the financial industry*. In *UNUSCAP2*, it is assumed that even coarsened cross-industry support of auditors within the same city office is difficult. I use the SIC division because it is assumed that some degree of mutual support is still feasible within the same SIC division.[21] Taking industry differences into account distinguishes the current study's measure from Ng et al.'s (2018a) measure of "resource constraints" and is also consistent (especially *UNUSCAP2*) with the work of Francis et al. (2017) suggesting that "…offices gaining a major client will experience a short-term capacity constraint (labor shortage) that could exacerbate workload or time-pressure problem and lead to lower-quality audits for *same-industry* [emphasis added] clients…." [22]

As robustness checks (Subsection 6.2), a metrics equivalent to Ng et al. (2018a) is used (i.e., assuming that the auditors within the same city office can support each other without any entrance barriers between industries). Further, I discuss the pros and cons of other bases (e.g., total assets, net sales, and client firm number) to calculate unused capacity and summarize their empirical results.

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empirical findings, the audit fees charged by audit firms actually comprise other components, such as litigation risks and reputation effects (Hay et al. 2006; Hay 2013). However, unless we could obtain large-scale proprietary data on capacity or cost drivers, the most feasible way for empirical studies is to use an acceptable basis to proxy for it (Anderson et al. 2003)."

[21] This assumption is supported by Chu et al. (2018) that: "Many differences at the 2-digit industry level may not be relevant to auditors. For example, whether an audit client manufactures "textile mill products" (SIC industry 22) or "apparel & other textile products" (SIC industry 23) or "lumber and wood products" (SIC industry 24) may not matter."

[22] Note that although *UNUSCAP2* may be more suitable than *UNUSCAP1* to calculate unused capacity for larger city offices, it eventually depends on the specific client portfolio and organizational structure of each city office. Therefore, both are used in the main analyses.

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3.2. Assumptions affecting the accuracy of UNUSCAP1 and UNUSCAP2 to represent unused capacity

In this subsection, I discuss three implicit assumptions behind the measurement of *UNUSCAP1* and *UNUSCAP2*. The magnitude of measurement errors of the two variables hinges on the extent to which audit practices approach these assumptions. The first assumption is that the audit process and strategy within an audit office (or office-industry) are generally the same across all client firms. This assumption is, of course, somewhat oversimplified. For example, due to the level of audit difficulty, the work for larger auditees is likely to happen all throughout the year, whereas the audit work for smaller auditees may primarily happen after the balance sheet date. However, as López and Peters (2012) point out, "…certain procedures cannot be performed until the end of the fiscal year period or shortly thereafter (AICPA 2006). In addition, some auditing standards emphasize the importance of year-end evidence as a means to reduce audit risk (AICPA 1983)." Therefore, these practices to some extent mitigate the concerns.

Given that *UNUSCAP1* and *UNUSCAP2* are based on audit fees, the second assumption is that the operations of audit and non-audit services within a city office are independent. That is, an auditor will not provide non-audit services, and *vice versa*. After inquiring with one partner and one manager who worked in two U.S. Big 4 offices, the current practice is generally consistent with the second assumption, except for some information technology specialists who would provide both audit (e.g., evaluation of internal controls) and non-audit services (e.g., design of internal control systems). However, as long as the portion of such personnel is relatively small or the distribution of their capacity between audit and non-audit services is stable, the negative effects on the accuracy of *UNUSCAP1* and *UNUSCAP2* to represent unused capacity should be limited as well.

The third assumption is that the occupation of unused capacity from private companies will not significantly affect the measurement of *UNUSCAP*. Due to data from private companies being unavailable (Lennox and Wu 2018), this assumption is pervasive in measuring auditing-related constructs, such as industry expert (Reichelt and Wang 2010), client importance (Li 2009), and office size (Francis and Yu 2009). Although there is no way to verify this assumption via public data in the U.S., the assumption is to some extent acceptable due to the fruitful findings in the research streams as mentioned above.

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3.3. Sample selection

Table 1 presents the sample selection process. The process starts with 116,382 U.S. firm-years with audit fee data in *Audit Analytics* in 2008–2020. A total of 21,697 firm-years with SIC codes ranging from 6000 to 6999 (financial service firms) are dropped. I further delete 30,399 firm-years that do not have valid SIC codes. This leads to the basis sample size (n = 64,286) to calculate *UNUSCAP1* and *UNUSCAP2*. Because these observations virtually all belong to financial service firms (e.g., investing, fund, and trust firms), this step will not negatively impact the calculation of *UNUSCAP1* and *UNUSCAP2*. I delete 4,809 firm-years that do not have complete audit-related variables (e.g., *MW*, *NAFR*) for the audit fee models of this study. 12,779 observations are deleted when merging with *Compustat*. Finally, 8,378 observations are lost when obtaining complete financial independent variables in *Compustat*. This leads to a sample size of 38,320 firm-years to test H_1 and H_2. To avoid the influence of outliers, all variables (except dummy variables) at the top and bottom 1% of their distributions are winsorized.

The year 2008 is chosen as the inception year for the following reasons. First, to comply with Sarbanes–Oxley Act (SOX) section 404, U.S. accelerated filers were required to file both a management report and an auditor's attestation of internal control over financial reporting for fiscal years ending on or after November 15, 2004 (SEC 2003). This may lead to unstable fluctuation in audit fees at least for several years. Second, in 2005, the Securities and Exchange Commission (SEC) defined a new filer called "large accelerated filer" and required a 60-day filing deadline, beginning with the annual report filed for its first fiscal year ending on or after December 15, 2006 (SEC 2005). This requirement may again make the audit fee market unstable for a while. Third, some of the variables (e.g., *DELTAROA*) require one period of lagged data.

Table 1 Sample selection

Sample selection process	
US firms with audit fee data in *Audit Analytics* in 2008–2020	116,382
Less: Financial service firms (SIC code: 6000–6999)	(21,697)
Less: Invalid SIC code (missing or zero)	(30,399)
Basis to calculate *UNUSCAP1* and *UNUSCAP2*	64,286
Less: Missing values in audit-related variables	(4,809)
Less: Merge with *Compustat*	(12,779)
Less: Missing values in financial-related variables	(8,378)
Final sample (for both H_1 and H_2)	38,320

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4. Empirical results

4.1. Descriptive statistics

Table 2 shows the descriptive statistics for variables testing H_1 and H_2 (n=38,320). On average, the client firms pay audit fees of 0.76M ($e^{13.543}$) to their auditors. Some variables seem to be unusual in terms of their means, such as *LEVERAGE* (1.261) and *ROA* (–0.402). However, their medians are 0.537 and 0.015, respectively. Thus, the results are primarily due to the skewed nature of *LEVERAGE* and *ROA* caused primarily by auditees of Non-Big 4 auditors, as found in prior studies (e.g., Doogar et al. 2015). Untabulated results indicate that if observations at the top and bottom 1% of all non-dummy variables are trimmed, then the means (medians) of *LEVERAGE* and *ROA* will be 0.702 (0.525) and –0.166 (0.019), respectively. The empirical results of main analyses are qualitatively unchanged if all non-binary variables are trimmed at the top and bottom 1%.[23] The mean of *UNUSCAP1* (*UNUSCAP2*) suggests that, on average, client firms are audited by a city office with unused capacity pertaining to normal audit tasks of 0.205 (0.137). Untabulated results show that, as compared to Big 4 auditees, non-Big 4 auditees are generally smaller in size, experience more frequent auditor changes, have higher debt ratios, are less profitable, face a higher probability of receiving going concern audit reports, and are audited by industry experts less frequently.

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[23] However, the sample size decreases substantially due to the relatively large number of control variables in this study.

Table 2 Descriptive statistics

Variable	n	Mean	Std Dev	25th Pctl	Median	75th Pctl
LNAF	38,320	13.543	1.485	12.540	13.692	14.581
UNUSCAP1	38,320	0.205	0.356	0.000	0.000	0.324
UNUSCAP2	38,320	0.137	0.291	0.000	0.000	0.000
BUSY	38,320	0.710	0.454	0.000	1.000	1.000
AUD_CHANGE	38,320	0.077	0.267	0.000	0.000	0.000
LNTENURE	38,320	2.088	0.876	1.609	2.197	2.708
LNTA	38,320	19.514	2.795	17.787	19.796	21.478
GC	38,320	0.126	0.332	0.000	0.000	0.000
SRSEGS	38,320	2.092	0.808	1.414	2.000	2.646
FORGN	38,320	0.503	0.500	0.000	1.000	1.000
RESTATE	38,320	0.077	0.267	0.000	0.000	0.000
SI	38,320	0.696	0.460	0.000	1.000	1.000
MB	38,320	4.029	7.947	0.959	1.929	3.765
ROA	38,320	-0.402	1.743	-0.165	0.015	0.066
LOSS	38,320	0.445	0.497	0.000	0.000	1.000
STOCK_RET	38,320	0.116	0.719	-0.300	0.023	0.336
DELTAROA	38,320	-0.004	0.920	-0.052	-0.001	0.040
MW	38,320	0.117	0.321	0.000	0.000	0.000
BIG4	38,320	0.614	0.487	0.000	1.000	1.000
CITYONLY	38,320	0.234	0.424	0.000	0.000	0.000
NATIONALONLY	38,320	0.094	0.292	0.000	0.000	0.000
JOINTLEADER	38,320	0.109	0.311	0.000	0.000	0.000
MERGER	38,320	0.141	0.349	0.000	0.000	0.000
REINTA	38,320	0.226	0.187	0.070	0.188	0.336
NEWFIN	38,320	0.846	0.361	1.000	1.000	1.000
NAFR	38,320	0.177	0.224	0.013	0.096	0.248
LEVERAGE	38,320	1.261	4.249	0.333	0.537	0.738
CR	38,320	2.817	3.202	1.130	1.891	3.182
CI	38,320	0.139	0.216	0.020	0.054	0.146

See Appendix for variable definitions.

4.2. Regression results[24]

Table 3 presents the empirical results of H_1. To control for serial correlation, I employ robust standard errors clustered by firm and report the adjusted results for all models in this study. The adjusted R-squared of all equations that use *LNAF* as dependent variables throughout this study are all above 80%, and the joint tests of

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[24] For parsimony and due to its inability to control for other factors, I do not present the results of univariate correlation analysis. Results are available upon request.

the models are all significant at the 1% level.[25] First reported are the results of Panel A, which uses *UNUSCAP1* to measure unused capacity. In column (1), I use only *UNUSCAP1* as the variable of interest (i.e., Equation (1)). In column (2), I use only *BUSY* to proxy for the busy season fixed effect as used in prior studies. In column (3), *BUSY* and *UNUSCAP1* are put together to "horse race" whether: (1) audit offices will incorporate the varying nature of opportunity costs, and (2) December is not an accurate proxy for the busy season when charging their clients.

In column (1), the coefficient of *UNUSCAP1* is negatively significant at the 1 percent level (coefficient= –0.077, t= –4.56), indicating that an audit office will charge lower audit fees when unused capacity pertaining to normal audit tasks is higher. Economically, the coefficient of *UNUSCAP1* means that, *ceteris paribus*, an increase in one standard deviation of *UNUSCAP1* in the sample will lower the audit fees by 2.7% ($e^{-0.077 \times 0.356}$-1), on average. The above figure is equivalent to 13.78 (2.7%/19.6%) percent of the average net profit margin of accounting, tax preparation, bookkeeping, and payroll services companies (NAICS code 5412) investigated by Sageworks for the 12 months ending August 2015.[26] In column (2), consistent with prior literature, the coefficient of *BUSY* is positively significant at the 1 percent level (coefficient= 0.056, t= 3.90), suggesting that on average, audit offices charge a premium of 5.76% ($e^{0.056}$-1) to client firms with fiscal year-end month in December. In column (3), the coefficient of *UNUSCAP1* is consistent with column (1); however, the coefficient of *BUSY* turns *insignificantly* positive (coefficient= 0.019, t= 0.79). Collectively, the above results indicate that *UNUSCAP1* better captures the *varying* nature of opportunity costs than *BUSY* does, thereby supporting H_1.

Two research designs are used to provide more evidence regarding H1. First, in columns (4) and (5), I respectively use the subsamples of *BUSY*=1 (n=27,201) and *BUSY*=0 (n=11,119) to rerun Equation (1). The coefficients of *UNUSCAP1* are all negatively significant, providing evidence that *UNUSCAP1* can better capture the continuous spectrum of opportunity costs whenever client firms end their fiscal year in December or not. Second, in columns (6) and (7), I run regressions limited to samples audited by offices that earn the highest monthly aggregate audit fees *other than* December, based on the fiscal year-end month of their non-financial client

[25] Multicollinearity seems not to be an empirical threat because the variance inflation factor (VIF) values of the variables of interest (i.e., *UNUSCAP1*, *UNUSCAP2*, *UNUSCAP1* × *AUD_CHANGE*, *UNUSCAP2* × *AUD_CHANGE*) are all less than 10 throughout all empirical results in this study.

[26] http://www.accountingweb.com/practice/growth/accounting-tops-list-of-most-profitable-industries.

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firms. *BUSY* and *UNUSCAP1* are the variable of interest for columns (6) and (7), respectively. This design is important because it can provide evidence that *a fiscal year-end month of December* is not a necessary determinant of audit fees.[27] As expected, the coefficient of *BUSY* in column (6) is not statistically significant (coefficient= 0.023, *t*= 0.68) because in this subsample, *BUSY* cannot represent auditors' "busy season" anymore. In contrast, the coefficient of *UNUSCAP1* in column (7) is still highly significant (coefficient= –0.101, *t*= –3.30).[28] The empirical results in Panel B where *UNUSCAP2* is employed to measure unused capacity are consistent with those of Panel A. To summarize, the empirical findings in Table 3 lend strong support for H_1. The signs of the control variables are generally as expected, with the exception of *DELTAROA* and *MERGER* in some columns.

[27] The sample size in columns (6)(7) of Table 3 shows that 9.88% (3,785/38,320) of firm-years are audited by audit offices that do *not* earn the highest monthly aggregate audit fees in December, based on the fiscal year-end month of their non-financial client firms. This percentage rises to 19.16% (7,341/38,320) in the case of *UNUSCAP2* (see columns (6)(7) of Panel B).

[28] For the subsample that audit offices earn the highest monthly aggregate audit fees in December, both the coefficients of *UNUSCAP1* and *BUSY* in different regressions are significant (untabulated).

Table 3　Main analysis results Ⅰ (testing H1)

Dependent Variable: *LNAF*

Panel A: Using *UNUSCAP1* as the test variable

		(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Variable	Exp. Sign	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Intercept	?	4.418***	(52.73)	4.354***	(51.48)	4.398***	(50.77)	4.284***	(41.03)	4.677***	(29.71)	3.651***	(18.23)	3.935***	(14.89)
UNUSCAP1	–	**-0.077*** **	**(-4.56)**			**-0.056****	**(-1.99)**	**-0.103***	**(-1.86)**	**-0.104****	**(-2.50)**			**-0.101*** **	**(-3.30)**
BUSY	+			0.056***	(3.90)	0.019	(0.79)					0.023	(0.68)		
AUD_CHANGE	–	-0.082***	(-7.16)	-0.083***	(-7.23)	-0.082***	(-7.18)	-0.056***	(-4.09)	-0.138***	(-6.82)	-0.066**	(-2.09)	-0.063**	(-2.00)
LNTENURE	–	-0.037***	(-5.45)	-0.037***	(-5.47)	-0.037***	(-5.44)	-0.031***	(-3.97)	-0.047***	(-3.86)	-0.053***	(-3.10)	-0.054***	(-3.17)
LNTA	+	0.447***	(99.48)	0.447***	(99.31)	0.447***	(99.46)	0.439***	(81.58)	0.469***	(57.00)	0.474***	(42.51)	0.471***	(42.75)
GC	+	0.110***	(5.67)	0.109***	(5.64)	0.110***	(5.65)	0.114***	(5.11)	0.093**	(2.45)	0.098*	(1.94)	0.098*	(1.95)
SRSEGS	+	0.145***	(13.61)	0.145***	(13.59)	0.145***	(13.60)	0.151***	(12.11)	0.124***	(6.38)	0.106***	(4.20)	0.106***	(4.23)
FORGN	+	0.148***	(9.13)	0.148***	(9.13)	0.148***	(9.14)	0.131***	(6.96)	0.167***	(5.40)	0.210***	(5.25)	0.206***	(5.20)
RESTATE	+	0.080***	(7.41)	0.080***	(7.38)	0.080***	(7.40)	0.084***	(6.58)	0.064***	(3.20)	0.040	(1.12)	0.042***	(1.19)
SI	+	0.107***	(12.08)	0.107***	(12.05)	0.107***	(12.07)	0.099***	(9.26)	0.115***	(7.60)	0.143***	(6.36)	0.142***	(6.30)
MB	+	0.002***	(3.58)	0.002***	(3.57)	0.002***	(3.58)	0.002***	(3.38)	0.001	(1.01)	0.002*	(1.74)	0.002*	(1.82)
ROA	–	-0.021***	(-4.82)	-0.021***	(-4.83)	-0.021***	(-4.83)	-0.019***	(-3.70)	-0.023***	(-2.94)	-0.020*	(-1.71)	-0.019	(-1.63)
LOSS	+	0.143***	(14.56)	0.143***	(14.54)	0.143***	(14.51)	0.136***	(11.65)	0.146***	(8.51)	0.150***	(6.01)	0.151***	(6.02)
STOCK_RET	–	-0.012***	(-3.07)	-0.012***	(-3.15)	-0.012***	(-3.11)	-0.012***	(-2.71)	-0.014**	(-2.04)	-0.016	(-1.18)	-0.014	(-1.05)
DELTAROA	–	-0.001	(-0.24)	-0.001	(-0.25)	-0.001	(-0.24)	-0.004	(-0.91)	0.005	(0.66)	0.002	(0.16)	0.002	(0.11)
MW	+	0.090***	(5.49)	0.090***	(5.52)	0.090***	(5.51)	0.080***	(4.16)	0.107***	(3.64)	0.126***	(2.92)	0.122***	(2.84)
BIG4	+	0.510***	(28.25)	0.508***	(28.11)	0.509***	(28.16)	0.525***	(24.59)	0.477***	(14.52)	0.380***	(7.86)	0.397***	(8.17)
CITYONLY	+	0.044***	(3.69)	0.044***	(3.65)	0.044***	(3.69)	0.050***	(3.55)	0.030	(1.40)	0.109***	(3.19)	0.112***	(3.28)
NATIONALONLY	?	0.016	(0.94)	0.016	(0.93)	0.016	(0.94)	0.047**	(2.35)	-0.045	(-1.42)	0.056	(1.20)	0.064	(1.35)
JOINTLEADER	+	0.097***	(5.56)	0.097***	(5.57)	0.097***	(5.56)	0.107***	(5.24)	0.071**	(2.24)	0.100	(1.49)	0.098	(1.45)
MERGER	+	0.000	(0.04)	0.000	(0.01)	0.000	(0.02)	0.008	(0.75)	-0.012	(-0.67)	-0.045	(-1.62)	-0.044	(-1.55)
REINTA	+	0.247***	(6.23)	0.250***	(6.31)	0.249***	(6.28)	0.286***	(5.76)	0.183***	(2.93)	0.092	(1.12)	0.088	(1.07)
NEWFIN	+	0.054***	(4.23)	0.054***	(4.23)	0.054***	(4.22)	0.063***	(3.98)	0.031	(1.53)	0.019	(0.68)	0.016	(0.56)
NAFR	?	-0.303***	(-13.84)	-0.302***	(-13.83)	-0.302***	(-13.83)	-0.276***	(-10.47)	-0.374***	(-9.90)	-0.369***	(-6.22)	-0.370***	(-6.24)
LEVERAGE	+	0.022***	(14.56)	0.022***	(14.64)	0.022***	(14.58)	0.022***	(12.00)	0.024***	(8.81)	0.023***	(6.82)	0.023***	(6.75)
CR	–	-0.024***	(-13.96)	-0.024***	(-13.95)	-0.024***	(-13.96)	-0.021***	(-11.59)	-0.032***	(-8.58)	-0.035***	(-7.21)	-0.035***	(-7.22)
CI	?	0.135***	(4.84)	0.166***	(6.10)	0.144***	(4.94)	0.187***	(5.56)	0.014	(0.23)	0.115**	(2.37)	0.049	(0.95)
YEAR		Controlled		Controlled		Controlled		Controlled		Controlled		Controlled		Controlled	
IND		Controlled		Controlled		Controlled		Controlled		Controlled		Controlled		Controlled	
Cluster		firm		firm		firm		firm		firm		firm		firm	
n		38,320		38,320		38,320		27,201		11,119		3,785		3,785	
Adjusted R^2		0.903		0.903		0.903		0.899		0.916		0.914		0.914	

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Table 3 Main analysis results Ⅰ (testing H1) (Continued)

Panel B: Summarized regression results using *UNUSCAP2* as the test variable

		(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Variable	Exp. Sign	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
UNUSCAP2	–	**-0.097*****	**(-5.17)**			**-0.071*****	**(-3.24)**	**-0.105*****	**(-2.60)**	**-0.064****	**(-2.25)**			**-0.077*****	**(-3.67)**
BUSY	+			0.056***	(3.90)	0.027	(1.58)					0.020	(0.76)		
CONTROLS		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
YEAR		Controlled		Controlled		Controlled		Controlled		Controlled		Controlled		Controlled	
IND		Controlled		Controlled		Controlled		Controlled		Controlled		Controlled		Controlled	
Cluster		firm		firm		firm		firm		firm		firm		firm	
n		38,320		38,320		38,320		27,201		11,119		7,341		7,341	
Adjusted R^2		0.903		0.903		0.903		0.899		0.916		0.913		0.914	

Table 3 presents the empirical results of H 1. Seven regression equations are run in Panel A. In column (1), only *UNUSCAP1* is used as the variable of interest (i.e., Equation (1)). In column (2), only *BUSY* is used as the variable of interest. In column (3), *BUSY* and *UNUSCAP1* are put together. In columns (4) and (5) where the variable of interest is *UNUSCAP1*, the subsamples of *BUSY*=1 and *BUSY*=0 are used to rerun Equation (1), respectively. In columns (6) and (7), regressions are run limited to samples audited by offices that earn the highest monthly aggregate audit fees *other than* December, based on the fiscal year-end month of their non-financial client firms. *BUSY* and *UNUSCAP1* are the variable of interest for columns (6) and (7), respectively. Panel B summarize the regression results by using *UNUSCAP2* to replace *UNUSCAP1*. For brevity, *CONTROLS* is used to represent all the control variables and the intercept. The *t*-statistics are adjusted for clustering by firms. Sample period: 2008–2020. See Appendix for variable definitions. *, ** and *** denote significant differences from zero at the 10%, 5%, and 1% levels, respectively (two-tailed).

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Table 4 presents the empirical results of H_2. To verify that the association between unused capacity pertaining to normal audit tasks and audit fee pricing is stronger for new clients, an interaction term $UNUSCAP \times AUD_CHANGE$ is added to Equation (1) to form Equation (2):

$$\begin{aligned} LNAF = {} & \alpha_0 + \alpha_1 UNUSCAP + \alpha_2 UNUSCAP \times AUD_CHANGE \\ & + \alpha_3 AUD_CHANGE + \alpha_4 LNTENURE + \alpha_5 LNTA + \alpha_6 GC \\ & + \alpha_7 SRSEGS + \alpha_8 FORGN + \alpha_9 RESTATE + \alpha_{10} SI + \alpha_{11} MB \\ & + \alpha_{12} ROA + \alpha_{13} LOSS + \alpha_{14} STOCK_RET + \alpha_{15} DELTAROA \\ & + \alpha_{16} MW + \alpha_{17} BIG4 + \alpha_{18} CITYONLY + \alpha_{19} NATIONALONLY \\ & + \alpha_{20} JOINTLEADER + \alpha_{21} MERGER + \alpha_{22} REINTA \\ & + \alpha_{23} NEWFIN + \alpha_{24} NAFR + \alpha_{25} LEVERAGE + \alpha_{26} CR \\ & + \alpha_{27} CI + \gamma YEAR + \lambda INDUSTRY + \varepsilon \end{aligned} \tag{2}$$

In Panel A, I use *UNUSCAP1* to represent unused capacity. Panel B summarizes the regression results using *UNUSCAP2* to represent unused capacity. In column (1) of Panel A, the coefficient of *UNUSCAP1* is negatively significant at the 1 percent level (coefficient= –0.069, t= –4.03). The coefficient of the variable of interest, *UNUSCAP1* × *AUD_CHANGE*, is also negatively significant (coefficient= –0.104, t= –3.21). The result is in line with H_2, which suggests that compared with continuing engagements, audit offices give more consideration to opportunity costs for new engagements. The two values are also economically significant because it means that, *ceteris paribus*, an increase in one standard deviation of *UNUSCAP1* in the sample will lower audit fees charged to *continuing* client firms by 2.43% on average. In contrast, *ceteris paribus*, an increase in one standard deviation of *UNUSCAP1* in the sample will lower the audit fees to *new* client firms by 5.97% on average. The empirical results in Panel B where *UNUSCAP2* is employed to measure unused capacity are consistent with those of Panel A. To summarize, the results of column (1) in both panels lend support to H_2.

As an additional analysis, auditor change (*AUD_CHANGE*) is categorized into three types: from non-Big4 to Big4 auditor (*Changeup*, mean=0.005), from Big4 to non-Big4 auditor (*Changedown*, mean=0.009), and two forms of parallel changes[29] (*Changeparallel*, mean=0.063), to investigate whether those variables, along with their interaction with unused capacity, have differential associations with audit

[29] i.e., from Big4 to Big4 or from non-Big4 to non-Big4.

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fees.[30] In the final sample of H_2 (n=38,320), *Changeparallel* constitute the majority of *AUD_CHANGE* (0.063/0.077=82%) and is considered a relatively normal form of auditor change in prior studies (e.g., Desir et al. 2014). In contrast, *Changeup* and *Changedown* account for only 6% (0.005/0.077) and 12% (0.009/0.077) of *AUD_CHANGE*, and are often considered to occur for special reasons. For example, prior studies find markets respond positively (negatively) to *Changeup* (*Changedown*)[31] because it has been long asserted that brand name audit firms (e.g., current Big 4) provide better audit quality (DeAngelo 1981).

In column (2) of Panel A where *UNUSCAP1* is employed to measure unused capacity, the coefficients of *Changeparallel* (coefficient= –0.086, t= –5.91) and *UNUSCAP1*× *Changeparallel* (coefficient= –0.109, t= –3.00) are consistent with those of *AUD_CHANGE* and *UNUSCAP1*× *AUD_CHANGE*. The initial fee effects of non-Big4 to Big4 auditor (coefficient=0.293, F=57.10, p<0.01)[32] and Big4 to non-Big4 auditor (coefficient= –0.335, F=143.14, p<0.01) are consistent with prior studies (e.g., Desir et al. 2014). However, neither the coefficient of *UNUSCAP1*× *Changeup* and *UNUSCAP1*× *Changedown* is statistically significant. Therefore, the significant results of *UNUSCAP1*× *AUD_CHANGE* are driven by parallel auditor changes. The insignificant coefficients of *UNUSCAP1*× *Changeup* and *UNUSCAP1*× *Changedown* may be due to the particular nature to switch to an auditor of different levels, changing the audit offices' considerations to incorporate unused capacity into audit fee pricing. Another possibility is the majority of values of *UNUSCAP1*× *Changeup* (99.88%) and *UNUSCAP1*× *Changedown* (99.80%) are zero, which therefore leads to a low-power test. The results of *UNUSCAP2* (column (2) of Panel B) are in line with *UNUSCAP1*.

[30] I thank one referee for the constructive suggestions.

[31] For example, see Fried and Schiff (1981); Nichols and Smith (1983); Klock (1994); Eichenseher et al. (1989); Dunn et al. (1999); and Knechel et al. (2007).

[32] When changing from non-Big4 to Big4 auditor, the total initial audit fee effect is the coefficient sum of *Changeup* and *BIG4*. Likewise, when changing from Big4 to non-Big4 auditor, the total initial audit fee effect is the coefficient of *Changedown* minus that of *BIG4*.

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Table 4 Main analysis results Ⅱ (testing H2)

Dependent Variable: *LNAF*					
Panel A: Using *UNUSCAP1* as the test variable					
		(1)		(2)	
Variable	Exp. Sign	Coeff.	t-stat	Coeff.	t-stat
Intercept	?	4.415***	(52.73)	4.415***	(52.77)
UNUSCAP1	–	-0.069***	(-4.03)	-0.070***	(-4.08)
UNUSCAP1 × ***AUD_CHANGE***	–	-0.104***	(-3.21)		
AUD_CHANGE	–	-0.062***	(-4.70)		
UNUSCAP1 × ***Changeup***	?			0.041	(0.41)
Changeup	?			-0.226***	(-5.15)
UNUSCAP1 × ***Changedown***	?			-0.010	(-0.14)
Changedown	?			0.184***	(6.01)
UNUSCAP1 × ***Changeparallel***	?			-0.109***	(-3.00)
Changeparallel	?			-0.086***	(-5.91)
LNTENURE	–	-0.037***	(-5.46)	-0.035***	(-5.09)
LNTA	+	0.447***	(99.49)	0.446***	(98.84)
GC	+	0.110***	(5.67)	0.109***	(5.65)
SRSEGS	+	0.145***	(13.61)	0.144***	(13.59)
FORGN	+	0.148***	(9.12)	0.146***	(9.04)
RESTATE	+	0.080***	(7.41)	0.081***	(7.49)
SI	+	0.107***	(12.06)	0.106***	(11.93)
MB	+	0.002***	(3.58)	0.002***	(3.67)
ROA	–	-0.021***	(-4.84)	-0.021***	(-4.91)
LOSS	+	0.143***	(14.55)	0.142***	(14.45)
STOCK_RET	–	-0.012***	(-3.07)	-0.012***	(-3.08)
DELTAROA	–	-0.001	(-0.22)	-0.001	(-0.19)
MW	+	0.090***	(5.49)	0.094***	(5.74)
BIG4	+	0.510***	(28.26)	0.519***	(28.27)
CITYONLY	+	0.044***	(3.69)	0.044***	(3.72)
NATIONALONLY	?	0.016	(0.95)	0.016	(0.94)
JOINTLEADER	+	0.097***	(5.57)	0.097***	(5.59)
MERGER	+	0.000	(0.01)	0.001	(0.16)
REINTA	+	0.247***	(6.24)	0.250***	(6.31)
NEWFIN	+	0.054***	(4.21)	0.054***	(4.26)
NAFR	?	-0.303***	(-13.85)	-0.301***	(-13.77)
LEVERAGE	+	0.022***	(14.56)	0.022***	(14.51)
CR	–	-0.024***	(-13.96)	-0.024***	(-14.06)
CI	?	0.134***	(4.78)	0.134***	(4.78)
YEAR		Controlled		Controlled	
IND		Controlled		Controlled	
Cluster		firm		firm	
n		38,320		38,320	
Adjusted R^2		0.903		0.904	

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Table 4 Main analysis results Ⅱ (testing H2) (Continued)

Panel B: Using UNUSCAP2 as the test variable

		(1)		(2)	
Variable	Exp. Sign	Coeff.	t-stat	Coeff.	t-stat
UNUSCAP2	–	-0.087***	(-4.58)	-0.089***	(-4.66)
UNUSCAP2 × ***AUD_CHANGE***	–	-0.138***	(-3.55)		
AUD_CHANGE	–	-0.064***	(-5.09)		
UNUSCAP2 × ***Changeup***	?			0.021	(0.18)
Changeup	?			-0.222***	(-5.13)
UNUSCAP2 × ***Changedown***	?			0.018	(0.19)
Changedown	?			0.181***	(6.09)
UNUSCAP1 × ***Changeparallel***	?			-0.148***	(-3.37)
Changeparallel	?			-0.089***	(-6.33)
CONTROLS		Yes		Yes	
YEAR		Controlled		Controlled	
IND		Controlled		Controlled	
Cluster		firm		firm	
n		38,320		38,320	
Adjusted R^2		0.903		0.904	

Table 4 presents the empirical results of H_2 as well as an additional analysis. In Panel A, *UNUSCAP1* is used to represent unused capacity. Panel B summarizes the regression results using *UNUSCAP2* to represent unused capacity. For brevity, *CONTROLS* is used to represent all the control variables and the intercept. In column (1) of both panels, to test H_2, an interaction term *UNUSCAP* × *AUD_CHANGE* is added to Equation (1) to form Equation (2). In column (2) of both panels, *AUD_CHANGE* is further categorized into *Changeup*, *Changedown*, and *Changeparallel*. The three variables, along with their interaction with unused capacity, are used to test their associations with audit fees. The *t*-statistics are adjusted for clustering by firms. Sample period: 2008–2020. See Appendix for variable definitions. *, ** and *** denote significant differences from zero at the 10%, 5%, and 1% levels, respectively (two-tailed).

5. Cross-sectional analyses

5.1. Audit office size

As delineated above, unused capacity is negatively related to opportunity costs. In labor-intensive professional organizations with obvious peak/non-peak periods of capacity such as audit firms (Palmrose 1989), the price elasticity of supply in the peak period is lower than that of the non-peak period (Ng et al. 2018b). That is, during the peak period, the cost (including opportunity costs) of squeezing existing capacity (e.g., via reducing services to existing customers) or creating new capacity (e.g., via temporary employment, outsourcing, or overtime) is high in the short term, making audit offices charge higher audit fees than the non-peak period.

An important factor affecting the magnitude of opportunity cost caused by unused capacity is the capacity management capability of an organization. Other things being equal, an organization with better capacity management capabilities is more likely to

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respond to capacity shortages by reallocating staff or obtaining external resources when the workload increases unexpectedly. Another practice is to shift some jobs between the peak period and the off-peak period. The above practices may also mitigate the unavoidable decline in work quality during the peak period (Ng et al. 2018b). Therefore, an organization with better capacity management capabilities can reduce the opportunity costs caused by tight capacity during peak periods, and can increase the opportunity costs caused by slack capacity during non-peak periods, so that the peak period effect is lower than that of organizations with relatively poor capacity management capabilities.

In the setting of auditing, prior literature suggests that an individual audit office can adjust capacity by diluting or reassigning existing resources or outsourcing (Bills et al. 2016). The larger the office, the more resources (e.g., staffing and money) and the lower the turnover rate of personnel (Francis and Yu 2009), so a large office has better flexibility to absorb capacity shock (Francis et al. 2017). For the same reason, large offices can more easily adjust their resources (e.g., auditors and specialists) by using practices such as "back orders" (Balakrishnan and Sivaramakrishnan 2002), more interim audit procedures, and continuous auditing to move unused capacity across months (López and Peters 2012). Lastly, based on the practice that audit expertise and human capital are office-specific to a certain degree (Danos et al. 1989; Francis et al. 2005; Vera-Muñoz et al. 2006), larger audit offices usually serve larger and more complex clients, and naturally have more experienced and professional auditors. As a result, these high-expertise auditors may often engage in resource-sharing (i.e., consultation and training) with other city offices.[33] Taken together, the negative association between unused capacity and audit fees may be weak or even absent for large audit offices.

The following research design is applied to investigate this issue. The final sample of H_1 and H_2 (n=38,320) is categorized into three groups (i.e., auditees of "Large Audit Office", "Medium Audit Office", and "Small Audit Office"). Audit office size is based on yearly audit fees earned by an audit office, following Francis and Yu (2009). The 75th percentile and 50th percentile are chosen as the thresholds to divide the sample. Table 5 presents the empirical results. In columns (1)(3)(5) of Panel A, the coefficients of *UNUSCAP1* in Equation (1) are negatively significant only in the groups of small and medium-size city office auditees. The results are generally consistent when using

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[33] This view is consistent with audit firms as networks of offices (Seavey et al. 2018). Specifically, when creating their proxies for knowledge sharing and oversight, they adjust for closeness centrality (Newman 2010) with relative office size.

UNUSCAP2 as another test variable (Panel B).[34] Similarly, in columns (2)(4)(6) of Panel A, the coefficients of *UNUSCAP1* in Equation (2) are negatively significant only in the groups of small and medium-size city office auditees, and the coefficient of *UNUSCAP1* × *AUD_CHANGE* is statistically significant only in the small-size office auditees. The results are generally consistent when using *UNUSCAP2* as another test variable (Panel B), except the coefficient of *UNUSCAP2* × *AUD_CHANGE* in the large-size office auditees (column (2)) turns negatively significant (coefficient= –0.208, t= –2.00). I also test whether the coefficients of *UNUSCAP1* (*UNUSCAP2*) in the groups of small and medium-size city office auditees are statistically smaller than those of the large-size city offices and get supportive evidence (untabulated).

In summary, at least for continuing client firms, the better capacity management capability owned by large audit offices can decrease the difference in opportunity costs caused by unused capacity between the peak/non-peak period, making the effect of peak period insignificant.

[34] One thing that may deserve noting is that if I compare the sign of *UNUSCAP1* (positive but insignificant) and *UNUSCAP2* (negative but insignificant) in the "Large Audit Office" group, it is consistent with the abovementioned conjecture that *UNUSCAP2* may be more suitable than *UNUSCAP1* to measure unused capacity for larger city offices, because the association between unused capacity and audit fees should be negative.

Table 5 Cross-sectional analysis results Ⅰ (audit office size)

Dependent Variable: *LNAF*

Panel A: Using *UNUSCAP1* as the test variable

Variable	Exp. Sign	Large Audit Office		Medium Audit Office		Small Audit Office	
		(1)	(2)	(3)	(4)	(5)	(6)
UNUSCAP1	?	0.013	0.016	-0.084***	-0.082***	-0.096***	-0.085***
		(0.56)	(0.67)	(-3.27)	(-3.16)	(-3.99)	(-3.41)
UNUSCAP1* × *AUD_CHANGE	?		-0.155		-0.067		-0.082**
			(-1.55)		(-1.22)		(-2.27)
AUD_CHANGE	–	-0.075**	-0.054	-0.126***	-0.113***	-0.071***	-0.055***
		(-2.34)	(-1.64)	(-5.07)	(-3.84)	(-5.60)	(-3.76)
CONTROLS		Yes	Yes	Yes	Yes	Yes	Yes
YEAR		Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
IND		Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Cluster		firm	firm	firm	firm	firm	firm
n		9,582	9,582	9,583	9,583	19,155	19,155
Adjusted R^2		0.869	0.869	0.865	0.865	0.871	0.871

Panel B: Using *UNUSCAP2* as the test variable

Variable	Exp. Sign	Large Audit Office		Medium Audit Office		Small Audit Office	
		(1)	(2)	(3)	(4)	(5)	(6)
UNUSCAP2	?	-0.032	-0.028	-0.172***	-0.169***	-0.112***	-0.099***
		(-1.26)	(-1.10)	(-5.96)	(-5.77)	(-3.90)	(-3.34)
UNUSCAP2* × *AUD_CHANGE	?		-0.208**		-0.077		-0.096**
			(-2.00)		(-1.15)		(-2.18)
AUD_CHANGE	–	-0.075**	-0.048	-0.123***	-0.111***	-0.071***	-0.059***
		(-2.35)	(-1.47)	(-4.92)	(-3.88)	(-5.62)	(-4.24)
CONTROLS		Yes	Yes	Yes	Yes	Yes	Yes
YEAR		Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
IND		Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Cluster		firm	firm	firm	firm	firm	firm
n		9,582	9,582	9,583	9,583	19,155	19,155
Adjusted R^2		0.869	0.869	0.866	0.866	0.871	0.871

Table 5 presents the summarized empirical results of Equation (1) (column (1), (3), and (5)) and Equation (2) (column (2), (4), and (6)) by partitioning the final sample into three groups (auditees of Large Audit Office, Medium Audit Office, and Small Audit Office) according to Francis and Yu (2009). 75th percentile and 50th percentile are used as the thresholds to classify the sample. In Panel A (B), *UNUSCAP1* (*UNUSCAP2*) is used to represent unused capacity. For brevity, *CONTROLS* is used to represent all the control variables and the intercept. The *t*-statistics are adjusted for clustering by firms. Sample period: 2008–2020. See Appendix for variable definitions. *, ** and *** denote significant differences from zero at the 10%, 5%, and 1% levels, respectively (two -tailed).

5.2. Big4 vs non-Big4 audit firms

Prior studies have identified many differences between Big 4 and non-Big 4 audit firms, such as audit fees and audit quality (Choi et al. 2008; Carson et al. 2012; DeFond et al. 2017; Jiang et al. 2019). Because this study includes both clients of Big 4 and non-Big 4 audit firms, I therefore investigate whether differential relation exists between unused capacity and audit fees across the two subsamples. Panel A (B) of Table 6 presents the results using *UNUSCAP1* (*UNUSCAP2*) to measure unused capacity. In column (1) and (2) of both panels, I report the results of Equation (1) for Big 4 and non-Big 4 auditees, respectively. In column (3) and (4) of both panels, I report the results for Equation (2) for Big 4 and non-Big 4 auditees, respectively. All variables of interest (*UNUSCAP1*, *UNUSCAP1* × *AUD_CHANGE*, *UNUSCAP2*, and *UNUSCAP2* × *AUD_CHANGE*) are negatively significant, as expected. However, no evidence (untabulated) is found that the coefficients of unused capacity on audit fees, regardless of continuing or new client firms, are significantly different between Big 4 and non-Big 4 auditees.[35] This finding suggests that unused capacity into fee pricing may be orthogonal to the brand of audit firms. Compared with the findings of Subsection 5.1, it seems that it is the office size rather than the brand of audit firms that determines auditors' capacity management capabilities, given that not all city offices of Big 4 are necessarily large in size.

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[35] Significant coefficient differences in *AUD_CHANGE* across the two subsamples are found in both panels (untabulated).

Table 6 Cross-sectional analysis resulus Ⅱ (Big4 vs non-Big4 audit firms)

Dependent Variable: *LNAF*					
Panel A: Using *UNUSCAP1* as the test variable					
		BIG4=1	*BIG4*=0	*BIG4*=1	*BIG4*=0
Variable	Exp. Sign	(1)	(2)	(3)	(4)
UNUSCAP1	?	-0.066***	-0.085***	-0.061***	-0.067**
		(-3.26)	(-3.15)	(-3.02)	(-2.34)
UNUSCAP1 × ***AUD_CHANGE***	?			-0.166***	-0.118***
				(-2.74)	(-3.21)
AUD_CHANGE	–	-0.141***	-0.062***	-0.109***	-0.039***
		(-6.35)	(-4.74)	(-4.47)	(-2.58)
CONTROLS		Yes	Yes	Yes	Yes
YEAR		Controlled	Controlled	Controlled	Controlled
IND		Controlled	Controlled	Controlled	Controlled
Cluster		firm	firm	firm	firm
n		23,513	14,807	23,513	14,807
Adjusted R^2		0.825	0.802	0.825	0.802
Panel B: Using *UNUSCAP2* as the test variable					
		BIG4=1	*BIG4*=0	*BIG4*=1	*BIG4*=0
Variable	Exp. Sign	(1)	(2)	(3)	(4)
UNUSCAP2	?	-0.086***	-0.105***	-0.082***	-0.083**
		(-3.96)	(-3.25)	(-3.72)	(-2.48)
UNUSCAP2 × ***AUD_CHANGE***	?			-0.151**	-0.144***
				(-2.57)	(-3.03)
AUD_CHANGE	–	-0.141***	-0.062***	-0.118***	-0.044***
		(-6.36)	(-4.73)	(-4.70)	(-3.08)
CONTROLS		Yes	Yes	Yes	Yes
YEAR		Controlled	Controlled	Controlled	Controlled
IND		Controlled	Controlled	Controlled	Controlled
Cluster		firm	firm	firm	firm
n		23,513	14,807	23,513	14,807
Adjusted R^2		0.825	0.802	0.825	0.802

Table 6 presents the summarized empirical results of Equation (1) (column (1) and (2)) and Equation (2) (column (3) and (4)) by partitioning the final sample into two groups (auditees of Big4 and non-Big4). In Panel A (B), *UNUSCAP1* (*UNUSCAP2*) is used to represent unused capacity. For brevity, *CONTROLS* is used to represent all the control variables and the intercept. The *t*-statistics are adjusted for clustering by firms. Sample period: 2008–2020. See Appendix for variable definitions. *, ** and *** denote significant differences from zero at the 10%, 5%, and 1% levels, respectively (two-tailed).

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6. Robustness checks

6.1. Lagged independent variables and first-differenced model

In this subsection, two potential concerns are addressed. The first concern is that, for new client firms, it may be more appropriate for (at least, partial) independent variables to be measured in lagged one-year values. This is because according to Burks and Stevens (2022), most auditor turnovers occur around a 30-day period after the Form 10-K filing date. Therefore, for incoming auditors, the main sources of information used to determine audit fees of year *t* may be that of year *t*-1. However, because it is common for audit fee models to employ the current-year values as controls regardless of continuing or new clients, to retain comparability with prior studies, current year values are still used as the basis to measure independent variables in the main analysis. Here, as a robustness check, in Panel A and B of Table 7, two audit fee models are run for new audit engagements only.[36]

The first model, as shown in Panel A, basically following Equation (1), except that *partial* independent variables are lagged one-year values (a prefix "*pre1*"). Those independent variables labelled "*pre1*" reflect client firms' prior year's (i.e., *t*-1) financial information, market returns, and outgoing auditor's opinions which may be most accessible for incoming auditor's pricing decisions. The remaining independent variables reflecting the incoming auditor's or engagement-specific characteristics are still measured in the current year (i.e., *t*). All independent variables of the second model, as shown in Panel B, are measured in the current year. Although differences in the direction of coefficients or level of significance exist in some independent variables, the explanatory power of either model is very similar. Most importantly, the coefficients of *UNUSCAP1* (*UNUSCAP2*) seem reasonably close across the two panels. Thus, it seems that using independent variables based on current year is acceptable for both continuing and new client firms.

The second concern regards the continuing client firms only. Just like what de Villers et al. (2014) have argued, it is not easy to adjust *continuing* clients' audit fees just by virtue of changes in audit offices' unused capacity. Although the coefficients of *UNUSCAP* (for continuing client firms) in Table 4 are all negatively significant, they actually represent the association between *cross-sectional variation* of *UNUSCAP* and audit fees. In contrast with de Villers et al. (2014), I run a first-differenced equation for the continuing client firms. All variables (except for

[36] To make the sample of Panel A and Panel B comparable, observations with missing values in either of the two models are deleted uniformly.

高瀛大學學術期刊資料庫

YEAR and *IND* fixed effects) are first-differenced and use "*FD*" as the prefix. According to deHaan (2021), two important advantages of first-differencing are "transform a dataset into *within-firm period-over-period changes* for all variables, and is another method for *eliminating unobserved Z that are constant within firms*." In Panel C of Table 7, the coefficients of *FDUNUSCAP1* (column (1)) and *FDUNUSCAP2* (column (2)) are still negatively significant, supporting that even for continuing clients, audit offices still adjust audit fees based on changes in unused capacity.

Table 7 Robustness checks

Dependent Variable: *LNAF*

Panel A: Partial lagged independent variables for new client firms

		(1)		(2)	
Variable	Exp. Sign	Coeff.	t-stat	Coeff.	t-stat
Intercept	?	5.175***	(25.47)	5.172***	(25.30)
UNUSCAP1	–	**-0.189*** **	**(-5.38)**		
UNUSCAP2	–			**-0.228*** **	**(-5.47)**
pre1LNTA	+	0.421***	(41.87)	0.421***	(41.63)
pre1GC	+	-0.034	(-0.84)	-0.036	(-0.88)
pre1SRSEGS	+	0.154***	(6.60)	0.154***	(6.61)
pre1FORGN	+	0.146***	(4.63)	0.142***	(4.50)
pre1RESTATE	+	0.067*	(1.81)	0.068*	(1.81)
pre1SI	+	0.130***	(5.06)	0.132***	(5.15)
pre1MB	+	0.000	(0.14)	0.000	(0.09)
pre1ROA	–	-0.031***	(-3.31)	-0.031***	(-3.22)
pre1LOSS	+	0.125***	(4.65)	0.124***	(4.63)
pre1STOCK_RET	–	0.004	(0.27)	0.005	(0.34)
pre1DELTAROA	–	0.005	(0.48)	0.005	(0.43)
pre1MW	+	0.106***	(3.29)	0.108***	(3.36)
BIG4	+	0.545***	(13.93)	0.551***	(13.99)
CITYONLY	+	-0.029	(-0.91)	-0.031	(-0.96)
NATIONALONLY	?	-0.153**	(-2.56)	-0.151**	(-2.53)
JOINTLEADER	+	-0.037	(-0.55)	-0.032	(-0.48)
pre1MERGER	+	-0.021	(-0.62)	-0.016	(-0.45)
pre1REINTA	+	0.024	(0.31)	0.014	(0.18)
pre1NEWFIN	+	0.063**	(2.15)	0.058**	(1.97)
NAFR	?	-0.215***	(-4.50)	-0.214***	(-4.47)
pre1LEVERAGE	+	0.021***	(4.65)	0.021***	(4.58)
pre1CR	–	-0.025***	(-6.58)	-0.024***	(-6.43)
CI	?	0.136***	(2.85)	0.142***	(2.99)
YEAR		Controlled		Controlled	
IND		Controlled		Controlled	
Cluster		firm		firm	
n		2,650		2,650	
Adjusted R^2		0.831		0.831	

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Table 7 Robustness checks (Continued)

Panel B: Current-year independent variables for new client firms

		(1)		(2)	
Variable	Exp. Sign	Coeff.	t-stat	Coeff.	t-stat
Intercept	?	5.299***	(27.07)	5.296***	(26.97)
UNUSCAP1	–	**-0.153*** **	**(-4.42)**		
UNUSCAP2	–			**-0.188*** **	**(-4.42)**
LNTA	+	0.413***	(42.13)	0.413***	(41.94)
GC	+	0.015	(0.38)	0.017	(0.43)
SRSEGS	+	0.182***	(7.65)	0.183***	(7.72)
FORGN	+	0.144***	(4.50)	0.141***	(4.40)
RESTATE	+	0.118***	(3.32)	0.120***	(3.37)
SI	+	0.158***	(6.06)	0.158***	(6.08)
MB	+	0.001	(0.79)	0.001	(0.62)
ROA	–	-0.015	(-1.60)	-0.014	(-1.50)
LOSS	+	0.139***	(5.12)	0.136***	(5.02)
STOCK_RET	–	-0.029**	(-1.96)	-0.028*	(-1.91)
DELTAROA	–	-0.032***	(-2.71)	-0.033***	(-2.80)
MW	+	0.086**	(2.48)	0.088**	(2.55)
BIG4	+	0.497***	(13.51)	0.503***	(13.56)
CITYONLY	+	-0.038	(-1.20)	-0.040	(-1.25)
NATIONALONLY	?	-0.090	(-1.46)	-0.089	(-1.45)
JOINTLEADER	+	-0.035	(-0.57)	-0.032	(-0.52)
MERGER	+	-0.022	(-0.68)	-0.023	(-0.70)
REINTA	+	-0.062	(-0.84)	-0.071	(-0.96)
NEWFIN	+	0.103***	(3.45)	0.101***	(3.40)
NAFR	?	-0.290***	(-5.86)	-0.289***	(-5.85)
LEVERAGE	+	0.020***	(5.74)	0.020***	(5.70)
CR	–	-0.027***	(-7.49)	-0.026***	(-7.37)
CI	?	0.153***	(3.24)	0.156***	(3.34)
YEAR		Controlled		Controlled	
IND		Controlled		Controlled	
Cluster		firm		firm	
n		2,650		2,650	
Adjusted R^2		0.833		0.833	

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Table 7 Robustness checks (Continued)

Dependent Variable: *FDLNAF*

Panel C: First-differencing model for continuing client firms

		(1)		(2)	
Variable	Exp. Sign	Coeff.	t-stat	Coeff.	t-stat
Intercept	?	-0.003	(-0.81)	-0.004	(-1.03)
FDUNUSCAP1	–	**-0.072*****	**(-4.37)**		
FDUNUSCAP2	–			**-0.171*****	**(-11.73)**
FDLNTENURE	–	0.018**	(2.41)	0.017**	(2.30)
FDLNTA	+	0.186***	(30.56)	0.185***	(30.55)
FDGC	+	0.022***	(2.98)	0.021***	(2.90)
FDSRSEGS	+	0.004	(0.73)	0.004	(0.70)
FDFORGN	+	0.034***	(3.56)	0.034***	(3.64)
FDRESTATE	+	0.025***	(6.50)	0.025***	(6.47)
FDSI	+	0.017***	(7.22)	0.017***	(7.34)
FDMB	+	-0.000	(-1.37)	-0.000	(-1.42)
FDROA	–	-0.007	(-1.57)	-0.007	(-1.49)
FDLOSS	+	0.018***	(6.35)	0.018***	(6.38)
FDSTOCK_RET	–	-0.005***	(-3.20)	-0.005***	(-3.26)
FDDELTAROA	–	0.002	(0.72)	0.002	(0.62)
FDMW	+	0.063***	(11.21)	0.063***	(11.21)
FDCITYONLY	+	0.041***	(8.98)	0.043***	(9.18)
FDNATIONALONLY	?	0.022***	(4.11)	0.022***	(4.18)
FDJOINTLEADER	+	0.049***	(8.82)	0.050***	(9.01)
FDMERGER	+	0.047***	(15.66)	0.046***	(15.52)
FDREINTA	+	0.054**	(2.22)	0.055**	(2.28)
FDNEWFIN	+	0.016***	(4.40)	0.016***	(4.43)
FDNAFR	?	-0.155***	(-19.38)	-0.155***	(-19.47)
FDLEVERAGE	+	0.017***	(8.19)	0.017***	(8.29)
FDCR	–	-0.009***	(-10.52)	-0.009***	(-10.52)
FDCI	?	0.647***	(23.25)	0.634***	(23.38)
YEAR		Controlled		Controlled	
IND		Controlled		Controlled	
Cluster		firm		firm	
n		33,017		33,017	
Adjusted R^2		0.204		0.209	

Table 7 presents the empirical results of robustness checks. The variables of interest in column (1) and column (2) are *UNUSCAP1* and *UNUSCAP2*. In Panel A, only new client firms constitute the final sample (n=2,650) and partial independent variables of Equation (1) are lagged one-year values (a prefix "*pre1*"). In Panel B, only new client firms constitute the final sample (n=2,650) and all independent variables of Equation (1) are current-year values. In Panel C, only continuing client firms constitute the final sample (n=33,017) and all independent variables (except for year and industry fixed effects) of Equation (1) are first-differenced. The *t*-statistics are adjusted for clustering by firms. Sample period: 2008–2020. See Appendix for variable definitions. *, ** and *** denote significant differences from zero at the 10%, 5%, and 1% levels, respectively (two-tailed).

6.2. Alternative measures of unused capacity pertaining to normal audit tasks

In this subsection, unused capacity pertaining to normal audit tasks is remeasured in the following ways. First, in the main analyses, when measuring unused capacity, it is assumed that some degree of entrance barriers among industries within an audit office exist. However, whether this assumption actually holds depends at least on the client portfolio, audit complexity, and size of audit offices. Here, I relax this assumption by using *the whole client firms* (i.e., ignores any industry classification) within an audit office to measure another metrics of unused capacity, *UNUSCAPR*.[37] Specifically, *UNUSCAPR* is calculated as one minus "the current year's aggregate audit fees for a specific month of an audit office, divided by the current year's highest monthly aggregate audit fees of that audit office." Simply put, the relationship between *UNUSCAPR* and Ng et al.'s (2018a) "resource constraints" (*RC*) is *RC*=1-*UNUSCAPR*. *UNUSCAPR* is also used in the main analysis of Yu and Huang (2022) to investigate the association between unused capacity and audit quality. Untabulated results of *UNUSCAPR* show that on average, client firms are audited by a city office with unused capacity pertaining to normal audit tasks of 0.213. Furthermore, the regression results provide consistent findings throughout all research hypotheses, and the coefficient magnitude of variables of interest is generally close to those of *UNUSCAP1*.

Second, I use alternative bases to calculate an audit office's unused capacity. Compared with other potential bases (e.g., client firm numbers, sales, and assets), the most important advantage of audit fees is that audit fees concurrently take the relative size and complexity of client firms into account, although audit fees also present several concerns.[38] In contrast, client firm sales and assets ignore the complexity[39], and client firm numbers ignore both the size and complexity of client firms. Taken together, serious measurement errors may exist when using each of these three bases (client firm numbers, sales, and assets) to calculate unused capacity.

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[37] Therefore, unlike *UNUSCAP1* and *UNUSCAP2* (see Table 1), financial service firms are not supposed to be removed when calculating *UNUSCAPR*.

[38] In addition to the concern that audit fees are determined by various factors other than efforts as discussed in Subsection 3.1., a mechanical relation with the dependent variable (*LNAF*) may arise because the formula for *UNUSCAP1* and *UNUSCAP2* are based on audit fees. However, I note that the formulas to express *UNUSCAP1* and *UNUSCAP2* are very complex. Further, just as what Francis et al. (2005, 130) have suggested, there is simply no way of knowing whether this bias indeed exists.

[39] López and Peters (2012) have argued that the auditability of every dollar asset (or sales) is different among industries, which will potentially introduce huge measurement errors into the calculation of unused capacity (especially for *UNUSCAP1*).

Therefore, robustness checks are conducted by using only samples audited by medium and large size audit offices and test the associations between audit fees (*LNAF*) and *UNUSCAP2*. The reasons are as follows. First, given that *UNUSCAP2* digs the measurement of unused capacity into *industry* level even deeper than *UNUSCAP1*, it might mitigate to some extent the measurement errors caused by complexity.[40] Second, when calculating *UNUSCAP2*, additional 18.50% and 4.98% sample losses occur due to missing values of sales and assets, respectively. Because medium and large size audit offices generally have larger client numbers, this may make the impact of missing values smaller.

When running Equation (1) for H_1, the coefficients of *UNUSCAP2* indicate that only in the samples of medium size office auditees, all three bases are negatively significant. When running Equation (2) for H_2, the coefficients of *UNUSCAP2*× *AUD_CHANGE* are negatively significant (for all bases) only in the samples of large size office auditees and the coefficients of *UNUSCAP2* are negatively significant (for all bases) only in the samples of medium size office auditees. To sum up, the empirical results using bases other than audit fees are consistent with those of Panel B of Table 5.

7. Conclusions and discussions

Although widely acknowledged by economics and accounting literature, prior empirical audit fee studies still exclusively use a fixed effect (*BUSY*) to proxy for the continuous nature of opportunity costs caused by varying capacity, which to some extent hinders the real relations between peak period effect and audit fees. In this study, two non-fixed metrics (*UNUSCAP1* and *UNUSCAP2*) are developed to measure the unused capacity of specific audit offices; further, I investigate several factors that may moderate the association between unused capacity and audit fees. This study finds that the continuous measure of unused capacity better captures the varying nature of opportunity costs than the traditional measure (i.e., *BUSY*) does. This study also verifies the negative association between unused capacity and audit fees is magnified for new clients. Further, I find that better capacity management capability, as proxied by large audit offices, can decrease the difference in opportunity costs caused by unused capacity between the peak/non-peak period,

[40] The extent to which *UNUSCAP2* can mitigate measurement errors resulting from complexity is unknown, because even the degree of homogeneity of constituent companies *within* an industry also varies by industry (Bills et al. 2015).

臺灣大學學術期刊資料庫

making the association between *UNUSCAP* and audit fees disappears. However, I find no evidence that the effect of unused capacity on audit fees is different between Big 4 and non-Big 4 auditees. This study not only improves the measurement of audit offices' unused capacity, but also finds at least two new factors (i.e., new clients and office size) moderating the association between unused capacity and audit fees, deepening our understanding of audit offices' pricing behavior.

The results of this study may have the following implications for future research. First, since 2017, audit firms must file Form AP to PCAOB (PCAOB 2015), which identifies the name of engagement partners of public companies. Thus, this new requirement may provide researchers an opportunity to dig the issue of unused capacity into partner-level. Second, the negative relationship between unused capacity and audit fees also raises the issue of capacity management in audit offices. For example, if the client portfolio in terms of fiscal year-end month for a city office is too concentrated, this will probably lead to relatively voluminous unused capacity in other fiscal year-end months, which cannot be fully absorbed through competing for new clients or engaging in other value-creating activities, such as training or cross-office technical support. Consequently, this may further negatively influence the operating efficiency of city offices and decrease their profits in the long run. I leave the above unsolved issues for future research.

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Appendix A Variable definitions of primary analyses

	Description
LNAF	Natural logarithm of audit fees for a firm in year *t*;
UNUSCAP1	The first metrics of unused capacity pertaining to normal audit tasks, calculated as one minus "the current year's aggregate audit fees for a specific month of an audit office, divided by the current year's highest monthly aggregate audit fees of that audit office." The audit fees of financial service firms (SIC code 6000–6999) are removed from the calculation. The identification of "month" indicated above is based on client firms' fiscal year-end month following the rule of *Compustat*;
UNUSCAP2	The second metrics of unused capacity pertaining to normal audit tasks, calculated as one minus "the current year's aggregate audit fees for a specific month of an office-industry (specifically, SIC division) combination, divided by the current year's highest monthly aggregate audit fees of that office-industry combination. The audit fees of financial service firms (SIC code 6000–6999) are removed from the calculation. The identification of "month" indicated above is based on client firms' fiscal year-end month following the rule of *Compustat*;
BUSY	One if a firm's fiscal year-end date is between 12/15 and 1/14, and zero otherwise;
AUD_CHANGE	One if there is an audit firm change for a firm in year t, and zero otherwise;
Changeup	One if there is a "upgrade" audit firm change (i.e., from non-Big 4 to Big 4) for a firm in year *t*, and zero otherwise;
Changedown	One if there is a "downgrade" audit firm change (i.e., from Big 4 to non-Big 4) for a firm in year *t*, and zero otherwise;
Changeparallel	One if there is a "parallel" audit firm change (i.e., from Big 4 to Big 4 or from non-Big 4 to non-Big 4) for a firm in year *t*, and zero otherwise;
LNTENURE	Natural logarithm of consecutive years (since 1950) audited by the latest audit firm for a firm in year *t*;
LNTA	Natural logarithm of total assets for a firm in year *t*;
GC	One if a firm receives a going concern opinion in year *t*, and zero otherwise;
SRSEGS	Square root of the number of segments for a firm in year *t*;
FORGN	One if a firm has at least one foreign segment in year *t*, and zero otherwise;
RESTATE	One if a firm discloses its financial restatement in year *t*, and zero otherwise;
SI	One if a firm reports special items in year t, and zero otherwise;
MB	Market value of common equity, divided by book value of common equity for a firm in year *t*, and zero if this ratio is negative;
ROA	Return on assets, measured as net income divided by average total assets for a firm in year *t*;
LOSS	One if a firm experiences a loss in year *t*, and zero otherwise;
STOCK_RET	A firm's 12-month stock returns in year *t*;
DELTAROA	Change in *ROA* for a firm from year *t*–1 to year *t*;
MW	One if a firm has at least one identified internal control material weakness in year *t*, and zero otherwise;
BIG4	One if a firm is audited by a city office of Deloitte, PricewaterhouseCoopers, Ernst & Young, or KPMG in year *t*, and zero otherwise;
CITYONLY	One for a city office not a national industry leader, but is a city (MSA) industry leader in year *t*, and zero otherwise (calculated by market share of audit fees based on two-digit SIC code);
NATIONALONLY	One for a city office not a city (MSA) industry leader, but is a national industry leader in year *t*, and zero otherwise (calculated by market share of audit fees based on two-digit SIC code);
JOINTLEADER	One for a city office which is both a national and city (MSA) industry leader in year *t*, and zero otherwise;

MERGER	One if a firm is involved in merger activity in year *t*, and zero otherwise;
REINTA	Sum of receivables and inventory, divided by total assets for a firm in year *t*;
NEWFIN	One if a firm issues new equity or debt exceeding $50,000, and zero otherwise;
NAFR	A firm's non-audit fees divided by audit fees in year *t*;
LEVERAGE	Total liabilities divided by total assets for a firm in year *t*;
CR	Current ratio (current assets divided by current liabilities) for a firm in year *t*;
CI	Client importance, equal to a client firm's audit fees divided by the current year's total audit fees of the audit office which audits the client firm;
YEAR	Year dummy variables;
INDUSTRY	Two-digit SIC code industry dummy variables;

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