

Resource allocation and billing policies in different engagement risk environments *

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Abstract:

This study distinguishes audit effort from risk premium by examining a Big 4 audit firm's resource allocation decisions and billing policies when facing different levels of engagement risk environments. It uses a unique dataset that contains audit hours and audit costs (i.e., audit hours*billing rates) for *each* auditor in *each* of the 909 audit teams (92 for public clients) of a Swedish Big 4 firm. We use public (private) clients to proxy clients associated with high (low) engagement risk and use propensity score matched sample. H1 predicts that, compared to clients with low engagement risk, audit costs of higher (lower) ranked auditors are greater (similar) for clients with high engagement risk. We investigate whether higher audit costs in H1 are driven by higher audit effort (i.e., hours) in H2 and/or by charging risk premium via higher billing rates in H3. H4 expects that the Big 4 firm allocates more competent auditors in higher ranks to clients with high engagement risk, compared to clients with low engagement risk. The results show that audit costs of higher ranks of auditors, i.e., partners and directors, are greater for public firms than for private firms. The higher audit costs are mainly driven by higher audit hours of higher ranked auditors but not due to risk premium charged by increasing billing rates. Finally, evidence shows that the Big 4 audit firm allocates more competent partners (i.e., partners with higher billing rates) to clients with high engagement risk, compared to clients with low engagement risk.

Key words: resource allocation, billing policies, audit costs, audit effort, engagement risk, auditor ranks

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1. Introduction

This study examines how Big 4 audit firms allocate their human resources and design their billing policies when auditing clients exposing audit firms to different levels of engagement risk. More specially, we investigate whether Big 4 audit firms allocate more audit effort of a certain types of auditors and charge risk premium by increasing billing rates when clients expose higher risk to Big 4 firms. Using a unique dataset, provided by a Swedish Big 4 firm, which contains information on the amount of audit hours and audit costs (=audit hours*billing rates) of *each* auditor in *each* of the seven ranks for 909 audit teams, we investigate how the Big 4 firm copes with engagement risk through their allocation of audit effort, i.e., audit hours, and policies of billing rates at the individual auditor level for clients with high and low engagement risk. To the best of our knowledge, this is the first study to distinguish audit effort from risk premium by employing audit hours and billing rates at the individual level.

Resource allocation is of key strategic importance to an organization, and is the process of managing assets in a manner that supports an organization's strategic goals and maximizes the effective use of limited resources (Bower and Gilbert, 2005; Dellestrand and Kappen, 2011). It is well documented that one important incentive for audit firms (and auditors) to supply high quality is risk, such as litigation risk (e.g., DeFond and Zhang 2014). While evidence shows that audit fees are higher for clients that expose higher risks to (Big 4) audit firms (e.g., Badertscher, Jorgensen, Katz, and Kinney 2014), and a few studies have found that Big 4 firms devote more effort to public firms than private firms (e.g., O'Keefe et al. 1994; Simunic and Stein 1996), little is known on whether Big 4 firms also charge risk premium by increasing billing rates. It is important to distinguish between audit effort and risk premium because the former is positively related to audit quality, while the latter simply shifts costs from audit firms to audit clients (DeFond and Zhang 2014). Taking advantage of a unique dataset, this paper provides initial evidence on how Big 4 firms make use of effort and

risk premium to cope with high engagement risk through resource allocation and billing policies.

Our data contain *most of* the engagements involving at least auditors in three ranks the Big 4 firm has audited in 2016 (covering the full audit cycle from July 2015 to June 2016). There are 909 engagements/teams, among them 92 are for public clients. The dataset includes, for *each* member in *each* team, the auditor name, the number of audit hours, the corresponding audit costs (i.e., hours*billing rates), and the rank the auditor belongs to. Billing rate for each auditor-team observation is computed by dividing audit cost by audit hour. We focus on the following seven ranks: partner, director, senior manager, manager, assistant manager, senior associates, and associates.¹ The audit firm has also provided variables of client characteristics.

Engagement risk includes litigation risk, reputation risk, and regulation risk, and refers to auditors' exposure to costs from litigation, adverse publicity (reputation risk), or other events related to audited financial statements (DeFond and Zhang 2014; Knechel et al. 2007). We use public (private) clients to proxy clients with high (low) engagement risk due to the different ownership characteristics between public and private clients and the much higher litigation and other costs public clients expose on Big 4 firms, compared to private clients (Badertscher et al. 2014). We acknowledge that engagement risk also varies within the public segment and within the private segment because of different levels of e.g., leverage and inherent risk of clients. However, we argue that the differences between public and private clients are much more important than the heterogeneity within each segment and this paper focuses on the different levels of engagement risk between public and private clients.

¹ Directors are in a rank between partners and senior managers, and can be similar to partners in some aspects. There are also others team members including secretaries, specialists, and a few others. The number of unique specialists is quite low (10). Most of these members are not auditors, and have very low billing rates.

As audit effort and resource allocation in general could be strongly affected by client characteristics (Hay et al. 2006; DeFond and Zhang 2014), it is important to match clients with different levels of engagement risk based on their characteristics. We follow the literature and use propensity score matching logistic regression (Lawrence et al. 2011, DeFond, Erkens, and Zhang 2016) to obtain a matched sample of 184 audit clients/teams. One weakness of previous studies on audit effort is the lack of matching public and private firms (e.g., O’Keefe et al. 1994). Our analyses are based on the matched sample. When necessary, we also use the full sample to confirm and strengthen our results.

Four hypotheses are developed. Hypothesis 1 (H1) predicts that audit costs of auditors in each of the *high* ranks for clients with high engagement risk are greater than audit cost of auditors in the *same* rank for clients with low engagement risk (H1a). For auditors in each of the *low* ranks, we expect audit costs are independent of the levels of engagement risk (H1b). We differentiate auditors in high and low ranks because previous evidence shows that Big 4 firms allocate more effort from higher ranked auditors when risk is higher (Bell et al. 2008).

As audit costs combine audit hours and billing rates, it is unclear whether the Big 4 firm increases audit hours or charges risk premium or both for clients with high engagement risk. There are two potential ways to charge risk premium: (1) bill the clients extra fees in addition to audit costs, and (2) increase billing rates so audit costs are higher for the same amount of audit hours. We were not able to obtain audit fees from the Big 4 firm, but were told that audit fees charged to clients are usually lower than audit costs with a discount of 10% on average. There is often more discount for public clients, indicating that the Big 4 firm does not charge extra fees in addition to audit costs to cover potential losses related to engagement risk, and the only possible way to charge risk premium is through increasing billing rates.

The second hypothesis (H2) and third hypothesis (H3) examine audit effort, measured by audit hours, and risk premium, respectively. H2 expects that, compared to clients with low

engagement risk, audit hours of auditors in each of the high (low) ranks are greater (similar) for clients with high engagement risk. We investigate whether the Big 4 firm charges risk premium by increasing billing rates in hypothesis 3 (H3). If the Big 4 firm wants to charge risk premium to shift costs related to engagement risk to audit clients through billing rates, it would increase billing rates when one auditor works for clients with high engagement risk, compared to the scenario when the *same* auditor audits clients with low engagement risk. Put differently, if it is true that audit firms charge risk premium via billing rates, billing rates of the *same* auditor will be higher when clients are associated with more engagement risk than clients with low risk. Hence, H3 predicts that, compared to clients with low engagement risk, billing rates of the *same* auditors are higher for clients of high engagement risk. To test H3, we focus on auditors that have audited both public and private clients in the sample.

Finally, we investigate whether Big 4 firms allocate more competent auditors in high ranks to clients with high risk by comparing billing rates of auditors in each rank that only audit public clients and those only auditing private clients in hypothesis 4 (H4). As billing rates are likely to reflect auditors' competence, we consider auditors with higher billing rates as more competent than those with lower billing rates in the same rank (also across ranks). Because clients with high engagement risk expose greater potential litigation and other risks to Big 4 firms, Big 4 firms might allocate more component auditors to such clients in an attempt to increase audit quality. H4 predicts that, compared to clients with low engagement risk, the Big 4 firm allocates more (similar) competent auditors of high (low) ranks to clients with greater engagement risk.

The results show that, compared to clients with low engagement risk, audit costs of higher ranks of auditors (i.e., partners and directors) are greater for clients with high engagement risk. For lower ranks of auditors, there is no significant difference of audit costs for clients with different levels of engagement risk. H1 is supported. The results for H2 are

similar to H1. In addition to significantly higher audit hours of partners and directors, there is marginal significance for higher audit effort of senior managers for clients with high engagement risk. H2 is also supported. This indicates that the Big 4 firm allocates more resources of more competent auditors, i.e., higher ranks, to clients with high risk, and the economic significance is strong for both H1 and H2. However, we find no evidence for H3 that billing rates of the same auditors are significantly different when they audit public vs. private clients. The results are robust no matter we use the matched sample or full sample. Hence, it does not seem that the Big 4 firm charges risk premium by increasing billing rates.

The results for H4 based on the matched sample show that *partners* that only audit public clients have higher billing rates than *partners* only auditing private clients. This suggests that the Big 4 firm allocates more competent *partners* to clients with higher engagement risk, compared to clients with low engagement risk. We do not find differences of billing rates for auditors in other ranks, indicating that the Big 4 firm does not differentiate auditors in other ranks with respects to engagement risk. This is in line with evidence in the literature that partners play most important roles in a team (Taylor 2011) and partners affect behaviors and attitudes of other team members (DeZoort and Lord 1994; Tan, Jubb, and Houghton 1997; Kaplan and Lord 2001; Lord and DeZoort 2001).

As the matched sample is only a small subset of the full sample, we also use the full sample to analyze whether partners' billing rates systematically vary when engagement risk differs. Analyses show that two unique partners only audit public firms, 48 unique partners only audit private firms, and 72 unique partners audit both public and private firms. It seems that (most) partners that audit public clients also audit private clients, while some partners only audit private clients. The evidence shows that billing rates of partners that can audit both types of clients are statistically higher than partners only auditing private clients. This lends

support to the results based on the matched sample that Big 4 firm allocates more competent partners to public clients.

This paper adds several contributions to the audit literature. First, to the best of our knowledge, it is the first to investigate both audit effort and risk premium at the auditor level for clients with different levels of engagement risk. DeFond and Zhang (2014) argue that while some studies examine audit effort, little is done to distinguish audit effort from risk premium, which is critical because audit effort increases audit quality (Caramanis and Lennox 2008), while risk premium transfers costs from audit firms to clients. Second, we examine billing rates at the auditor level and show that billing rates of the same auditors are the same, or not statistically different, no matter they audit clients of high or low risk. This provides initial evidence that Big 4 firms do not seem to charge risk premium through higher billing rates. Third, we find that, for clients with high engagement risk, the Big 4 audit firm not only allocates greater effort of more competent auditors in terms of ranks (i.e., auditors in higher ranks), but also differentiate auditors in the highest rank (i.e., partners) and assigns more competent partners to clients with high engagement risk than clients with low risk. Finally, this study could be of interests for regulators and academics due to the positive relationship between audit effort and audit quality (Caramanis and Lennox 2008; Che, Langli, and Svanström 2017).

We acknowledge some caveats of this study. First, we do not have detailed data on audit fees charged to audit clients, although we were told that audit fees are generally lower than audit costs, which is confirmed by auditors in other Swedish Big 4 firms. Second, while it is an advantage to focus on the same Big 4 audit firm due to the homogeneous audit procedures, audit methodologies, quality control, etc., the use of only one audit firm may limit the generalizability of the results as different audit firms and/or audit firms in other countries

might have different billing policies and resource allocation. We call for future research to shed more insights on these issues using data from other countries.

The rest of the paper is organized as follows. Section 2 discusses the institutional setting. Related literature and hypotheses development are outlined in section 3. We describe data, methodology, variable measurements, and descriptive statistics in section 4. Results are presented in section 5. Section 6 concludes.

2. Institutional setting

There are 697 listed companies (i.e., public) in Sweden as of August 21, 2017. Among them, 295 are listed in a major market place (NASDAQ OMX Stockholm large, mid or small cap), and the rest are listed on smaller lists such as Firth North, Aktietorget, NGM Equity, NGM Nordic MTF. In addition to the general rules and requirements applicable to all companies, listed companies should follow requirements issued by the stock exchange while auditors are required to apply to the EU directives regarding audit of Public Interest Entities (EU, No 537/2014). There are 438 869 unlisted limited liability companies (i.e., private), of which a vast majority is very small. Only the smallest entities are currently exempted from the statutory audit requirement.²

The Swedish audit market consists of over 900 audit firms but is dominated by the Big 4 firms, especially in the market of public companies. The Big 4 audit firms employ close to 50 % of the 3,476 certified auditors (as of December 1, 2016). The vast majority of audit firms are small and without any international partners. International Standards on Auditing (ISA) should be applied for all statutory audits in Sweden.

² Companies not exceeding two of the following three size criteria are exempted from the audit requirement: a net turnover of 3 million SEK (1 USD = 7.99 SEK, August 30, 2017) a balance sheet total of 1.5 million SEK, and an average number of full-time employees of 3.

For audits of public companies in Sweden there is a noticeable litigation risk for the audit firm and the signing audit partner that appears to have increased in the recent years. There are recent and ongoing cases of potential audit failures that have gone to court with substantial claims.³ These cases have attracted considerable media attention. In addition to litigation, auditors can suffer reputational loss from receiving disciplinary sanctions issued by the Supervisory Body of Public Accountants (SBPA). SBPA carries out regular inspections on certified auditors with *public clients* every third year. For practical reasons, the regular quality inspection of auditors without public assignments has been delegated to the professional institute, FAR,⁴ and takes place every sixth year. This indicates that audit quality of public clients is considered extra important and that the risk of reputational loss following disciplinary cases is somewhat higher for audits of public clients. The names of sanctioned auditors are made available shortly after the decision is made, but in contrast to PCAOB reports on settled disciplinary orders, this information has to be specifically requested from SBPA.⁵ SBPA publishes all disciplinary sanctions on its website, but does not reveal the name of the auditor or the audit firm. The SBPA also regularly inspects audit firms to ensure that they provide acceptable levels of quality.

The possible sanctions against auditors based on the degree of seriousness are (i) a reprimand, (ii) a warning, and (iii) the withdrawal of license. In the period 2004-2011, sanctions were issued against approximately 10% of certified auditors.⁶ One should note that

³ There are currently ongoing legal processes against auditors in HQ Bank and Kraft & Kultur. The claims are on 3.7 billion SEK and 1.8 billion SEK (excluding interest rate) respectively (1 USD = 9.53 SEK as of 22 Aug, 2017). In August 2013, the court of appeal decided to issue damages of 2 billion SEK (including interest rate) against the audit firm (audit partner) in Prosolvía. Later, an off-court settlement of 742.5 million SEK was arranged.

⁴ FAR is the professional institute for authorized auditors, approved auditors and other qualified professionals in the accountancy sector in Sweden.

⁵ Receiving the name of sanctioned auditors is free of charge. By telephoning or emailing the SBPA, the names of sanctioned auditors are received within a short period of time. The Chief Legal Advisor at SBPA informed us that they receive telephone calls from clients weekly asking for this information. Typically, the request for this information peaks during periods when general meetings are held.

⁶ Sundgren and Svanström (2013) investigated 267 out of total 274 disciplinary sanctions issued in the period 2005-2009 and showed that 68 sanctions (25%) involved issues related to auditor reporting.

there is no fine related to these sanctions. Sundgren and Svanström (2014) show however that compared with unsanctioned Big 4 auditors, sanctioned Big 4 auditors have a lower salary after the sanction compared with before the sanction thus suggesting that auditors have clear incentives to avoid sanctions. They found no change in the reporting behavior (accuracy of going concern reporting) of sanctioned auditors for the post-sanction period.

Audits (of somewhat larger companies) are carried out in audit teams. For larger engagements, each team involves at least three main roles/ranks; the audit partner (typically signing auditor), managers (divided into senior manager, manager, and assistant manager) and associates (senior associate and associate).⁷ The audit team may also compose directors and/or in-house experts (i.e., tax, IFRS etc.), where the rank of directors is between partners and senior managers. While the engagement partner is signing the audit report and is responsible for client contacts, the manager communicates with associates and coordinates most of the audit procedures. Staffing and composition of the audit team are made primarily on the basis of competence (for example the industry), availability, and development opportunity (see Annelin, Svanström, and Willekens 2017).

3. Literature and hypotheses development

The levels of engagement risk may affect the allocation of resources to the engagement. Allocation of resources is strategic decision taken by the audit firm that involves policies on how to mitigate (high) engagement risks. Engagement risk is the risk that auditors will suffer a loss via litigation, reputational loss or costs exceeding fees (Johnstone 2000; Bell et al. 2002; Brown and Johnstone 2009). In the professional literature engagement risk is described as the auditor's exposure to "loss or injury from litigation, adverse publicity, or other events arising in connection with the audited financial statements" (DeFond and Zhang 2014, p.296; SAS

⁷ It can happen that one team has no partners if the client is relatively small. On engagements in public companies, the signing auditor must be a partner.

106). According to Knechel et al. (2007), engagement risk arises from three sources: litigation risk, reputation risk, and regulation risk. Litigation risk exposes auditors to financial penalties while reputation risk impairs the ability to attract and retain clients. Regulation risk is the threat of regulatory intervention, which subjects auditors to sanctions that may include fines and criminal penalties. These risks are not independent of each other as litigation and regulatory sanctions for example are likely to impact auditor's reputation (DeFond and Zhang, 2014). We do not distinguish between these sources in this study. Instead we assume that the (overall) engagement risk varies significantly between public and private companies and treat engagements in public (private) companies as generating high (low) engagement risk. This claim is valid considering prior evidence and discussions explained below.⁸

First, public firms' market liquidity and ownership dispersion are higher than for private firms, therefore more equity investors are harmed by misstatement of audited financial statements and the risk of litigation for the auditor increases (St Pierre 1983; Katz 2009). For the Big 4 audit firms in the U.S., 78 % of litigation damage payments relate to audits of public equity firms, 16 % to audits of private equity firms and 6 % to non-audit services (Badertscher et al. 2014). Furthermore, leading insurers of small audit firms consider public versus private ownership of audit clients as an important factor in determining litigation risk (CAQ 2008). There is also (some) evidence that auditors are pricing the greater litigation risk when auditing public firms. Badertscher et al. (2014) find that audit fees for public firms in the U.S. are 20-22 % higher than fees for similar private firms. While this is evidence supporting that auditors are responding to engagement risk (e.g., litigation), it is however unclear whether the increase in fees is to cover costs from increased audit production *effort* or to reflect a *risk premium*

⁸ We recognize that there are other important determinants of engagement risk (see Simunic and Stein, 1996) and that these factors may vary between private and public companies. Important for this study, conclusions are derived based on analysis from matched samples of private and public companies (Propensity Score Matching).

charged for higher expected future litigation costs (Palmrose 1986; Simunic and Stein 1996; Badertscher et al. 2014).⁹

The level of engagement risk is likely to impact (strategic) allocation decisions made by audit firms (Hackenbrack and Knechel 1997). There is an established audit production literature that investigates determinants of total audit hours and (to some extent) mix of labour input (see Causholli, DeMartins, Hay, and Knechel 2010 for a review).¹⁰ Evidence indicates that auditors are sensitive to conditions that heighten their risk when pricing and conducting an audit (Schelleman and Knechel, 2010). One factor considered in this literature is whether clients' are public or private companies (O'Keefe, Simunic, and Stein 1994; Stein, Simunic, and O'Keefe 1994; Hackenbrack and Knechel 1997; Dopuch, Gupta, Simunic, and Stein 2003; Bell, Doogar, and Solomon 2008; Schelleman and Knechel 2010). In several of these studies, greater audit hours were spent by all ranks of auditors in public companies compared with private companies (O'Keefe et al. 1994; Dupuch et al. 2003. However, Schelleman and Knechel (2010) find, using data from 119 audit engagements in the Netherlands, that partner hours is significantly higher for engagements in listed companies compared with unlisted companies while there is no such association for hours spent by manager, supervisor, assistant, and others. One limitation in prior research relates to the (lack of) strength in inferring greater effort in public (listed) firms given that private and public samples are not matched on client characteristics.

Hackenbrack and Knechel (1997) study audit hours by audit activities (survey data) and show that the proportion of labor at each rank depends on the activities actually conducted

⁹ Only a limited number of studies are able to (directly) distinguish between audit effort and audit fee premium (Bae, Choi, and Rho 2016, Bronson, Ghosh, and Hogan 2017). Using Korean data, Bae et al. (2016) complement prior literature documenting higher fees for ISA (industry specialist auditor) audits compared with non-ISA audits by reporting that auditors both work greater hours and charge a higher unit price per audit hour when applying ISA. Bronson et al. (2017) document that a significant portion of the fee premium charged by auditor of companies cross-listed in the US is attributable to increased audit effort related to regulatory and disclosure requirements.

¹⁰ Table 1 (Panel A and B) in Causholli et al. 2010, p. 58-63, lists prior research about total audit hours and hours by rank.

during the course of the audit. They find that partners and managers spent significantly more hours on review work and client interaction in public companies (compared with private companies). Managers also spent more hours on planning and substantive testing (critical and non-critical) in public companies compared with in private companies. Building on that, Bell et al. (2008) report an increase by 25 % of partner and manager time (the proportion increased by 40 %) post-Business Risk Auditing compared with pre-Business Risk Auditing. This finding was explained by more complex risk assessments and audit judgments under Business Risk Auditing. In related research, Knechel, Rouse, and Schelleman (2009) find however that whether a client is publicly or privately owned is not related to audit efficiency (efficiency measured by the cost of labor input relative to hours spent on gathering of audit evidence). Overall, prior production research documents that allocation of resources to high and low ranked auditors is not constant for all engagements.

Resource allocation is the process of assigning and managing assets in a manner that supports an organization's strategic goals (Bower and Gilbert, 2005). Resource allocation is of key strategic importance to the organization and involves balancing competing needs and priorities and determining the most effective course of action in order to maximize the effective use of limited resources and to gain the best return on investment (Dellestrand and Kappen, 2011). Audit firms need to reach goals which include delivering acceptable (or high) audit quality and optimizing available resources (i.e. minimize cost). Since billing rates for different ranks of auditors vary to a large extent, resource allocation on audit engagements means assigning lower ranked auditors a relatively large proportion of audit hours (Annelin, Svanström, and Willekens 2017). For example, about 50 % of audit hours were allocated to staff (i.e., lowest ranked auditors) on engagements with assets exceeding 100 million USD (O'Keefe et al. 1994).

To understand more about allocation in audit teams, one needs to also consider audit cost (audit hours*billing rate). It is well known that partners are more costly than managers, who are in turn more costly than associates. From prior research, we know little about audit cost and there is a lack of evidence on how audit costs are allocated to auditor ranks on engagements involving different risk levels. It is also (largely) unknown if a higher cost (fee) in public companies reflects a risk premium and/or different levels of audit effort.

Based on prior evidence, we assume that audit firms take into account engagement risk in resource allocation decisions. Litigation risk and reputation risk are among the main risks that expose the auditors to financial penalties and impair auditors' ability to attract and retain clients (Knechel, Salterio, and Ballou 2007, DeFond and Zhang 2014). Auditors have strong incentives to remain independent and to deliver high audit quality, particularly due to litigation risk, because "litigation damage claims against auditors can be large enough to threaten the viability of even the largest audit firm" (DeFond and Zhang 2014, p.297). The assumption remains valid considering our institutional setting in that *engagement risk* from audits of public clients (in Sweden) is existent and non-trivial.¹¹

All types of audit labor can be assumed important in reducing the auditor's engagement risk to an acceptable level at a minimum cost. However, it is unclear from prior research whether audit firms respond to engagement risk by allocating more resources of auditors in high or low ranks or increase effort of auditors in all types of ranks. Delivering high audit quality will reduce the engagement risk to an acceptable (low) level and therefore, there are reasons to expect greater allocation of costs to high ranked auditors when the engagement risk is high. High ranked auditors such as partners are more experienced, have greater expertise and responsibilities, and make more strategically important decisions than lower

¹¹ Kraft & Kultur, HQ Bank and Prosovia are recent or ongoing litigation cases involving (potential) audit failures which have led to major court cases, issued damages and/or large off-court settlements. See also section 2 on institutional setting.

ranked auditors. Also, the highest ranked auditors (i.e., audit partners) are responsible for the engagements and they gain economic benefits and prestige/status from leading these engagements (Zerni et al. 2012), but at the same time they bear the risk in case of audit failure.

Although high ranked auditors, e.g., partners, are considerably more costly than auditors in low ranks e.g., associates (Annelin et al. 2017; Che and Svanström 2017), their expertise is likely prioritized for engagements where risks are high and consequences of reputational loss are potentially detrimental. Partners' (and other high ranked auditors') role in planning, reviewing work of others, and negotiation with client may increase under high risk conditions (Hackenbrack and Knechel 1997). We predict that when engagement risk is high, more audit costs (hours * billing rate/hour) are allocated to higher ranked auditors while a similar level of cost is allocated to lower ranked auditors. Therefore, we formulate the following two (sub-) hypotheses:

H1a: Compared to clients with low engagement risk, Big 4 audit firms allocate more audit cost to higher ranked auditors in clients with high engagement risk.

H1b: Compared to clients with low engagement risk, Big 4 audit firms allocate similar audit cost to lower ranked auditors in clients with high engagement risk.

We expect audit effort to reflect the engagement risk. An important strategic issue is the resource allocation decision concerning whether additional audit effort to reduce engagement risk can be best achieved by increasing effort of all ranks of auditors in the team or by prioritizing effort from the higher ranked auditors. Prior production research referred to above finds that risk measure influences the mix of labor input including the use of experts and industry specialists (O'Keefe et al. 1994; Hackenbrack and Knechel 1997; Knechel et al. 2009).

The literature also provides some guidance with regard to how effort is allocated to ranks of auditors in public versus private companies (O'Keefe et al. 1994; Dupuch et al. 2003; Bell et al. 2008). All these studies indicate that a greater number of hours are allocated to partners in public compared with private companies. A few recent studies have also find preliminary

support for a link between partner and manager time spent on the audit engagement and audit quality (Cameran, Ditillo, and Pettinicchio 2017, Van Linden, Knechel and Willekens 2017). Given the risks and stakes involved in audits of public companies, audit firms are likely willing to allocate more resources of higher ranked auditors to minimize the risks of litigation and reputation loss. On riskier engagements, we expect a larger degree of partner (and probably other high ranked auditors) involvement in different audit procedures through review work and client interaction. Prior research provides mixed results for lower ranked auditors with regard to higher effort in public companies compared with private companies (Bell et al. 2008; Schelleman and Knechel 2010). For riskier engagement, we argue based on Bell et al. (2008) that higher ranked auditors may substitute lower-ranked auditors (on some tasks). Overall, we expect similar effort of the lower ranked auditors in clients of high and low engagement risk. We formulate the following two hypotheses:

H2a: Compared to clients with low engagement risk, Big 4 audit firms allocate more audit effort of higher ranked auditors to clients with high engagement risk.

H2b: Compared to clients with low engagement risk, Big 4 audit firms allocate similar amount of audit effort of lower ranked auditors to clients with high engagement risk.

To compensate for the higher engagement risk in public companies, audit firms may alternatively or in addition to increased audit effort charge a higher billing rate per hour (risk premium). One should note that audit firms could (in theory) also charge a premium by invoicing (charging) a price to the client that is higher than the total audit cost. However, information from the Big 4 firm does not indicate that audit firms are doing that.¹² The literature indicates that audit fees are adjusted to risk measures such as listing status (Simunic

¹² The audit firm that provided us with the data has informed us that audit fees charged to the client do not exceed the total audit cost. However, audit fees are on average about 10 % lower than audit cost with some variation between engagements. The reason is that audit fees are semi-fixed (an interval) and if more audit work is needed, the audit firm may not be able to charge for the additional effort.

1980; Schelleman and Knechel 2010) but it is in general unknown whether a risk premium is charged via higher billing rate and which billing policies are applied. Bedard and Johnstone (2004) is one exception. They report that auditors plan increased effort and billing rates for clients with earnings manipulation risk, and that the positive relationships between earnings manipulation risk and both effort and billing rates are greater for clients that also have heightened corporate governance risk.

Researching whether risk premiums are charged via higher or lower ranked auditors is a first attempt to understand how billing policies function in high and low engagement risk environments. We expect that audit firms compensate engagement risk not only by additional audit effort but also by charging a premium for high ranked auditors and formulate the following two hypotheses:

H3a: Compared to clients with low engagement risk, Big 4 audit firms charge a risk premium via higher billing rates of higher ranked auditors to clients with high engagement risk.

H3b: Compared to clients with low engagement risk, Big 4 audit firms charge similar billing rates of lower ranked auditors to clients with high engagement risk.

There are two ways to adjust the effort level of an engagement in response to increased risk in order to reduce the risk of material misstatements: 1) work more hours or 2) assign more experienced costly personnel (Schelleman and Knechel 2010). The final resource allocation decision considered in this study is whether audit firms differentiate auditors with different levels of competence within the same rank and allocate certain (expert or high profile) auditors to engagements with high risk. Within the group of partners (signing auditors), there are a (smaller) pool of auditors with experience of auditing public clients (high risk) and another (larger) pool of auditors without this experience (Sundgren and Svanström

2017). Being assigned to public firm engagements which are regarded as profile clients (Zerni et al. 2012) is prestigious (especially for partners). We hypothesize that high ranked auditors with public client experience on average have higher billing rates than the same high ranked auditors with private clients and that the audit firm prioritizes engaging more competent auditors in each of the high ranks (even if billing rates are higher) to audits of public companies in order to compensate for the high engagement risk. Allocation of more resources to more qualified/experienced auditors when risk levels increase is documented in Krishnan (2003) analyzing industry specialists and Johnstone and Bedard (2003) on the use of specialists. Based on the discussion above, we formulate the following two (sub-) hypotheses:

H4a Compared to clients with low engagement risk, Big 4 audit firms allocate more competent auditors (i.e., higher billing rates) of higher ranked auditors to clients with high engagement risk.

H4b Compared to clients with low engagement risk, Big 4 audit firms allocate similar competent auditors in lower ranks for clients with high engagement risk.

4. Data, methodology, and descriptive statistics

4.1 Data

This paper uses a unique dataset provided by a Big 4 audit firm in Sweden. The dataset contains most of the large audit engagements that have at least three ranks of auditors in the team (e.g., partners, managers, and associates). All the auditors are categorized into the following detailed ranks: partner, director, senior manager, manager, assistant manager, senior associate, associate, and others. The sample includes 909 audit teams/engagements (92 are for public clients) in 2016 (covering the full audit cycle from July 2015 to June 2016). For *each* team member in each audit team, the data consist of name, rank, disaggregated audit hours and corresponding audit costs (i.e., hours*billing rates). The Big 4 audit firm also provides us

with some information on the client characteristics, such as, industry, client size, leverage, and sales growth.¹³

4.2 Sample based on the propensity score matching approach

As client characteristics, e.g., size and risk, are important determinants of audit fees and effort (Hay et al. 2006; O’Keefe et al. 1994), we use propensity score matching method to match each of the 92 listed firms with private firms without replacement. The first step is to conduct a propensity score matching logistic regression of the indicator variable, *Public*, on all the control variables, and to obtain the propensity scores.¹⁴ We then match each of the 92 public clients with one private client having the closest propensity scores without replacement and use the pairs as the matched sample, which has 92 private and 92 public firms. Hence, the matched sample has 184 observations. We use the propensity score matched sample for all the analyses to alleviate the impacts of client characteristics.¹⁵ We also use the full sample when necessary.

4.3 Variable measurements and methodologies

The tests for the first two hypotheses (H1 and H2) use the same sample (the matched sample) and only differ on the use of dependent variables. Hypothesis 3 (H3) and hypothesis 4 (H4) are about billing rates, but use different sub-samples. Hence, we first present the variables and methodology for H1 and H2 together, and then separate the discussion for H3 and H4.

4.3.1 Test variable

We first discuss the test variable, which proxies engagement risk, because it is the same for most of the analyses. DeFond and Zhang (2014, P.296) discuss engagement risk as follows:

¹³ The audit firm does not provide us the name or organizational number of the clients for anonymity reasons. We have to explicitly ask the variables from the Big 4 audit firm.

¹⁴ Logistic model of propensity score matching method is often used in the literature (e.g., Lawrence et al. 2011). DeFond, Lennox, and Zhang (2017) document that the results based on propensity score matching are sensitive to the settings. We have tried different approaches, for example, using the default probit method and dropping some control variables. The main findings hold.

¹⁵ Although it is important to use the propensity score matched sample, our un-tabulated results using the full sample provide qualitatively similar results.

“*Engagement risk* is used in the professional literature to describe the auditor’s exposure to “loss or injury from litigation, adverse publicity, or other events arising in connection with the audited financial statements” (SAS 106). Engagement risk arises from three sources: litigation risk, reputation risk, and regulation risk (Knechel et al., 2007). As public firms have stock shares traded in the stock exchanges and usually have a large amount of investors, compared to private firms, public firms expose Big 4 audit firms to much higher risks of litigation, reputation, regulation, among others (e.g., Badertscher et al. 2014; Johnstone and Bedard 2003; Bell et al. 2002). Hence, we use public (private) firms to proxy clients of high (low) engagement risk. Although engagement risk could vary within the segment of public/private clients, we argue that the different characteristics of public vs. private firms are much more important than the differences within each segment. Hence, we focus on the higher level of engagement risk (public vs. private firms), rather than the lower level differences within each segment, e.g., leverage, when measuring clients’ engagement risk. The test variable, *Public*, equals 1 if the client is public and 0 if the client is private. The definitions of all the variables are reported in Appendix A.

4.3.2 *The dependent variable for H1 and H2*

As we compare each individual rank between public and private clients, the dependent variable is at the rank level. H1 examines audit costs. H2 examines audit effort, which is measured by audit hours. For each rank in each team, we aggregate the audit costs and audit hours of all the auditors. We then compute the natural logarithm of the aggregated audit costs and audit hours as dependent variable for auditors in each rank to test H1 and H2. The seven dependent variables for H1 are audit costs of partners (*LnCostPart*), directors (*LnCostDir*), senior managers (*LnCostSenMan*), managers (*LnCostManag*), assistant managers (*LnCostAssMan*), senior associates (*LnCostSenAss*), and associates (*LnCostAssoc*). Similarly, the seven dependent variables for H2 are audit hours of partners (*LnHourPart*), directors

(*LnHourDir*), senior managers (*LnHourSenMan*), managers (*LnHourManag*), assistant managers (*LnHourAssMan*), senior associates (*LnHourSenAss*), and associates (*LnHourAssoc*).

4.3.3. Regression model for H1 and H2

We employ the following regression equation (1) to test H1 and H2.

$$(1) DepVar = \alpha + \beta * Public + Controls + FE_industries + e$$

The dependent variable (*DepVar*) and test variable (*Public*) for H1 and H2 have been explained above. Control variables are the same for all the regressions and will be discussed later in this section. We include fixed effect on industries (*FE_industries*) to capture industry specific impacts. We conduct the ordinary least square (OLS) regression for *each* of the seven ranks for both H1 and H2.

4.3.4. Sample and methodology for H3

H3 investigates whether the Big 4 firm charges risk premium by increasing billing rates to clients with high engagement risk (public firms), compared to clients with low engagement risk (private firms). We focus on auditors that have audited *both* public *and* private clients in the matched sample, and examine whether billing rates of the same auditors are higher when they audit public clients than when they audit private clients. We then regress billing rates on the test variable, *Public*, for each rank of the auditors at the auditor level using the matched sample as follows:

$$(2) Billing = \alpha + \beta * Public + FE_auditors + e$$

Equation (2) is the regression used to test H3. The dependent variable, *Billing*, is billing rate or the unit audit price for each auditor that has worked for *both* public *and* private clients in the matched sample. The test variable, *Public*, which is the same as the one defined above,

equals 1 if the client is public firm and 0 if the client is private firm. As this analysis only cares whether billing rates of the *same* auditors differ between public and private clients, the other client characteristics, such as, size and risk, do not really matter and we do not control for them. However, it is important to include fixed effect on auditors (*FE_auditors*) as our interest is within-auditor difference of billing rates. Hence, fixed effect on auditors is added to control for auditor specific effects.

4.3.5. Sample and methodology for H4

H4 examines whether the Big 4 firm allocates more competent auditors within each rank to clients with high engagement risk (public clients), compared to clients with low engagement risk (private clients). It is very likely that billing rates among auditors measure their competence, such as, skills, expertise, and experience. Hence, auditors with higher billing rate are in general more competent no matter within the same rank or across ranks. While the *same* auditor with different billing rates for public and private clients could indicate that the Big 4 firm charges risk premium, *different* auditors with heterogeneous billing rates could reflect the Big 4 firms' resource allocation decisions if auditors with higher billing rates are assigned to public clients.

The analysis for H4 focuses on *different* auditors, and we identify all the auditors that *only* audit public clients, and *only* audit private clients. We then regress billing rates on the test variable, *Public*, for auditors in each rank. Similar to equation (2) used to test H3, we do not include control variables in this analysis because we only concern about auditors' billing rates and the only factor of audit clients we care is whether the client is public or private. Different from equation (2), we do not include fixed effect on auditors when testing H4 because we compare billing rates of different auditors and the interest is between-auditor difference. The following equation (3) is used to test H4. The variables are similar to equation (2) except for the fixed effect on auditors, but the sample is different.

$$(3) \text{ Billing}_i = \alpha + \beta * \text{Public}_i + e_i$$

4.3.6 Control variables

Control variables are used in equation (1) to test H1 and H2. Client size is the most important determinant of audit fees (e.g., Hay et al. 2006). We use the natural logarithm of total assets (*LnTA*) to measure client size. The level of performance is considered as a risk factor that may lead to less audit effort if performance is good (Hay et al. 2006; Causholli et al. 2010). Hence, we add firms' returns on assets (*ROA*) as a control variable. As firms with higher debt ratio may have higher business risk, which in turn affects auditors' business risk (inherent risk in the audit risk model), firms with higher leverage may attract more audit effort from auditors (O'Keefe et al. 1994). Therefore, we control for the leverage of client firms (*Leverage*), which is the ratio of total debt to total assets.

The familiarity between the auditor and the client might matter for audit effort. We use *Tenure*, which measures the number of years the client has been registered as a client in the audit firm's system, as a proxy for audit tenure. More audit effort might be necessary if one client has more inventory. Hence, we include the ratio of inventory to total assets (*InvenTAratio*) as a control. As fixed assets and the amount of depreciation may affect auditors' judgement and effort, we control for property, plant, and equipment (PPE) scaled by total assets (*PPE_TA*) and the ratio of depreciation to total assets (*DepreciationTA*). We also control for liquidity risk by including cash liquidity (*CashLiquidity*) and interest payable (*IntersetPayalbe*). Firms that experience high sales growth may require more audit effort due to more transactions. Therefore, we control for sales growth (*SalesGrowth*), which is the percentage change in sales in 2016 compared to sales in the previous year.¹⁶

¹⁶ We winsorize *ROA*, *Leverage*, *InterestPayble*, *CashLiquidity*, and *SalesGrowth* at the 1st and 99th percentiles to mitigate the effect of extreme values. Additional analyses using unwinsorized variables provide similar results.

Audit effort might vary for clients in different geographies and we include an indicator variable for clients that are located in each of the three largest cities in Sweden: Stockholm, Gothenburg, and Malmö, where *Stockholm* (*Gothenburg* and *Malmo*) is 1 if the client firm is located in Stockholm (*Gothenburg* and *Malmö*), and 0 otherwise.

4.4 Descriptive statistics

Table 1 reports the descriptive statistics for all the dependent and control variables for both private firms (in the first four columns) and public firms (in the four columns next to the last), and the t-value of the differences of the means of private and public firms (in the last column). The statistics include mean (Mean), standard deviation (SD), the 25th, 50th, and 75th percentiles. Note that the statistics are based on the propensity score matched sample.

--Insert Table 1 about here--

The first seven rows report audit costs for auditors in each rank: partner (*SumCostPart*), director (*SumCostDir*), senior manager (*SumCostSenMan*), manager (*SumCostManag*), assistant manager (*SumCostAssMan*), senior associate (*SumCostSenAss*), and associate (*SumCostAssoc*). Except audit costs of assistant managers and associates, audit costs of private clients are statistically lower than costs of public clients. The next seven rows present statistics of natural logarithm of audit costs for each rank. The t-values in the last column show that the difference between public and private clients is statistically significant only for partners and directors.

The subsequent 14 rows exhibit the information for audit hours of each rank of auditors. The differences of the mean values of audit hours between private and public clients, reflected by the t-values in the last column, are quite similar to the ones for audit costs. The only exception is that the natural logarithm of audit hours of senior managers is statistically higher for public clients than for private clients. In short, audit costs and hours provide similar

picture that audit costs and hours of higher ranked auditors are statistically higher for public clients than for private clients, which provide initial support for H1 and H2.

The rest presents statistics of the control variables. Interestingly, the t-values for the differences between public and private clients are insignificant for all the client characteristics. Un-tabulated statistics based on the full sample show that there are systematic differences between public and private clients for most of the control variables. This confirms that the propensity score matching approach has effectively matched clients of the two segments and greatly alleviates their impacts on the dependent variables.

The correlation matrix for the test and control variables, reported in Panel B of Table 1, shows that the highest correlation is between *InvenTAratio* and *PPE_TA*, which is 0.51. Most of the correlations are quite low.

5. Main results

Before we present results for each hypothesis, which focuses on the level of ranks, we first conduct regression analyses at the audit team level. For each team, we aggregate audit costs and audit hours across all the ranks and obtain total audit costs and total audit hours for each team. We then conduct analysis using equation (1), where the dependent variable is the natural logarithm of total audit costs and total audit hours. Un-tabulated results show that total audit costs and total hours are significantly higher for public clients than private clients, as expected.

5.1 Results for Hypothesis 1 (H1)

The regression results for H1 are reported in Table 2. Panel A presents the results for regressing audit costs on the test variable, *Public*, for the ranks of partners (*CostPart*), directors (*CostDir*), and senior managers (*CostSenMan*). Panel B provides similar regression results for lower ranks of auditors that are managers (*CostManag*), assistant managers

(*CostAssMan*), senior associates (*CostSenAss*), and associates (*CostAssoc*). The coefficient on the test variable, *Public*, is of interest, and a positive and significant coefficient indicates more audit costs for public clients than for private clients.

--Insert Table 2 about here--

In Panel A, the coefficient on *Public* for partners is high, at 2.885, and very significant with a high t-value of 6.1. The coefficient on *Public* is also positive and significant for directors, at 1.727 with a t-value of 2.06. For senior managers in the last column of Panel A, the coefficient on *public* is positive but insignificant. None of the coefficients on *Public* for lower ranks of auditors in Panel B of Table 2 are statistically significant.

Table 2 shows that audit cost to public clients is substantially higher than that to private clients from the rank of partners and directors. This indicates that the Big 4 firm allocates much more resources of the higher ranked auditors to clients with higher engagement risk, supporting H1. The coefficient on *Public* for partners, 2.885, converts to 16.9 ($=e^{2.885}-1$) times more audit cost to public clients, compared to private clients of similar characteristics. The corresponding number for directors is 4.6 ($=e^{1.727}-1$) times more audit cost to public clients than to private clients. These higher audit costs could be driven by more audit hours or higher billing rates or both.

We briefly discuss the control variables. For both Panel A and Panel B, the only control variable that is significant for all ranks of auditors is client size (*LnTA*), which is consistent with the literature that client size is the most important client characteristics that affects audit input/fees (e.g., Hay et al. 2006). Only a few other control variables have significant coefficients for some of the ranks of auditors. The adjusted R^2 is highest for partners, at 27.7%, and lowest for senior managers, at 4.8%. In general, it seems whether a

client has high or low engagement risk, public vs. private, significantly determines audit costs from highly ranked auditors, i.e., partners and directors, but not auditors in lower ranks.

5.2 Results for Hypothesis 2 (H2)

While we find supportive evidence for H1 that audit costs of partners and directors are much higher for public clients than private clients in Table 2, it is unclear whether the additional audit cost is driven by more audit hours or higher billing rates, or both. H2 predicts that audit effort, measured by audit hours, of higher ranked auditors is greater for public clients than private clients. The regression results are presented in Table 3. Panel A reports the results for audit hours of partners (*HourPart*), directors (*HourDir*), and senior managers (*HourSenMan*). The coefficient on *Public* is positive and statistically significant at the 1% level for partners (coeff.=1.321, t-value=6.88) and directors (coeff.=0.883, t-value=2.8), and is only marginally significant at the 10% level for senior managers. All the coefficients on lower-ranked auditors presented in Panel B of Table 3 are insignificant.

--Insert Table 3 about here--

This table shows that higher-ranked auditors, i.e., partners, directors, and senior managers, exert more audit effort to public clients than to private clients. The magnitude and significance of the coefficient on *Public* are positively related to the order of ranks. H2 is supported. The coefficient on *Public* for partners, 1.321, converts to 2.7 ($=e^{1.321}-1$) times more audit hours to public clients than private clients. The coefficients on *Public* for directors and senior managers correspond to 1.42 ($=e^{0.883}-1$) and 0.77 ($=e^{0.569}-1$) times more audit hours for public than private clients.

The results for control variables are similar to the ones for audit costs in Table 2. Only client size (*LnTA*) has positive and significant coefficient for all ranks of auditors except one. The adjusted R^2 is highest for partners, at 40.2%, and lowest for senior managers, at 5.1%.

5.3 Results for hypothesis 3 (H3)

This subsection tests H3 to examine whether the Big 4 firm charges risk premium through increasing billing rates to clients with high engagement risk.

--Insert Table 4 about here--

The results for H3 about billing rates of the *same* auditors are reported in Table 4. We first identify auditors in each rank that have audited both public and private clients in the matched sample. We then regress billing rates at the auditor level on *Public*, including fixed effect on auditors, so we examine the difference in billing rates for public and private clients of the *same* auditors. Panel A (B) reports regression results for higher (lower) ranked auditors. For all the coefficients on *Public*, none is positive and significant. The coefficients for senior managers (SenMan) and associate managers (AssMan) are negative and significant, indicating that these managers have lower billing rates when they audit public clients compared to private clients. However, the magnitude of the coefficients on *Public* is very small, at -31 and -17 for senior and assistant managers. Compared to billing rates of about 2,000 SEK for senior managers and more than 1,000 SEK for assistant managers, the difference in billing rates is not economically significant and could be negligible.

Panels A and B of Table 4 show that billing rates of auditors from all ranks are not higher for public clients than for private clients. This indicates that the Big 4 firm does not charge risk premium by increasing billing rates when auditors work for clients with high engagement risk. H3a is not supported. As discussed earlier in this paper that the Big 4 firm does not charge fees in addition to audit costs to their audit clients, and usually there are some discounts, this suggests that audit fees charged to clients are slightly lower than audit costs and there is no extra fee to compensate higher risk. In sum, our results do not provide evidence that the Big 4 firm charges risk premium to clients with higher engagement risk.

As partners have the highest billing rates and exert significantly more effort to public clients than private clients, we investigate partners' billing rates for public and private clients in more detail. Panel C of Table 4 presents, for each partner that audits both public and private clients in the matched sample, the average billing rates (*MeanBilling*) and the number of clients (*NumClients*) for public clients (*Public*) and private clients (*Private*). The last two columns report the difference of billing rates (*DiffBilling*) and the difference in percentage (*DiffPercent*). There are in total 45 unique partners that have audited by types of clients. The first row shows that this partner has audited 8 public clients and 2 private clients and the average billing rates (*MeanBilling*) is 2400 for both groups. Among the 45 partners, 31 have exactly the same billing rates for both types of clients.

The next to last row in Panel C of Table 4 shows that the average billing rate across the 45 partners (*MeanBilling1*) is 3631 for public clients and is 3663 for private clients. The difference is -32 ($=3631-3663$) and 0.88% ($=-32*2/(3631+3663)$). The last row reports the number of clients (*NumClients*) weighted average of *MeanBilling* for partners (*MeanBilling2*), which is 3668 for public clients and 3736 for private clients. The difference is -68 ($=3668-3736$) and -1.84% ($=-68*2/(3668+3736)$). These two rows suggest that it does not matter how we compute average billing rates, and there is no big difference in billing rates for public and private firms. To be precise, the results actually indicate slightly lower billing rates for some partners when they audit public clients, which is against H3 that the Big 4 firm charges risk premium.

In short, Table 4 finds no evidence that the Big 4 firm increases billing rates to charge risk premium when auditing clients with high engagement risk.

5.4 Results for hypothesis 4 (H4)

Previous subsection shows that auditors that audit both public and private clients have similar billing rates in Table 4. This subsection tests H4 and focuses on auditors that *only* audit public *or* private clients using the matched sample. Panels A and B in Table 5 present the results of regressing billing rates on *Public* for each of the seven ranks. The coefficient on *Public* is positive and significant for Partners (Part) in Panel A, and negative and significant for managers (Manag) in Panel B. The coefficients for other ranks are insignificant. The coefficient on *Public* for partners indicates that the Big 4 firm allocates partners with higher billing rates, who are likely to be more competent, to public clients than to private clients.

--Insert Table 5 about here--

Panel C of Table 5 explores further the difference of billing rates for partners only auditing public or only auditing private clients. In other words, the partners in this analyses are different auditors, which is different from Panel C of Table 4. The first two columns in Panel C of Table 5 report the average billing rates (*MeanBilling*) and the number of clients (*NumClients*) for public clients (*Public*), and the next two columns present similar statistics for private clients (*Private*). The row “*#TeamPartners*” close to the bottom shows that there are in total 70 (19) partner-team observations for public (private) clients. The row “*#UniquePartners*” indicates that there are 32 (19) unique partners that only audit public (private) clients in the matched sample. The last two rows report that the average billing rates (*MeanBilling1*) and *NumClients* weighted average billing rates (*MeanBilling2*) are about 3500 for public clients and about 3000 for private clients. The difference is about 17%, reported in the last column. Panel C confirms the results of higher billing rates of partners to public clients, compared to private clients, as reported in Panel A of Table 5.

5.5 Billing rates based on the full sample

One may argue that results in Table 4 and Table 5 are based on the matched sample, which is a subsample only including 184 teams/clients, and does not contain all the clients of the auditors. To mitigate this concern, we use the full sample that contains 909 clients. As the evidence so far indicates that partners are the most important auditors and exert significant more audit effort to public clients, compared to private clients, we focus on partners when examining billing rates based on the full sample.

We first examine billing rates of partners that audit both public and private clients. There are 71 unique such partners that audit 239 partner-public client observations, and 481 partner-private client observations. Similar to Panel C of Table 4, we report the billing rates to public and private clients of each unique partner in Panel A of Table 6. The last two rows show that the average billing rates for public and private clients are slightly above 3500 SEK and are very close. Among the 71 unique partners, 48 partners have exactly the same billing rates for the two segments of clients. This panel provides consistent evidence as Table 4 that the Big 4 firm does not charge risk premium by increasing billing rates of partners when they audit clients with high engagement risk.

We then focus on partners that only audit public clients or only audit private clients using the full sample. There are just two partners that only audit public firms in the full sample. One has two clients with the constant billing rate of 2800 SEK and another has five clients with the constant billing rate of 4100 SEK. In contrast, there are 48 unique partners that only audit private clients in this full sample. This indicates that most partners that can audit public clients also audit private clients, while some partners only audit private clients and not public clients. We expect that partners that can audit both types of clients are likely to be more competent, i.e., have higher billing rates, than partners only auditing private clients.

For each partner that only audits private clients based on the full sample, we report her average billing rates (*MeanBilling*) and the number of clients (*NumClients*) in Panel B of

Table 6. Statistics for partners that only auditing public clients are not reported as there are only two such partners. The last two rows show that the average billing rate of the 48 partners is 2776 (*MeanBilling1*) and the number of clients (*NumClients*) weighted average of billing rate is 2902 (*MeanBilling2*). The differences between partners that audit both types of clients in Panel A of Table 6 and partners only auditing private clients in panel B for *MeanBilling1* and *MeanBilling2* are 27.7% $(=(3540+3550)/2/2776-1)$ and 24.4% $(=(3614+3609)/2/2902-1)$, which are economically significant.

Panel A and Panel B of Table 6 provide descriptive statistics of billing rates for partners that audit both types of clients and partners that only audit private clients, and billing rates of the former are much higher than those of the latter. We now conduct regression analysis by regressing billing rates on *PartnerBoth*, which equals 1 if the partner audits both types of clients, and 0 if the partner only audits private clients. The results are presented in Panel C of Table 6. The coefficient on *PartnerBoth* is positive and very significant with a t-value of 7.45. The magnitude of the coefficient is 877.69, which indicates that billing rates of partners that audit both types are about 32% $(877.69/2733.156)$ higher than billing rates of partners that only audit private clients. These results confirm that the Big 4 firm in general allocates more competent partners to public clients, compared to private clients. However, when the same partner audits both public and private clients, billing rates are similar.

--Insert Table 6 about here--

5.6 Short summary

Taken together, the results show that auditors of higher ranks, especially partners, have exerted much more audit effort to clients with high engagement risk than clients with low engagement risk. Audit hours and audit costs of lower ranked auditors have no statistical differences for these two types of clients. While the evidence supports more effort from

(higher ranked) auditors to public clients, no results indicate that the Big 4 firm charges risk premium by increasing billing rates of auditors. In other words, the same auditors have more or less the same billing rates no matter they audit public or private clients. However, there is evidence that partners that audit public clients (and private clients) have significantly higher billing rates than partners those only auditing private clients in the sample. As partners associated with higher billing rates are likely to be more competent, it seems that the Big 4 firm does allocate higher quality partners to public clients, compared to private clients.

6. Conclusions

This paper investigates a Big 4 firm's resource allocation and billing policy by comparing engagements with high (public clients) and low engagement risk (private clients). Resource allocation is an important strategic decision for any organization and indicates how the firm prioritizes limited resource to achieve its goals. Our empirical analyses are based on a matched sample of private and public companies. We focus on seven ranks and conduct analyses for each of the seven ranks separately. To the best of our knowledge, this is the first study to examine whether audit firms allocate a higher (similar) audit cost to higher (lower) ranks of auditors auditing public firms, compared with private firms. Next, we analyze whether more effort is allocated and/or higher billing rates are charged to higher ranked auditors to compensate for the higher engagement risk in public clients compared with private clients. This provides insights as to the extent a higher fee in public companies compared with private companies (Badertcher et al. 2014) is related to effort and/or risk premium. Finally, we test whether more competent auditors in high ranks (e.g., higher billing rates than others in the same rank) are allocated to high risk engagements.

We use a unique dataset of 909 audit engagements, provided by a Big 4 audit firm in Sweden. The dataset includes the number of audit hours and the corresponding costs (audit hours*billing rate) for *each* of the auditors in each team. The audit cost measures take into

account both the number of hours and the billing rates of each auditor. Compared to using only audit hours to study resource allocation, audit costs provide a more precise measure because auditors in different ranks (and to some extent within ranks) have different costs due to heterogeneous billing rates. All team members are categorized in the following ranks: partners, directors, senior managers, managers, assistant managers, senior associates, associates, and others.

Results show that audit firms allocate a higher cost to high ranked auditors (i.e., partners and directors) on engagements with high risk (public clients), which supports H1a. The higher cost seems to be driven by auditors of higher ranks exerting much more audit effort to clients with high engagement risk than clients with low engagement risk (support of H2a). Audit hours and audit costs of lower ranked auditors have no statistical differences for these two types of clients (support of H1b and H2b). While the evidence supports more effort from (higher ranked) auditors to public clients, no results indicate that the Big 4 firm charges risk premium by increasing billing rates of (high and low ranked) auditors (H3a not supported, H3b supported). In other words, the same auditors have more or less the same billing rates no matter they audit public or private clients. However, there is evidence that partners allocated to public clients (and also private clients) have significantly higher billing rates than partners that *only* audit private clients in the sample (H4a supported). As partners associated with higher billing rates are likely to be more competent, it seems that the Big 4 firm does allocate higher quality partners to public clients, compared to private clients.

This paper provides initial evidence that the Big 4 firm allocates *more* of the *highest* quality resources to clients that expose higher engagement risk to the audit firm while allocation of lower ranked auditors is similar to that of low risk engagements. Overall, this study sheds new insights on the allocation of audit resources of a Big 4 audit firm and how the firm allocates human resources to mitigate high engagement risk. Given the positive link

between effort and quality (Caramanis and Lennox 2008; Che, Langli, and Svanström, forthcoming), this paper is also of interests for regulators and academics that are concerned about audit quality. Importantly, we document that the higher audit cost allocated to higher ranked auditors on public engagements cannot be attributed to charging a risk premium via a higher billing rate (but instead to increased effort). Findings further support that audit firms are highly sensitive to engagement risk in allocating resources and deciding on the mix of labor input.

This paper is subject to some limitations. Although it is an advantage to focus on audit teams of the same audit firm, which equips all the teams with the same audit methodologies, quality controls, etc., the use of one audit firm may limit the generalizability of the results. Big 4 firms have a lot in common in terms of policies and practices but there are also significant differences. Given the fact that Big 4 firms have international networks and often implement similar policies worldwide, it is likely that the inferences in this paper are valid for Big 4 firms in other countries. However, we caution the generalizability of our results in case different audit firms or audit firms in other countries have different policies. In addition, we do not have data on audit fees, which prevents us from investigating the exact differences between audit fees charged to clients and audit costs.

Appendix A: Variable definitions

Variable	Variable definitions
LnSumCosts	= The natural logarithm of the aggregated audit costs of all team members
LnCostPart	= The natural logarithm of the aggregated audit costs of all partners
LnCostDir	= The natural logarithm of the aggregated audit costs of all directors
LnCostSenMan	= The natural logarithm of the aggregated audit costs of all senior managers
LnCostManag	= The natural logarithm of the aggregated audit costs of all managers
LnCostAssMan	= The natural logarithm of the aggregated audit costs of all assistant managers
LnCostSenAss	= The natural logarithm of the aggregated audit costs of all senior associates
LnCostAssoc	= The natural logarithm of the aggregated audit costs of all associates
LnSumHours	= The natural logarithm of the aggregated hours of all team members
LnHoursPart	= The natural logarithm of the aggregated hours of all partners
LnHoursDir	= The natural logarithm of the aggregated hours of all directors
LnHoursSenMan	= The natural logarithm of the aggregated hours of all senior managers
LnHoursManag	= The natural logarithm of the aggregated hours of all managers
LnHoursAssMan	= The natural logarithm of the aggregated hours of all assistant managers
LnHoursSenAss	= The natural logarithm of the aggregated hours of all senior associates
LnHoursAssoc	= The natural logarithm of the aggregated hours of all associates
Billing	= Billing rate, that is, unit audit fee per hour, at the the auditor level
Public	= 1 if the client firm is listed, and 0 otherwise
PublicBoth	= 1 if the partner audits both public and private clients, and 0 if the partner only audits private clients
LnTA	= The natural logarithm of total assets of the audit client
ROA	= The return on assets of the audit client
Leverage	= The leverage ratio of the client, which is the ratio of total debt to total assets
Tenure	= The number of years the audit client has been registered as a client in the audit firm' system
InvenTAratio	= The ratio of inventory to total assets
PPE_TA	= The ratio of property, plant, and equipment (PPE) to total assets
DepreciationTA	= The ratio of depreciation to total assets
InterestPayble	= The interest expenses that have been incurred but have not been paid
CashLiquidity	= The ratio of cash and cash equivalents that can be easily converted to cash to current assets
SalesGrowth	= The changes in sales from year 2015 to year 2016.
StateClient	= 1 if the client is state owned, and 0 otherwise
NonProfit	= 1 if the client is non-profit and 0 otherwise
Stockholm	= 1 if the audit client is located in Stockholm and 0 otherwise
Gothenburg	= 1 if the audit client is located in Gothenburg and 0 otherwise
Malmo	= 1 if the audit client is located in Malmo and 0 otherwise

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Table 1: Descriptive statistics

	Private firms					Public firms					t-values
	Mean	SD	P25	P50	P75	Mean	SD	P25	P50	P75	
Cost (1000SEK)											
SumCostPart	223	405	10	93	232	478	769	116	236	466	-2.8***
SumCostDir	137	321	0	3	177	326	646	0	86	410	-2.5**
SumCostSenman	97	217	0	10	93	188	350	0	24	262	-2.1**
SumCostManag	127	169	0	65	217	225	403	0	88	310	-2.2**
SumCostAssman	149	214	0	84	180	180	324	0	80	220	-0.8
SumCostSenass	118	127	21	93	167	208	385	26	93	186	-2.1**
SumCostAssoc	79	125	13	52	88	104	157	7	52	115	-1.2
LnCostPart	9.52	4.73	9.22	11.44	12.35	12.35	1.19	11.66	12.37	13.05	-5.6***
LnCostDir	5.99	5.90	0.00	7.85	12.09	7.52	6.18	0.00	11.34	12.92	-1.7*
LnCostSenman	5.96	5.71	0.00	9.17	11.44	7.24	5.87	0.00	10.07	12.47	-1.5
LnCostManag	7.66	5.62	0.00	11.09	12.29	8.34	5.59	0.00	11.38	12.65	-0.8
LnCostAssman	8.64	5.24	0.00	11.34	12.10	8.51	5.29	0.00	11.29	12.30	0.2
LnCostSenass	9.88	3.89	9.97	11.44	12.02	10.24	3.67	10.15	11.44	12.13	-0.6
LnCostAssoc	9.69	3.35	9.43	10.86	11.38	9.57	3.63	8.80	10.86	11.65	0.2
SumHourPart	64	112	3	25	67	134	210	31	65	140	-2.8***
SumHourDir	53	114	0	1	71	123	231	0	36	157	-2.6***
SumHourSenman	50	106	0	5	51	105	189	0	12	153	-2.5**
SumHourManag	80	101	0	42	136	150	274	0	64	190	-2.3**
SumHourAssman	114	156	0	65	151	147	266	0	64	173	-1
SumHourSenass	115	124	25	86	157	203	382	28	95	208	-2.1**
SumHourAssoc	96	149	20	72	118	126	186	8	76	134	-1.2
LnHourPart	2.93	1.84	1.32	3.25	4.23	4.21	1.15	3.47	4.20	4.95	-5.7***
LnHourDir	1.95	2.19	0.00	0.69	4.27	2.76	2.50	0.00	3.62	5.06	-2.3**
LnHourSenman	1.97	2.12	0.00	1.73	3.96	2.65	2.43	0.00	2.52	5.04	-2.0**
LnHourManag	2.82	2.30	0.00	3.77	4.92	3.22	2.45	0.00	4.18	5.25	-1.1
LnHourAssman	3.37	2.20	0.00	4.19	5.02	3.30	2.37	0.00	4.17	5.16	0.2
LnHourSenass	3.83	1.84	3.27	4.46	5.06	4.03	2.01	3.36	4.57	5.34	-0.7
LnHourAssoc	3.68	1.69	3.01	4.29	4.78	3.66	1.95	2.22	4.35	4.90	0.1
LnTA	13.77	1.78	12.61	13.77	14.85	13.75	2.16	12.47	13.52	15.23	0.1
ROA	-0.07	0.32	-0.04	0.01	0.07	-0.07	0.36	-0.05	0.03	0.07	0
Leverage	0.40	0.28	0.17	0.38	0.59	0.40	0.26	0.18	0.40	0.60	-0.1
Tenure	11.59	4.95	8.00	12.00	16.00	11.17	4.78	8.00	12.00	16.00	0.6
InvenTAratio	0.02	0.08	0.00	0.00	0.00	0.03	0.10	0.00	0.00	0.00	-0.5
PPE_TA	0.01	0.02	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0
DepreciationTA	0.01	0.02	0.00	0.00	0.01	0.01	0.06	0.00	0.00	0.00	-0.9
InterestPayable	0.10	0.22	0.00	0.01	0.05	0.10	0.21	0.01	0.02	0.07	0
CashLiquidity	3.66	6.89	0.69	1.39	3.29	4.51	10.31	0.46	1.11	3.41	-0.7
SalesGrowth	0.15	0.53	-0.02	0.02	0.15	0.16	0.52	0.00	0.02	0.27	-0.1
Stockholm	0.58	0.50	0.00	1.00	1.00	0.58	0.50	0.00	1.00	1.00	0
Goteborg	0.10	0.30	0.00	0.00	0.00	0.15	0.36	0.00	0.00	0.00	-1.1
Malmo	0.12	0.33	0.00	0.00	0.00	0.10	0.30	0.00	0.00	0.00	0.5

Panel B: Pearson's correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Public	1.00												
2 LnTA	-0.01	1.00											
3 ROA	0.00	0.46#	1.00										
4 Leverage	0.00	0.09	-0.26#	1.00									
5 Tenure	-0.04	0.30#	0.18*	0.05	1.00								
6 InvenTAratio	0.04	-0.07	-0.08	0.25#	0.14*	1.00							
7 PPE_TA	0.00	0.01	-0.04	0.06	0.27#	0.51#	1.00						
8 DepreciationTA	0.06	-0.20#	-0.33#	0.03	-0.07	0.10	0.01	1.00					
9 InterestPayable	0.00	-0.22#	-0.21#	-0.18*	-0.02	-0.03	-0.09	-0.06	1.00				
10 CashLiquidity	0.05	-0.08	0.09	-0.43#	-0.03	-0.09	-0.06	0.06	0.33#	1.00			
11 SalesGrowth	0.01	-0.16*	0.00	-0.07	-0.21#	-0.04	-0.04	0.06	-0.01	0.01	1.00		
12 Stockholm	0.00	0.15*	0.05	-0.04	-0.08	-0.09	-0.13*	-0.03	-0.08	-0.01	0.03	1.00	
13 Goteborg	0.08	-0.11	-0.12	0.08	-0.03	-0.04	-0.07	-0.04	0.12	-0.05	0.01	-0.44#	1.00
14 Malmo	-0.03	0.19*	0.05	0.19*	0.03	-0.05	-0.02	0.10	-0.10	-0.09	-0.09	-0.41#	-0.13*

This table presents descriptive statistics and correlation matrix based on the propensity score matched sample. Panel A reports the mean (Mean), standard deviation (SD), and the 25th, 50th, and 75th percentiles of all the dependent and control variables for both the private firms (left) and public firms (right). The t-statistics of the differences of means for private and public firms are reported in the last column (t-value). ROA, Leverage, InterestPayable, CashLiquidity, and SalesGrowth are winsorized at 1st and 99th percentiles. Note that all the variables of costs are in 1000 SEK. Panel B presents Pearson's correlation matrix for the test variable and control variables. * (#) indicates significance at the 5% (1%) level.

Table 2: Results for audit cost of each rank

Panel A: Higher ranks of team members

	(1) CostPart	(2) CostDir	(3) CostSenMan
Public	2.885*** (6.10)	1.727** (2.06)	0.995 (1.18)
LnTA	0.588*** (3.80)	1.173*** (4.28)	0.472* (1.70)
ROA	-0.137 (-0.15)	-1.526 (-0.95)	-2.098 (-1.29)
Leverage	1.082 (0.98)	0.935 (0.48)	-1.117 (-0.56)
Tenure	0.015 (0.28)	0.057 (0.59)	0.004 (0.04)
InvenTAratio	2.822 (0.75)	-8.223 (-1.23)	7.263 (1.08)
PPE_TA	-28.441** (-2.54)	7.054 (0.36)	-37.286* (-1.86)
DepreciationTA	-0.075 (-0.01)	-19.536* (-1.84)	14.361 (1.34)
InterestPayable	2.104* (1.68)	-0.879 (-0.40)	0.528 (0.24)
CashLiquidity	-0.022 (-0.70)	0.030 (0.53)	-0.006 (-0.11)
SalesGrowth	-0.671 (-1.43)	0.854 (1.03)	-0.305 (-0.36)
Stockholm	0.261 (0.37)	1.096 (0.87)	1.683 (1.32)
Goteborg	-0.772 (-0.84)	-1.148 (-0.71)	2.697 (1.64)
Malmo	-0.490 (-0.48)	-0.631 (-0.35)	-0.892 (-0.49)
Fixed effect on Industry	Yes	Yes	Yes
Constant	-1.188 (-0.55)	-11.114*** (-2.90)	-0.875 (-0.23)
Observations	184	184	184
Adjusted R ²	0.277	0.147	0.048

Panel B: Lower ranks of team members

	(1) CostManag	(2) CostAssMan	(3) CostSenAss	(4) CostAssoc
Public	0.876 (1.12)	-0.287 (-0.38)	0.363 (0.73)	-0.008 (-0.02)
LnTA	0.483* (1.89)	0.606** (2.45)	0.418** (2.56)	0.360** (2.27)
ROA	0.566 (0.38)	1.832 (1.26)	-0.670 (-0.70)	0.043 (0.05)
Leverage	1.919 (1.05)	2.322 (1.31)	2.283* (1.95)	-0.012 (-0.01)
Tenure	0.144 (1.59)	-0.049 (-0.56)	0.102* (1.75)	0.138** (2.45)
InvenTAratio	-12.939** (-2.08)	-3.643 (-0.60)	2.510 (0.63)	-4.067 (-1.05)

PPE_TA	27.186 (1.47)	7.085 (0.40)	-54.875*** (-4.64)	-10.750 (-0.94)
DepreciationTA	1.292 (0.13)	6.301 (0.66)	-12.740** (-2.02)	0.020 (0.00)
InterestPayable	-1.980 (-0.96)	-0.559 (-0.28)	-0.908 (-0.69)	-0.059 (-0.05)
CashLiquidity	-0.114** (-2.17)	0.011 (0.21)	0.055 (1.65)	0.020 (0.61)
SalesGrowth	1.068 (1.38)	0.480 (0.64)	-0.272 (-0.55)	0.107 (0.22)
Stockholm	1.882 (1.60)	1.085 (0.96)	1.537** (2.05)	0.547 (0.75)
Goteborg	1.038 (0.69)	0.791 (0.54)	1.207 (1.25)	-0.119 (-0.13)
Malmo	1.306 (0.78)	-0.175 (-0.11)	1.688 (1.57)	1.416 (1.36)
Fixed effect on Industry	Yes	Yes	Yes	Yes
Constant	-4.583 (-1.28)	-1.135 (-0.33)	2.654 (1.16)	2.340 (1.06)
Observations	184	184	184	184
Adjusted R^2	0.129	0.073	0.217	0.136

This table presents the results of regressing audit cost of auditors in each rank on the test variable, *Public*, and control variables, using the propensity score matched sample. *Public* is 1 if the audit client is public firm, which proxies high engagement risk, and 0 if the audit client is private firm, which proxies low engagement risk. Panel A reports the results for auditors in higher ranks, i.e., the rank of partners (CostPart), directors (CostDir), and senior managers (CostSenMan). Panel B presents the results for auditors in lower ranks, i.e., the rank of managers (CostManag), assistant managers (CostAssMan), senior associates (CostSenAss), and associates (CostAssoc). All the variables are defined in Appendix A. Fixed effects on industries are included in all the analyses. The t-values based on the ordinary least squares (OLS) regressions are reported in the parentheses below the coefficients. * (**) [***] indicates significance at the 10 (5) [1] percent level using two-tailed tests.

Table 3: Results of audit effort (audit hours) at the rank level

Panel A: Higher ranks of team members

	(1) HourPart	(2) HourDir	(3) HourSenMan
Public	1.321*** (6.88)	0.883*** (2.80)	0.569* (1.70)
LnTA	0.398*** (6.33)	0.539*** (5.21)	0.179 (1.63)
ROA	-0.473 (-1.28)	-0.785 (-1.29)	-0.735 (-1.14)
Leverage	0.456 (1.01)	0.232 (0.31)	-0.376 (-0.48)
Tenure	0.036 (1.63)	0.021 (0.57)	0.000 (0.01)
InvenTAratio	0.205 (0.13)	-3.393 (-1.35)	2.347 (0.88)
PPE_TA	-8.677* (-1.91)	3.542 (0.47)	-10.590 (-1.34)
DepreciationTA	-0.946 (-0.39)	-6.370 (-1.59)	5.675 (1.34)
InterestPayable	0.899* (1.77)	-0.944 (-1.13)	0.553 (0.63)
CashLiquidity	-0.013 (-1.02)	0.010 (0.46)	-0.003 (-0.13)
SalesGrowth	-0.239 (-1.26)	0.326 (1.04)	-0.058 (-0.17)
Stockholm	-0.201 (-0.70)	0.216 (0.45)	0.709 (1.41)
Goteborg	-0.323 (-0.87)	-0.700 (-1.14)	1.117* (1.73)
Malmo	-0.631 (-1.52)	-0.652 (-0.96)	-0.532 (-0.74)
Fixed effect on industry	Yes	Yes	Yes
Constant	-3.619*** (-4.12)	-5.666*** (-3.92)	-0.870 (-0.57)
Observations	184	184	184
Adjusted R ²	0.402	0.209	0.051

Panel B: Lower ranks of team members

	(1) HourManag	(2) HourAssman	(3) HourSenass	(4) HourAssoc
Public	0.479 (1.47)	-0.143 (-0.44)	0.219 (0.87)	0.031 (0.12)
LnTA	0.237** (2.22)	0.327*** (3.09)	0.254*** (3.10)	0.232*** (2.78)
ROA	0.009 (0.01)	0.868 (1.40)	-0.516 (-1.07)	-0.378 (-0.77)
Leverage	1.203 (1.57)	0.925 (1.22)	1.254** (2.14)	0.334 (0.56)
Tenure	0.074* (1.94)	-0.033 (-0.88)	0.072** (2.48)	0.061** (2.07)
InvenTAratio	-5.732**	-0.854	0.575	-1.315

	(-2.20)	(-0.33)	(0.29)	(-0.65)
PPE_TA	11.757	2.076	-21.211***	-7.422
	(1.52)	(0.27)	(-3.57)	(-1.23)
DepreciationTA	0.867	3.660	-6.180*	0.052
	(0.21)	(0.89)	(-1.95)	(0.02)
InterestPayable	-0.922	-0.166	-0.288	-0.217
	(-1.07)	(-0.19)	(-0.43)	(-0.32)
CashLiquidity	-0.040*	0.001	0.026	0.014
	(-1.83)	(0.06)	(1.55)	(0.84)
SalesGrowth	0.404	0.247	-0.126	-0.034
	(1.25)	(0.77)	(-0.51)	(-0.14)
Stockholm	0.761	0.468	0.980**	0.285
	(1.55)	(0.97)	(2.60)	(0.74)
Goteborg	0.396	0.534	0.424	-0.147
	(0.63)	(0.85)	(0.87)	(-0.30)
Malmo	0.255	0.060	0.864	0.789
	(0.36)	(0.09)	(1.60)	(1.44)
Fixed effect on industry	Yes	Yes	Yes	Yes
Constant	-3.238**	-1.538	-1.107	-1.093
	(-2.17)	(-1.04)	(-0.96)	(-0.94)
Observations	184	184	184	184
Adjusted R ²	0.157	0.103	0.240	0.121

This table presents the results of regressing audit effort, measured by audit hours, of auditors in each rank on the test variable, *Public*, and control variables, using the propensity score matched sample. *Public* is 1 if the audit client is public firm, which proxies high engagement risk, and 0 if the audit client is private firm, which proxies low engagement risk. Panel A reports the results for auditors in higher ranks, i.e., the rank of partners (HourPart), directors (HourDir), and senior managers (HourSenMan). Panel B presents the results for auditors in lower ranks, i.e., the rank of managers (HourManag), assistant managers (HourAssMan), senior associates (HourSenAss), and associates (HourAssoc). All the variables are defined in Appendix A. Fixed effects on industries are included in all the analyses. The t-values based on the ordinary least squares (OLS) regressions are reported in the parentheses below the coefficients. * (**) [***] indicates significance at the 10 (5) [1] percent level using two-tailed tests.

Table 4: Billing rates of auditors auditing both public and private clients

Panel A: Higher ranks of team members

	(2) Part	(3) Dir	(4) SenMan
Public	-23.948 (-0.75)	0.002 (0.00)	-31.235*** (-2.85)
Fixed effect on auditors	Yes	Yes	Yes
Constant	2419.158*** (30.79)	2875.648*** (180.02)	1915.617*** (53.36)
<i>N</i>	272	100	96
adj. <i>R</i> ²	0.816	0.997	0.968

Panel B: Lower ranks of team members

	(1) Manag	(2) AssMan	(3) SenAss	(4) Assoc
Public	-5.373 (-1.04)	-17.000*** (-2.98)	-3.801 (-1.38)	1.141 (0.31)
Fixed effect on auditors	Yes	Yes	Yes	Yes
Constant	1252.755*** (64.48)	1250.032*** (37.41)	1101.900*** (60.70)	674.430*** (26.19)
<i>N</i>	124	159	404	436
adj. <i>R</i> ²	0.981	0.966	0.986	0.965

Panel C: Billing rates of partners that audit both public and private firms

EmployeeID	Public		Private		DiffBilling	DiffPercent
	MeanBilling	NumClients	MeanBilling	NumClients		
1	2,400	8	2,400	2	0	0.00%
2	4,000	6	4,000	3	0	0.00%
3	3,300	3	3,500	1	-200	-5.88%
4	4,100	5	4,100	5	0	0.00%
5	3,650	8	4,100	2	-450	-11.61%
6	4,500	1	4,500	3	0	0.00%
7	3,300	3	3,300	2	0	0.00%
8	3,454	9	3,500	2	-46	-1.33%
9	4,000	4	4,000	1	0	0.00%
10	3,876	1	3,892	1	-16	-0.41%
11	4,500	2	4,500	1	0	0.00%
12	2,764	1	3,300	1	-536	-17.68%
13	3,896	4	4,000	1	-104	-2.62%
14	3,400	3	3,400	1	0	0.00%
15	3,200	1	3,200	1	0	0.00%
16	3,334	5	3,200	2	134	4.09%
17	3,500	4	3,500	5	0	0.00%
18	4,000	6	4,000	3	0	0.00%
19	4,500	1	4,500	1	0	0.00%
20	4,000	4	4,000	3	0	0.00%
21	3,800	1	3,800	1	0	0.00%

22	3,300	3	3,300	3	0	0.00%
23	3,778	7	3,721	2	57	1.53%
24	2,400	3	2,400	2	0	0.00%
25	3,696	3	3,667	2	29	0.79%
26	4,000	4	4,000	2	0	0.00%
27	4,000	1	4,000	1	0	0.00%
28	4,000	8	4,000	1	0	0.00%
29	3,093	2	3,093	1	0	-0.01%
30	3,500	5	3,500	2	0	0.00%
31	3,200	1	3,376	4	-176	-5.36%
32	2,900	4	2,900	1	0	0.00%
33	3,500	3	3,500	1	0	0.00%
34	3,700	5	3,700	2	0	0.00%
35	4,102	3	4,200	3	-98	-2.37%
36	4,000	3	4,000	4	0	0.00%
37	4,300	7	4,300	5	0	0.00%
38	4,300	7	4,300	2	0	0.00%
39	3,200	6	3,200	1	0	0.00%
40	4,300	3	4,300	1	0	0.00%
41	3,600	4	3,600	1	0	0.00%
42	4,100	12	4,100	5	0	0.00%
43	3,070	3	3,100	1	-30	-0.98%
44	2,975	2	2,988	2	-13	-0.42%
45	2,900	1	2,900	1	0	0.00%
#TeamPartners		180		92		
#UniquePartners		45		45		
MeanBilling1	3,631		3,663		-32	-0.88%
MeanBilling2	3,668		3,736		-68	-1.84%

This table compares billing rates for public and private clients of the same auditors that audit both public and private clients to examine whether Big 4 audit firms charge risk premium to public clients by increasing auditors' billing rates, compared to private clients, using the propensity score matched sample. Panel A (B) reports results of regressing billing rates of auditors that audit both public clients and private clients on the test variable, *Public*, for higher (lower) ranked auditors. *Public* is 1 if the audit client is public firm, which proxies high engagement risk, and 0 if the audit client is private firm, which proxies low engagement risk. Fixed effect on auditors is used in all the regressions. Panel C presents, for each of the partners that audit both public and private clients, the average of billing rates (*MeanBilling*) and the number of clients (*NumClients*) for public clients (*Public*) and private clients (*Private*). The last two columns exhibit the difference of *MeanBilling* for public and private clients in magnitude (*DiffBilling*) and in percentage (*DiffPercent*). The last two rows report the average of billing rates of *MeanBilling* (*MeanBilling1*) and the *NumClients* weighted average of billing rates of *MeanBilling* (*MeanBilling2*). The two rows next to the last two report the total number of team-partners observations (*#TeamPartners*) and the number of unique partners (*#UniquePartners*).

Table 5: Billing rates of auditors only auditing public *or* private clients

Panel A: Higher ranks of team members					
	Part	Dir	SenMan		
Public	516.6** (3.40)	512.5 (1.62)	18.91 (0.23)		
Constant	2966.3*** (22.00)	2187.0*** (9.01)	1846.2*** (28.68)		
<i>N</i>	89	75	64		
Panel B: Lower ranks of team members					
	Manag	AssMan	SenAss	Assoc	
Public	-131.1** (-2.87)	-36.24 (-1.20)	5.549 (0.23)	-17.76 (-0.67)	
Constant	1623.0*** (47.91)	1266.2*** (59.24)	978.9*** (55.33)	788.3*** (42.55)	
<i>N</i>	113	161	166	156	
Panel C: Billing rates of partners that <i>only</i> audit public clients or private clients in the matched sample					
	Public		Private		
	MeanBilling	NumClients	MeanBilling	NumClients	DiffBilling
	2,400	5	2,000	1	
	2,407	1	2,325	1	
	2,700	2	2,400	2	
	2,800	8	2,450	2	
	3,000	2	2,600	2	
	3,200	2	2,650	1	
	3,236	1	2,650	1	
	3,264	1	3,088	1	
	3,300	4	3,100	1	
	3,400	7	3,291	1	
	3,466	1	3,300	1	
	3,500	5	3,600	1	
	3,600	1	3,666	1	
	3,650	2	3,790	1	
	3,693	1	4,000	2	
	3,800	2			
	3,900	1			
	4,000	8			
	4,100	8			
	4,175	1			
	4,181	1			
	4,200	5			
	4,484	1			
#TeamPartners		70		19	
#UniquePartners		32		19	
MeanBilling1	3,498		2,994		16.84%
MeanBilling2	3,483		2,966		17.42%

This table compares billing rates for public and private clients of *different* auditors that audit *either* public *or* private clients to examine whether Big 4 audit firms allocate better auditors to public clients, compared to private clients, using the propensity score matched sample. Panel A (B) reports results of regressing billing rates of auditors that audit either public clients or private clients on the test variable, *Public*, for higher (lower) ranked auditors. Panel C presents the average of billing rates (*MeanBilling*) and the number of clients (*NumClients*) for partners only auditing public clients (*Public*) and partners only auditing private clients (*Private*). The last two

rows report the average of billing rates of *MeanBilling (MeanBilling1)* and the *NumClients* weighted average of billing rates of *MeanBilling (MeanBilling2)*. The last column for these two rows presents the difference in percentage. The two rows next to the last two report the total number of team-partners observations (*#TeamPartners*) and the number of unique partners (*#UniquePartners*).

Table 6: Partners' billing rates using full sample

Panel A: Billing rates of partners auditing both public and private clients in the full sample

EmployeeID	Public		Private		DiffBilling	DiffPercent
	MeanBilling	NumClients	MeanBilling	NumClients		
1	2,400	8	2,400	4	0	0.00%
2	4,000	6	4,000	9	0	0.00%
3	3,300	3	3,392	18	-92	-2.74%
4	2,400	1	2,400	2	0	0.00%
5	4,484	1	4,500	1	-16	-0.37%
6	3,400	7	3,400	11	0	0.00%
7	4,100	5	4,100	13	0	0.00%
8	3,650	8	4,100	10	-450	-11.61%
9	4,500	1	4,500	5	0	0.00%
10	3,500	4	3,500	8	0	0.00%
11	3,300	3	3,300	15	0	0.00%
12	3,454	9	3,500	6	-46	-1.33%
13	4,000	4	4,000	8	0	0.00%
14	3,876	1	3,884	6	-8	-0.19%
15	4,196	5	4,200	1	-4	-0.09%
16	4,500	2	4,500	6	0	0.00%
17	2,764	1	3,300	6	-536	-17.68%
18	3,896	4	3,800	3	96	2.50%
19	3,400	3	3,400	13	0	0.00%
20	3,200	1	3,200	12	0	0.00%
21	2,400	1	2,400	2	0	0.00%
22	3,334	5	3,200	13	134	4.09%
23	4,000	1	4,000	4	0	0.00%
24	3,500	4	3,500	13	0	0.00%
25	4,000	6	4,000	11	0	0.00%
26	3,693	1	3,677	1	16	0.43%
27	4,500	1	4,500	2	0	0.00%
28	4,000	4	4,000	9	0	0.00%
29	3,800	1	3,800	3	0	0.00%
30	3,300	3	3,300	7	0	0.00%
31	3,650	1	3,579	3	71	1.96%
32	3,778	7	3,771	8	7	0.18%
33	4,100	3	4,100	13	0	0.00%
34	2,400	3	2,400	5	0	0.00%
35	3,558	2	3,453	12	105	3.00%
36	3,696	3	3,687	5	9	0.25%
37	3,500	1	3,500	2	0	0.00%
38	2,400	1	2,400	3	0	0.00%
39	4,000	4	4,000	13	0	0.00%
40	4,000	1	3,988	5	12	0.29%
41	2,400	1	2,400	4	0	0.00%
42	4,000	1	4,000	12	0	0.00%
43	3,267	3	3,141	8	125	3.91%

44	4,000	8	4,000	6	0	0.00%
45	2,407	1	2,411	2	-4	-0.18%
46	3,093	2	3,081	7	12	0.40%
47	3,500	5	3,500	6	0	0.00%
48	3,200	1	3,370	6	-170	-5.18%
49	2,900	4	2,900	3	0	0.00%
50	3,500	3	3,500	8	0	0.00%
51	4,188	2	4,122	1	66	1.58%
52	3,700	5	3,700	12	0	0.00%
53	3,800	2	3,800	3	0	0.00%
54	4,102	3	4,164	9	-62	-1.51%
55	4,000	3	4,000	7	0	0.00%
56	4,300	7	4,300	18	0	0.00%
57	3,600	1	3,600	3	0	0.00%
58	4,300	7	4,300	10	0	0.00%
59	3,200	6	3,200	6	0	0.00%
60	4,300	3	4,300	1	0	0.00%
61	3,600	4	3,600	6	0	0.00%
62	3,000	2	3,000	1	0	0.00%
63	4,100	12	4,100	8	0	0.00%
64	3,200	2	3,200	6	0	0.00%
65	3,070	3	3,062	6	8	0.27%
66	4,000	4	4,000	1	0	0.00%
67	2,975	2	2,986	8	-11	-0.36%
68	3,300	3	3,300	9	0	0.00%
69	2,800	6	2,800	5	0	0.00%
70	2,900	1	2,900	3	0	0.00%
71	2,700	2	2,700	5	0	0.00%
#TeamPartners		239		481		
#UniquePartners		71		71		
MeanBilling1	3,540		3,550		-10	-0.29%
MeanBilling2	3,614		3,609		5	0.14%

Panel B: Billing rates of partners only auditing private clients in the full sample

EmployeeID	Private	
	Billing	NumClients
1	2,400	2
2	3,000	10
3	2,450	3
4	3,666	4
5	2,650	2
6	2,450	7
7	3,600	2
8	2,500	2
9	2,600	3
10	2,400	2
11	3,050	3
12	2,400	4
13	4,000	14
14	2,400	2
15	2,850	5
16	2,400	4

17	2,650	4
18	2,400	3
19	1,900	7
20	3,793	11
21	2,400	8
22	2,400	3
23	2,400	3
24	2,600	7
25	3,600	6
26	2,600	3
27	2,650	3
28	4,000	6
29	2,000	3
30	3,100	12
31	2,400	3
32	2,450	2
33	2,450	3
34	2,800	2
35	2,450	6
36	3,700	4
37	3,300	3
38	3,300	4
39	3,291	12
40	2,650	2
41	2,000	8
42	2,400	2
43	2,400	2
44	2,325	3
45	2,900	5
46	3,700	2
47	3,078	3
48	2,333	3
#TeamPartners		217
#UniquePartners		48
MeanBilling1	2,776	
MeanBilling2	2,902	

Panel C: Regression results comparing billing rates of partners auditing both public and private clients and partners only auditing private clients

(1)	
Part	
PartnerBoth	877.690*** (7.45)
Constant	2733.156*** (26.46)
<i>N</i>	937
adj. <i>R</i> ²	0.055

This table compares billing rates of partners for public and private clients using the full sample. Panel A presents, for each of the partners that audit both public and private clients, the average of billing rates (*MeanBilling*) and the number of clients (*NumClients*) for public clients (*Public*) and private clients (*Private*). The last two columns exhibit the difference of *MeanBilling* for public and private clients in magnitude (*DiffBilling*) and in percentage (*DiffPercent*). The last two rows report the average of billing rates of *MeanBilling* (*MeanBilling1*) and the *NumClients* weighted average of billing rates of *MeanBilling* (*MeanBilling2*). The two rows next to the last two report the total number of team-partners observations (*#TeamPartners*) and the number of unique partners (*#UniquePartners*). Panel B is similar to Panel A, except that

it reports the billing rates for partners that only audit private clients in the full sample. There are only two partners that only audit public firms in the full sample and the results are not reported. Panel C reports results of regressing billing rates on *PartnerBoth*, which is 1 if the partner audits both public and private clients, and 0 if the partner only audit private clients in the full sample.