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How does auditors' work stress affect audit quality? Empirical evidence from the Chinese stock market

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ABSTRACT

With reference to the Job Demands–Control Model, we empirically examine the effect of auditors' work stress on audit quality using a sample of Chinese A-share listed companies and their signature auditors from 2009 to 2013. The results show that (1) there is generally no pervasive deterioration in audit quality resulting from auditors' work stress; (2) there is a significant negative association between work stress and audit quality in the initial audits of new clients; and (3) the perception of work stress depends on auditors' individual characteristics. Auditors from international audit firms and those in the role of partner respond more strongly to work stress than industry experts. Auditors tend to react more intensively when dealing with state-owned companies. We suggest that audit firms attach more importance to auditors' work stress and rationalize their allocation of audit resources to ensure high audit quality.

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1. Introduction

Work stress has been referred to as an “occupational flu” in this era of the knowledge-driven economy (Lu, 2006). Under the mechanism of market competition, various professionals such as lawyers, doctors and executives all face some degree of work stress, as do auditors, who enjoy the reputation of the economic police. In the US, the Public Company Accounting Oversight Board has expressed concern that audit quality might be compromised due to auditors' workload or time pressure.¹ Auditors in China suffer from pervasive work

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stress resulting from time limits, human resources, liability risks, etc. Work stress peaks in the busy season, from January to February, when auditors' work schedules average more than 10 h per day. It is therefore logical to question (1) whether and how pervasive work stress affects auditors' decision-making and audit quality; and (2) whether auditors' response to work stress supports conflict theory or incentive theory, or both?

Despite its widespread existence in audit practice, academic studies concerning auditors' work stress are rare. The unavailability of large samples and the consequent absence of empirical evidence mean that a majority of studies are based on questionnaire surveys or experimental studies, and there is still no consensus among researchers (Jones et al., 2010; Liu and Zhang, 2008). Fortunately, we have access to the mandatorily disclosed information on Chinese listed companies' signature auditors required by the China Securities Regulatory Commission (CSRC). Therefore, in this paper we empirically examine the effects of auditors' individual work stress on audit quality using large samples of listed companies and their corresponding signature auditors in the Chinese A-share market from 2009 to 2013, following the framework of the Job Demands–Control model proposed by Karasek (1979). We hope that our work will help to clarify the mechanism by which work stress affects audit behavior and the coping system regarding the stress response.

Specifically, the primary originalities and contributions of this paper are as follows: (1) Despite the fact that auditors' work stress is familiar to us in practice, academic studies concerning the issue are seldom addressed. This study helps to fill this gap by offering a logical argument and empirical evidence in the context of the Chinese stock market. (2) Our conclusion, which is more systematic than those in the literature based solely on the analysis of work demands (stressors), is drawn from a comprehensive study of the combined effects of work demands and work control, while taking into account the particular demands of auditing. (3) The paper enriches related studies on auditors' work stress from a psychological perspective by taking into consideration individual differences in perception, thus leading to the finding that responses to work stress vary significantly from person to person.

2. Literature review

Since the early twentieth century, with the development of industrialization and informatization, work stress has become an important issue in the fields of psychology, behavioral science and sociology. There has been widespread discussion regarding the definition of work stress, its influence mechanism and coping strategies, resulting in a series of outstanding academic achievements represented by Stimulation Theory, Response Theory (Selye, 1976) and Interaction Theory (Karasek, 1979), among others. The above studies indicate that individual responses to work stress can affect physical and mental health, work quality and even organizational performance through the stimulus and response system (Janssen, 2001; Lu et al., 2010). However, the effect of work stress on audit quality is seldom addressed in the field of auditing studies.

First, among the diagnoses and experimental studies, Soobaroyen and Chengabroyan (2006) and Agoglia et al. (2010) argue that stress due to work or time budgeting tends to impair audit efficiency and quality. Liu (2008) claims that the time pressure of audit engagements could impede the proper implementation of audit procedures and damage audit quality, according to a survey of a nationwide audit firm. Stress due to time budgeting or deadlines also tends to aggravate auditors' perceived pressure (Margheim et al., 2011). Second, in terms of empirical studies, López and Peters (2012) argue that workloads can damage audit quality at the level of the audit firm. A few scholars focusing on "busyness" (which differs from work stress) find it harmful to audit quality (e.g., Sundgren and Svanström, 2014), while others do not. For example, Goodwin and Wu (2016) suggest that the relationship between auditor busyness and audit quality depends on whether the former is in equilibrium, yet Choo (1986) finds an inverse U-shaped relation between the two. Choo's work is supported by Huang and Bai (2014), who draw a similar conclusion from the results of a questionnaire survey involving several audit firms in China's Nanjing, Suzhou and other regions. However, the universality of that conclusion is still under question given the limited representativeness of the study sample.

In the past 20 years, scholars have begun to consider auditors' work stress. However, the academic results are not fruitful, nor are the findings consistent. What is more, the literature discussing the effects of work stress on audit performance and quality is limited by a lack of reliability and generalizability, because most studies use experimental or survey designs. We are very fortunate that the accessibility of personal information on the auditors of Chinese listed companies, the market competition environment and the centralized auditing of

annual reports in peak season make it possible to carry out a systematic study. Given this, in this paper we provide an in-depth investigation of the topic from an individual perspective to address the shortage of academic research. This paper is expected to contribute to a solution to the practical issues concerning auditors' work stress, and at the same time providing scientific evidence for perfecting the regulatory policies on auditors' behavior.

3. Theoretical analysis and hypothesis development

Combining various interpretations of work stress, we define it as a series of physiological, psychological and behavioral responses due to the continuing effects of one or more stressors on individuals in an organization (Xu, 1999). In terms of auditing, auditors' work stress mainly results from the conflict between limited auditing resources and overwhelming audit workload within a limited time window (López and Peters, 2012).

According to the Job Demands–Control Model proposed by Karasek (1979), which is widely recognized in the fields of psychology and management science, work stress includes two key aspects: job demands and job control. The effect of work stress depends on the interaction between work demands and work control.² Work demands refer to difficulty and workload, including the amount of work, time and role conflicts; work control reflects the individual's response to work demands, including coping strategies and relief mechanisms. Previous studies find that work stress is positively related to the intensity of work demands, and negatively associated with work control (Landsbergis, 1988; Fletcher and Jones, 1993); moreover, work control is helpful for improving job satisfaction and job performance (Greenberger et al., 1989; Dwyer and Ganster, 1991). In terms of auditing work, auditors' work demands (stressors) include multiple aspects ranging from time pressure and workload, cost control and performance evaluation to legal risk and responsibility. In view of work demands, an auditor's work control ability (coping strategies) usually includes time planning, allocation of manpower and material resources, adjustment of the audit plan, etc.³ Then, the joint effect depends on the effectiveness of the auditor's work control over work demands, and the heterogeneity of an auditor's work control ability will lead to different responses. Hence, given the quality control mechanism of an audit firm, how does an auditor's work stress influence the audit behavior and audit quality? To clarify this mechanism, we analyze it from the perspective of time pressure, work load, cost and assessment, in the context of the competitive environment and institutional background of the Chinese audit market.

Time pressure is the main concern. Many studies show that time pressure, including time limitation pressure and time budget pressure, is the main factor affecting auditor behavior (Rhode, 1978; Margheim et al., 2011). First, the CSRC stipulates that all listed companies should disclose their audited financial reports before 30 April, which means that auditors face a clear time limitation pressure because they must finish all of the audit work within the prescribed time and issue a fair audit report. Usually, the auditing process is more complex when the auditee is larger, and auditors will bear a greater workload and take longer to complete the audit, so the time pressure is more obvious. For example, the auditor of PetroChina listed on the Main Board will experience greater time pressure than the auditor of Donghua Energy Ltd., an SME-listed company in the energy industry. Second, according to preliminary data from the past five years, auditors on average sign the financial statements of more than three listed companies a year in the China stock market. The auditors in charge sign the audit reports of more than four companies on average, which means that they face a certain amount of stress from time budgeting. They have to allocate their work hours reasonably according to the features of each auditee. Usually, if an auditor takes a number of clients in a fiscal year, the working time allocated to each client will be less, and he will bear a heavier time budgeting pressure. Under the dual pressures of a prescribed time limit and time budgeting, auditors must take corresponding control measures, including allocating time to all clients and arranging the audit staff, but whether these control measures can work effectively depends on how well the time pressure is controlled. In general, as the time limitation and time budget pressures increase, the auditor's boundary of control is likely to be exceeded, especially in the busy audit season when a number of engagements need to be carried out in parallel. Time pressure is

² In this paper, job demands and work demands and job control and work control are used synonymously.

³ In general, the work control strategies of an audit firm mainly include organizational support, incentive mechanism, etc., but every auditor uses each of these strategies.

greater, and it becomes difficult to ensure that each client has enough disposable time to implement full audit procedures appropriately, so auditors have to compress time or even cut short audit procedures (Willett and Page, 1996; Soobaroyen and Chengabroyan, 2006), which directly affects the reliability and adequacy of the audit evidence obtained, and thereby affects the efficiency of the audit judgment (Pierce and Sweeney, 2004).

Second, workload and job burnout are discussed. In China, auditing is recognized as a special service performed under high stress, but with low job satisfaction. Generally, in the busy annual audit season, the more engagements an auditor undertakes, the more difficult or complicated the auditing projects, so the greater the workload intensity. In view of the high intensity of the workload, the auditor and his team often implement control measures such as lengthening their working hours, sometimes for several months, which undoubtedly influences the efficiency and effectiveness of auditing work. The possible negative consequences include the unreasonable compression of audit time, and following audit procedures in a parrot-like fashion (Agoglia et al., 2010). More importantly, auditors who experience intense time pressure and bear a high-intensity workload, beyond their capacity and over a long period, will suffer from job burnout.⁴ Moreover, the greater the workload pressure, the stronger the sense of job burnout will be. Further, auditors' job burnout can lead to emotional exhaustion, extreme tiredness or even depersonalization (Sweeney and Summers, 2002). The potential consequences of such manifestations include reduced professional skepticism and audit efficiency, such as accepting questionable evidence; less recalculation or re-execution of programs that are time consuming and labor intensive; and a reduction in the necessary analyses, which make it difficult to identify inconsistent fluctuations between the auditee and its industry information or anomalies between the actual and expected data. Hence, there is less likelihood of detecting accounting differences or misstatements and an increased probability of audit failure, finally resulting in reduced audit quality (Margheim et al., 2011).

Third, audit cost and performance appraisal are considered. Although people regard auditors as the “economic police,” auditors are responsible for their own profits and losses, and are economic actors with limited rationality. They must, therefore, comply with the “cost-benefit principle,” with limitations on the expenditures for each auditee, including manpower and physical resources. It is necessary to match audit quality with audit fees. In general, under the premise of the given audit resources of an audit firm, the more complex and difficult the audit projects, the more clients there are, and the greater the resource constraints and cost control pressure. In the busy audit season, the cost control pressure on auditors conflicts with the quality control requirements of the audit firm. This is especially true when there is intense audit market competition, and performance appraisal systems tend to be based on the time budget. In short, this kind of conflict increases the potential for unethical behavior, such as spending less time on audits or even violating auditing standards, thus increasing the probability of audit failure (Liu, 2008).

Fourth, auditors are subject to legal risks and responsibilities. Given the changing economic environment, industry globalization, increasingly complicated business transactions and financial accounting, auditors are facing growing difficulties in their work. However, public investors tend to place increasing expectations on auditors due to contract objectives, decision making and risk aversion (Schipper and Vincent, 2003). In addition, with the gradual improvements in audit laws and regulations, the legal risks and responsibilities of audit firms and auditors for failing to carry out proper auditing are become increasingly explicit. In contrast, improvements in audit knowledge and technological innovations are relatively slow, resulting in unbalanced development and an increasing gap between investors' expectations and auditors' ability. This gap further intensifies auditors' stress and escalates the effects of stress on auditing behavior and quality.

In summary, individual work stress is created by the combined effects of time pressure, workload, cost control, performance appraisal, legal risks and responsibilities. This stress, along with the resulting job burnout, influences auditors' psychological activities and behavioral decisions, which in turn affect audit efficiency and quality. Usually, the greater the stress, the greater the observed effects; however, consistent with Incentive Theory, it is possible that the effects of stress on audit quality might be limited or even beneficial when there are effective work controls on work demands (McClenahan et al., 2007). Nevertheless, the relationship between

⁴ Job burnout is a comprehensive set of symptoms including individual emotional exhaustion, the disintegration of personality and low personal accomplishment.

work stress and audit quality remains an empirical question that is yet to be tested. Thus, we propose the following hypothesis:

H1. Auditors' work stress affects audit quality.

Next, we consider whether the relationship between auditors' work stress and audit quality is subject to other factors due to the distinctiveness of auditing work. Audit tenure may be one such factor. Specifically, to evaluate the audit risk during the initial audit of a new client, the auditor must gain a comprehensive understanding of the client's operating characteristics, accounting policies, industry development and other information. In this case, the auditor needs to invest more initial audit costs in the new client, including working hours, human and material resources and so on. The more clients an auditor is responsible for, the greater the total workload and the fewer working hours and audit resources he will be able to spend on each client, especially new clients. This is how the direct conflict between work demand and work control is created. Moreover, the more intense the conflict, the greater the work stress and its negative effects are likely to be, and the greater the negative consequences on the audit performance, the provision of sufficient evidence and the efficiency of the audit judgment. Correspondingly, in non-initial audits for continuing clients,⁵ given a certain total workload and stress, the effectiveness of work controls on work demands tends to improve with subsequent audits, and the accumulation of experience and knowledge acquired through the familiarity with and mastery of specific client and industry information. The improvement in effectiveness then mitigates the negative effects of work stress on audit quality. This analysis leads to the second hypothesis:

H2. The influence of auditors' work stress on audit quality is mainly observed in the initial audit engagement of a new client.

4. Research design

4.1. Sample and data

Our sample comprises A-share companies listed on the Shanghai and Shenzhen stock markets from 2009 to 2013. Financial data for these companies are derived from the CSMAR database, and each auditor's personal information is manually collated and corrected according to company annual reports and information system of the CICPA. Consistent with former studies, we remove (1) companies in the finance industry; (2) companies with missing financial data for the previous year, with initial public offerings or with less than 15 industry-year observations in the calculation of discretionary accruals; and (3) companies with missing data on the signature auditor. Additionally, we winsorize the continuous variables in the intervals 0–1% and 99–100%. The final sample includes 9639 firm-year observations.

4.2. Variables and model

4.2.1. Variable definitions

- (1) Auditors' work stress (*WS*). Work stress is measured by the number of listed companies audited by an auditor, taking into consideration both the number of companies and the business complexity of each company. Therefore, we estimate work stress by the following equation:

$$WS = \frac{\sum_{i=1}^m \sum_{j=1}^n TA_{ij}}{m} \quad (\text{a1})$$

where for listed company *j* audited by auditor *i*, TA_{ij} refers to the natural logarithm of total assets; *n* is the total number of listed companies audited by auditor *i* in the fiscal year; and *m* is the number of signature auditors of specific company *j*. In the majority of cases, there are two auditors in charge of audit-

⁵ In this paper, an "old client" refers to a company that has been audited by a signature auditor at least once; that is, the audit tenure is at least two years.

ing a company's annual report ($m = 2$), although in a few cases there are three ($m = 3$, accounting for about 1.75%). *WS* reflects the average work stress borne by the two or three signature auditors of a specific company.

- (2) Audit quality. Audit quality is measured by the absolute value of discretionary accruals (*DA*) using the *Modified Jones Model*. In addition, we use audit failure as a substitute variable in the robustness tests.
- (3) Initial audit. The initial audit is defined as the first audit of a company and the signing of the corresponding annual reports: *FST* equals 1 for new clients, and 0 otherwise (see Table 1).

4.3. Model design

(1) Test of Hypothesis 1

We establish model 1 to test the influence of auditors' work stress on audit quality.

$$|DA| = \alpha_0 + \alpha_1 WS + \sum \beta_i Company_chara_i + \sum \lambda_j Auditfirm_chara_j + \sum \mu_k Auditor_chara_k + \sum \phi_l year_l + \sum \varphi_m ind_m + \varepsilon \quad (1)$$

$|DA|$ refers to the absolute value of discretionary accruals, as a proxy of audit quality. *WS* refers to auditors' work stress, which is expected to be positive. We take three determinants of audit quality into consideration: company characteristics (*Company_chara*), audit firm characteristics (*Auditfirm_chara*) and auditor characteristics (*Auditor_chara*), drawing on the experience of Xue et al. (2012), Gul et al. (2013), among others.

Table 1
Variable definitions.

Category	Variable	Symbol	Definition
<i>Explained variable</i>	Audit quality	$ DA $	The absolute value of discretionary accruals
<i>Explanatory variables</i>	Work stress	<i>WS</i>	Formula (a1)
	Initial audit	<i>FST</i>	Initial audit equals 1; 0 otherwise
<i>Company_chara</i>	Financial situation	<i>debt</i>	Asset-liability ratio
	Size	<i>size</i>	The natural logarithm of total assets
	Cash flow	<i>cf</i>	Net cash flow of operating activities per share
	Special treatment	<i>st</i>	Special treatment equals 1; 0 otherwise
	Litigation risk	<i>risk</i>	Pending litigation risk equals 1; 0 otherwise
	Earnings	<i>loss</i>	Net profit is negative equals 1; 0 otherwise
	Inventory ratio	<i>inv</i>	Total inventory/operation revenue
	Accounts receivable	<i>rec</i>	Accounts receivable/operation revenue
	Company value	<i>tq</i>	Market value/replacement cost
	Company governance	<i>spv</i>	Size of the board of supervisors
	Age of company	<i>age</i>	Age of company
<i>Auditfirm_chara</i>	Audit firm size	<i>big</i>	Equals 1 for Big-4 audit firm; 0 otherwise
	Audit firm tenure	<i>ften</i>	The cumulative audit years of audit firm
	Audit firm change	<i>chg</i>	Equals 1 if the audit firm has changed; 0 otherwise
	Audit firm Transformation	<i>trs</i>	Equals 1 if the audit firm changes to a limited liability partnership; 0 otherwise
	<i>Auditor_chara</i>	Gender	<i>gen</i>
Qualification		<i>deg</i>	Equals 1 if more than one auditor has a master's degree; 0 otherwise
Experience		<i>epr</i>	The average number of signatures for listed companies of the auditor in previous years
Client dependence		<i>imp</i>	Average of a specific client/all client assets
<i>Fixed Effect</i>		Year, Industry	<i>year, ind</i>

Table 2
Descriptive statistics.

	N	Mean	Median	Min	Max	Std
<i> DA </i>	9639	0.074	0.049	0.001	0.523	0.085
<i>WS</i>	9639	67.312	60.151	20.411	191.865	35.909
<i>FST</i>	9639	0.145	0	0	1	0.352
<i>debt</i>	9639	0.466	0.469	0.046	1.161	0.233
<i>size</i>	9639	21.823	21.660	19.192	25.765	1.281
<i>cf</i>	9639	0.348	0.257	−2.192	3.485	0.797
<i>st</i>	9639	0.048	0	0	1	0.213
<i>risk</i>	9639	0.133	0	0	1	0.339
<i>loss</i>	9639	0.093	0	0	1	0.291
<i>inv</i>	9639	0.433	0.193	0	5.397	0.813
<i>rec</i>	9639	0.187	0.128	0.0004	1.002	0.196
<i>tq</i>	9639	1.894	1.503	0.594	7.935	1.243
<i>spv</i>	9639	0.426	0.375	0.200	0.833	0.129
<i>age</i>	9639	13.617	13	1	35	5.094
<i>big</i>	9639	0.057	0	0	1	0.232
<i>ften</i>	9639	6.049	4	1	21	4.832
<i>chg</i>	9639	0.067	0	0	1	0.251
<i>trs</i>	9639	0.530	1	0	1	0.499
<i>gen</i>	9639	0.496	0	0	1	0.500
<i>deg</i>	9639	0.216	0	0	1	0.412
<i>epr</i>	9639	16.279	11.5	0	117.5	15.235
<i>imp</i>	9639	0.528	0.548	0.134	1	0.235

(2) Test of Hypothesis 2

We establish model 2 to test the influence of auditors' work stress on audit quality with different audit tenures.

$$|DA| = \alpha_0 + \alpha_1 WS + \alpha_2 FST + \alpha_3 WS * FST + \sum \beta_i Company_chara_i + \sum \lambda_j Auditfirm_chara_j + \sum \mu_k Auditor_chara_k + \sum \phi_l year_l + \sum \varphi_m ind_m + \varepsilon \quad (2)$$

*WS * FST* refers to the interaction term between *WS* and *FST*, which is expected to be positive. To test hypothesis H2, the analysis is divided into two steps. First, we conduct a regression test on model 1 grouped by initial audit (*FST* equals 1 or 0), and second, we include the interaction term (*WS * FST*) and conduct another regression test on model 2.

5. Empirical results and analysis

5.1. Descriptive statistics and correlation analysis

Tables 2 and 3 report the descriptive statistics and correlation analyses.⁶ Table 2 shows that there is substantial variation in *WS*, making it suitable for analyzing work stress reactions at the individual level. In terms of the composition of audit clients, new clients account for about 14.5%. Table 3 shows that the correlation between *WS* and *|DA|* is insignificant in the full sample. After distinguishing by audit tenure, the correlation between *WS* and *|DA|* is significantly positive at the 5% level in the initial audit, while it is insignificant in the non-initial audit. Moreover, the correlation between *WS * FST* and *|DA|* is significantly

⁶ We also test whether there is a u-shaped relationship between work stress and audit quality. The results show that the Pearson coefficient of *|DA|* and *WS* squared is not significant, and the univariate and multivariate analyses show that the regression coefficient of *WS* squared is not significant. Moreover, the robustness test using alternative measurements of work stress and audit quality does not support a u-shaped relationship.

Table 3
Pearson correlations.

Pearson	WS			WS * FST
	ALL	FST = 1	FST = 0	
DA	–0.001	0.061**	–0.007	0.075***

Notes: Because of the limited space, this table only lists the correlation coefficients of the main variables.

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

positive. This indicates that the effect of auditors' work stress on audit quality is more obvious in the initial audits of new clients, which is yet to be further tested.

5.2. Multivariate analysis

5.2.1. Preliminary test of the full sample

Table 4 reports the regression results of the full sample. The results of model 1 show that when audit quality is measured by |DA|, the coefficient of WS is positive but not significant, suggesting that work stress does not impair audit quality overall in the Chinese audit market. Therefore, the finding that auditors' work stress is controlled fails to support H1. However, this does not mean that auditors' work stress has no effect, as we still need to consider the particular details of audit work.

5.2.2. Considering audit tenure

Considering audit tenure, first, the result of model (1) shows that the coefficient of WS is significantly positive at the 1% level in the initial audits of new customers ($FST = 1$), but decreases and is non-significant in non-initial audits ($FST = 0$). Moreover, the results of the Chow test show a significant difference between these two groups. Second, when the interaction term ($WS * FST$) is included in model (2), the coefficient of $WS * FST$ is significantly positive at the 5% level. These results show that signature auditors have different work stress reactions with different audit tenures. The effect of work stress on audit quality is mainly indicated in the initial audit, reflecting a negative reaction, which supports H2. In other words, in the initial audits of new clients, the conflict between work demands and work control exerts a negative effect on audit efficiency and audit quality due to unclear business features, accounting methods and industry information. This evidence supports the Conflict Theory. However, in the non-initial audit stage, the effects of learning by doing, which occur with the accumulation of audit experience and the acquisition of relevant knowledge, can enhance the signature auditor's work control capability and ease the negative effect of work stress.

Among the control variables, some coefficients of *size* and *cf* are significantly negative, while other coefficients of *debt*, *st* and *risk* are significantly positive, indicating that earnings quality is better in larger companies that have better cash flow. This result is consistent with previous studies (Xue et al., 2012). In addition, the significantly negative coefficient of *deg* suggests that highly educated auditors help to ensure a high quality audit.

6. Further analysis

6.1. Perception of work stress varies from person to person

Audit work has a distinct people-oriented characteristic, which means that auditors' perceptions of work stress and their reactions are likely to vary from person to person. Individuals differ in their ability to cope with the same level of work stress. Different auditors adopt different coping strategies with varying degrees of effectiveness, which eventually leads to work stress having different effects on audit quality. Previous studies also indicate that individual heterogeneity is an important factor affecting audit quality. There are two main factors that influence auditors' perceptions of stress: individual heterogeneities, such as the auditor's role,

Table 4
Multivariate regression.

	Model (1)	Model (1) group test		Model (2)
		<i>FST</i> = 1	<i>FST</i> = 0	
<i>WS</i>	0.004(1.32)	0.021 ^{***} (2.84)	0.001(0.45)	0.001(0.26)
<i>Chow Test</i>			0.020 ^{***} (0.000)	
<i>FST</i>				0.004(0.06)
<i>WS * FST</i>				0.026 ^{**} (2.47)
<i>Debt</i>	0.041 ^{***} (3.85)	0.036 [*] (1.84)	0.043 ^{***} (4.26)	0.042 ^{***} (3.92)
<i>Size</i>	-0.006 ^{***} (-2.84)	-0.005(-0.78)	-0.006 ^{***} (-3.43)	-0.006 ^{***} (-2.61)
<i>Cf</i>	-0.013 ^{***} (-3.13)	-0.021 ^{***} (-3.58)	-0.012 ^{***} (-2.81)	-0.013 ^{***} (-3.15)
<i>st</i>	0.020 ^{***} (3.94)	0.034 [*] (1.87)	0.016 ^{***} (2.80)	0.020 ^{***} (3.93)
<i>risk</i>	0.006 ^{**} (2.49)	0.007(0.70)	0.005 ^{***} (2.70)	0.006 ^{**} (2.52)
<i>loss</i>	0.006(1.63)	0.009(0.58)	0.005(1.57)	0.006(1.52)
<i>inv</i>	0.003(0.58)	0.004(0.35)	0.002(0.56)	0.003(0.58)
<i>rec</i>	-0.0005(-0.06)	0.005(0.38)	-0.002(-0.22)	-0.0004(-0.06)
<i>tq</i>	0.006 ^{**} (3.77)	0.002(1.09)	0.007 ^{***} (4.48)	0.007 ^{***} (4.31)
<i>spv</i>	-0.006(-0.59)	-0.015(-0.54)	-0.003(-0.44)	-0.006(-0.55)
<i>age</i>	0.0002 [*] (1.73)	0.0001(0.06)	0.0003(1.38)	0.0003 [*] (1.95)
<i>big</i>	-0.0002(-0.04)	-0.002(-0.19)	-0.001(-0.11)	-0.001(-0.13)
<i>ften</i>	-0.001 ^{**} (-2.24)	-0.002(-1.49)	-0.0004(-1.42)	-0.0004 [*] (-1.86)
<i>chg</i>	0.008 [*] (1.88)	-0.003(-0.24)	-0.005(-1.30)	-0.001(-0.09)
<i>trs</i>	-0.002(-0.85)	-0.008 ^{**} (-2.31)	-0.0005(-0.16)	-0.002(-0.84)
<i>gen</i>	-0.002(-1.20)	-0.007 ^{**} (-2.03)	-0.002(-0.73)	-0.002(-1.14)
<i>deg</i>	-0.005 ^{***} (-3.20)	-0.006 [*] (-1.86)	-0.006 ^{***} (-3.20)	-0.006 ^{***} (-3.21)
<i>epr</i>	-0.000(-0.45)	-0.0002(-1.18)	0.0001(0.77)	0.000(0.31)
<i>imp</i>	0.002(0.41)	0.008(0.87)	0.005(0.77)	0.003(0.62)
<i>year, ind</i>	Controlled	Controlled	Controlled	Controlled
<i>adj R²</i>	0.079	0.097	0.076	0.079
<i>F</i>	18.61 ^{***}	4.14 ^{***}	15.99 ^{***}	18.35 ^{***}
<i>N</i>	9639	1396	8243	9639

Notes:

(1) For ease of understanding, the coefficients of the explanatory variables *WS* and *WS * FST* are multiplied by 100; the rest are unchanged.

(2) The Chow test results outside the brackets refer to the difference between the coefficients of the two groups and the significance level, and the *P* values are inside the brackets.

* *p* < 0.1.

** *p* < 0.05.

*** *p* < 0.01.

industry expertise, gender and age; and audit firm heterogeneities, such as the efficiency of quality control mechanisms, support mechanisms and mechanisms for sharing legal responsibility.

6.1.1. The role of signature auditors

In China, the annual financial reports of listed companies should be audited and signed by at least two auditors to clarify the legal responsibility, which means that the different roles of signature auditors determine different legal responsibilities. Specifically, partner auditors have responsibility for the residual control and income of the audit firm and thus bear more legal responsibilities than non-partners. In particular, after a partnership is transformed into a limited liability partnership, the legal responsibilities of the partners increase significantly. Therefore, it is possible that the different legal responsibilities of partners and non-partners may lead to differences in their reactions to stress.

For this purpose, we partition the full sample into two groups: partners (PART equals 1) and non-partners (PART equals 0).⁷ As shown in Panel A of Table 5, when PART equals 0, the regression coefficient of work stress (*WS*) is 0.016 and significant at the 5% level in the initial audit engagement of a new client. When PART

⁷ If all signature auditors are partners, we define it as a partners' group, and otherwise as a non-partners' group. We test the sample of non-initial audits (old clients), but do not draw any evidential conclusions.

Table 5
Further tests.

<i>Panel A: Further test 6.1</i>			
(1) Role	<i>PART</i> = 0	<i>PART</i> = 1	<i>ALL</i> ₁
<i>WS</i>	0.016 ^{**} (2.02)	0.061 ^{***} (3.77)	0.015 ^{**} (2.15)
<i>Chow test</i>		0.045 [*] (0.051)	
<i>PART</i>			−0.019 (−1.20)
<i>WS</i> * <i>PART</i>			0.033 ^{**} (2.44)
(2) Industry experts	<i>EXPT</i> = 0	<i>EXPT</i> = 1	<i>ALL</i> ₁
<i>WS</i>	0.025 ^{***} (2.93)	−0.013 (−0.51)	0.025 ^{***} (2.71)
<i>Chow test</i>		0.038 (0.588)	
<i>EXPT</i>			0.004 (0.32)
<i>WS</i> * <i>EXPT</i>			−0.016 ^{**} (−2.00)
(3) Gender	<i>GEN</i> = 0	<i>GEN</i> = 1	<i>ALL</i> ₁
<i>WS</i>	0.025 [*] (1.80)	0.018 ^{**} (2.03)	0.024 ^{***} (2.80)
<i>Chow test</i>		0.007 (0.181)	
<i>GEN</i>			−0.002 (−0.33)
<i>WS</i> * <i>GEN</i>			−0.008 (−0.74)
(4) Age	<i>OLD</i> = 0	<i>OLD</i> = 1	<i>ALL</i> ₁
<i>WS</i>	0.017 [*] (1.72)	0.019 [*] (1.71)	0.022 (1.63)
<i>Chow test</i>		0.002 (0.271)	
<i>OLD</i>			0.001 (0.16)
<i>WS</i> * <i>OLD</i>			−0.001 (−0.06)
(5) Audit firms	<i>BIG</i> = 0	<i>BIG</i> = 1	<i>ALL</i> ₁
<i>WS</i>	0.019 ^{**} (2.38)	0.148 ^{***} (2.82)	0.021 ^{***} (2.73)
<i>Chow test</i>		0.129 (0.901)	
<i>BIG</i>			−0.005 (−0.18)
<i>WS</i> * <i>BIG</i>			0.008 (0.11)
<i>Panel B: Further test 6.2</i>			
(1) SOE	<i>State</i> = 0	<i>State</i> = 1	<i>ALL</i> ₁
<i>WS</i>	0.016 [*] (1.68)	0.047 ^{**} (2.09)	0.017 [*] (1.93)
<i>Chow test</i>		0.031 (0.283)	
<i>State</i>			−0.027 ^{***} (−6.34)
<i>WS</i> * <i>State</i>			0.013 (0.99)
(2) Central enterprises	<i>Cent</i> = 0	<i>Cent</i> = 1	<i>ALL</i> ₁
<i>WS</i>	0.015 ^{**} (2.26)	0.103 ^{***} (2.98)	0.018 ^{**} (2.37)
<i>Chow test</i>		0.088 ^{**} (0.045)	
<i>Cent</i>			−0.025 ^{***} (−3.20)
<i>WS</i> * <i>Cent</i>			0.035 [*] (1.84)
<i>Panel C: Further test 6.3</i>			
Direction of discretionary accruals	$ DA^+ $		$ DA^- $
<i>WS</i>	0.022 ^{**} (2.26)		0.001 (0.10)
<i>Chow test</i>			0.021 ^{***} (0.000)

Notes:

(1) *ALL*₁ refers to the initial audit sample.

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

equals 1, the regression coefficient of *WS* increases to 0.061 and significant at the 1% level, and the Chow test shows that there is a significant difference between the two groups. In addition, the coefficient of the *WS* * *PART* interaction is significantly positive at the 5% level. These results comprehensively indicate that partner auditors have a stronger response to stress than non-partners. The reasonable explanation for this phenomenon is that partners of audit firms bear relatively more legal responsibilities and are more conscious

of their brand reputation. Although we do not deny that this can urge partners to ensure the quality of audit, it also leads to greater work stress in response to the same workload, which increases work stress indirectly.

6.1.2. Industry expertise

Industry expertise is behind the saying, “Able men are always busy”: the most able auditors can be deemed industry experts. Compared with non-experts, does the advantage of experience in the client’s industry ease the stress reaction in the initial audit of a new client?

For this purpose, we partition the full sample into two groups: industry experts (EXPT equals 1) and non-experts (EXPT equals 0).⁸ Panel A of Table 5 shows that the coefficient of *WS* is 0.025 and significant at the 1% level in the group of non-experts (EXPT equals 0), while *WS* is insignificant in the group of industry experts (EXPT equals 1). The Chow test shows that there is no significant difference between these two groups, but the coefficient of *WS* * *EXPT* is significantly negative. This shows that the effect of industry experts cannot completely eliminate, but does partially alleviate, the negative effects of auditors’ work stress on audit quality.

6.1.3. The gender of signature auditors

In daily life, males and females have different physiological and psychological responses to stress, and thus their perceptions and reactions to work stress are different. Therefore, we examine whether the effects of auditors’ work stress differ between males and females. We define a group that includes at least one female auditor as a female group (GEN equals 1), and otherwise as non-female (GEN equals 0).⁹ Panel A of Table 5 shows that the coefficients of *WS* in the non-female group are larger than in the other, but the difference is not significant. This indicates that there is no significant correlation between an auditor’s gender and the effect of work stress.

6.1.4. The age of signature auditors

People of different ages may have different perceptions of and reactions to work stress. In terms of audit work, younger auditors are usually able to withstand greater work intensity such as increased working hours. However, older auditors have richer experience that may help to ease the perception of work stress. Therefore, we examine whether work stress is influenced by auditors’ age. We partition the full sample into two groups: an old (OLD equals 1) and a non-old group (OLD equals 0).¹⁰ The results in Table 5 show that there is no significant difference between the two groups, which means that the effect of work stress on audit quality is not influenced by the auditor’s age.

6.1.5. Audit firm characteristics

The audit service provided by an auditor clearly relies on the audit firm, so the audit firm’s mechanisms for restraining auditors’ professional behavior are likely to affect perceptions of and reactions to work stress. Specifically, the audit quality control mechanism and the work support mechanism for auditors, such as the allocation of audit resources and peer review mechanism, differ depending on the scale and type of audit firm. These factors together constitute the behavior constraint mechanism, which affects auditors’ psychological perception. In short, the heterogeneous characteristics of different audit firms can also affect the perception and reaction of work stress. Fortunately, the Chinese audit market provides a natural condition, namely the co-existence of local and Big 4 audit firms. As the quality control mechanism, staff support and restraint mechanisms of these two kinds of firms are different, is there any difference in work stress response?

We partition the full sample into two groups: local firms (BIG equals 0) and Big 4 firms (BIG equals 1). Table 5 shows that compared with local audit firms, the auditors of Big 4 firms have a more obvious stress

⁸ If at least one of the signature auditors has audited more than five companies belonging to the same industry within in the previous year, we define it as an expert group, and otherwise as a non-expert group. In the sample of initial audits (new clients), the accumulated number of companies audited within the previous year is 1.8 on average, which is lower than the mean value of 4.8 in the full sample. Similar to the study by Xue (2012), we use the definition standard of the top 20% and top 20 in the industrial market, and we finally obtain consistent conclusions.

⁹ In addition, if all signature auditors are female we define the group as female, and otherwise as non-female; we find no significant difference between these two groups.

¹⁰ If the average age of the signature auditor is greater than the mean value of 44.19, then the group is classified as old, and otherwise as non-old.

response, but the difference between the two groups is not significant. This lack of difference may be due to the joint effect of two forces: on the one hand, compared to local audit firms, Big 4 firms usually provide better work support and incentive mechanisms for auditors, which can ease work stress; on the other hand, perhaps more importantly, the need for Big 4 firms to protect their strong brand reputation and reduce risk imposes more rigid service requirements and stricter restrictions, which may enhance the auditor's perception of and reaction to work stress.

6.2. Property nature of audit clients

Listed companies in the Chinese security market can be divided into state-owned companies and non-state-owned companies according to their property. In terms of state-owned companies, central holding companies and local government holding companies coexist, which are characteristics of the Chinese security market. In particular, the central holding companies have to be audited by both a public audit firm and the Chinese National Audit Office. Therefore, is there any difference in the perception of and response to work stress for the two types of companies?

Based on this characteristic of the Chinese security market, we conduct further analysis. In Panel B of Table 5, we divide the full sample into state-owned companies (State equals 1) and non-state-owned companies (State equals 0). The results show that the reaction to work stress is more obvious in the sub-sample of state-owned companies, but this difference is not significant. We then divide the full sample into central holding companies (Cent equals 1) and local government holding companies (Cent equals 0), and the results show that the reaction to work stress is more obvious in the sub-sample of central holding companies, and the Chow test shows that the difference is significant. The coefficient of $WS * Cent$ is also significantly positive. These results show that government audits increase auditors' work stress and negative reactions, but unfortunately government audits do not enhance the quality of independent audits.

6.3. Direction of discretionary accruals

We divide the full sample into two sub-samples by distinguishing between positive discretionary accruals ($|DA+$) and negative discretionary accruals ($|DA-|$). The regression results listed in Panel C of Table 5 show that the coefficient of WS is significantly positive in the positive ($|DA+$) but not in the negative discretionary accruals ($|DA-|$) sub-group. This difference between the two sub-samples is significant, indicating that the negative reaction to work stress is mainly embodied in tolerating the positive discretionary accruals of initial audit clients.

7. Robustness tests

To strengthen the reliability of the results, we perform the following robustness tests.

7.1. Endogeneity test

In exploring the relationship between auditors' work stress and audit quality, there may be a problem with client-auditor self-selection; that is, auditors with a heavy workload and high stress may exercise less discretion in selecting clients. They may be more likely to accept clients with poor quality accounting information, which leads to lower audit quality. To alleviate this problem, we adopt the propensity score matching method. First, we calculate the median of auditors' work stress by sub industry and sub year, and judge the intensity of work stress accordingly. We classify those with stress levels higher than the median as the treated group, and the rest as the control group. Then, we use the nearest neighbor matching method to perform tests. The results listed in Table 6 show that the T value is 2.00 before and 1.68 after the nearest neighbor matching, suggesting that there is a significant positive correlation between WS and $|DA|$ in the initial audits of new clients.¹¹

¹¹ Other empirical results, which are not shown in Table 6 due to limited space, indicate that the T values are 1.68 and 1.79 using the radius matching method and kernel matching method, respectively, which are consistent with the above. In addition, we use the above methods to test the full sample, and obtain consistent conclusions.

Table 6
Robustness tests.

Variable	Sample	Treated	Control	Diff.	S.E.	T-stat
<i>Panel A: Robustness test 7.1</i>						
DA	Pre-matching	0.095	0.084	0.011	0.006	2.00
	Post-matching	0.095	0.061	0.034	0.020	1.68
	Model (1)	Model (1) group testing				Model (2)
		$FST = 1$		$FST = 0$		
<i>Panel B: Robustness test 7.2</i>						
WS''	0.001(0.31)	0.013*** (3.56)		-0.002(-0.59)		-0.003(-1.03)
Chow test				0.015*** (0.000)		
FST						0.011** (2.27)
$WS'' * FST$						0.028*** (2.93)
	Model (1)	Model (1) group testing				Model (2)
		$FST = 1$		$FST = 0$		
<i>Panel C: Robustness test 7.2</i>						
WS''	0.002(0.68)	0.012*** (3.53)		-0.001(-0.40)		-0.001(-0.25)
Chow test				0.013*** (0.000)		
FST						0.172(1.54)
$WS'' * FST$						0.012*** (3.66)

Notes: AF is the only explanatory variable; the coefficient of WS'' listed in Table 6 is not enlarged 100 times.

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

7.2. Alternative measurement of auditors' work stress

There is an occupational characteristic of audit work: the longer an auditor works, the more his qualifications and abilities increase, as well as the number of clients. In Fig. 1, the horizontal axis represents the accumulated working years of auditors before the observation year, and the vertical axis represents auditors' business workload (the mean value of the sum of the natural logarithm of the audit client's assets). To rule out the possible effect of auditors' qualifications or abilities on the measurement of auditors' work stress, we adopt the following specific methods. First, according to the number of working years (*Years*) accumulated before the observation year, we divide the auditors into eight grades (N) with 3-year intervals¹²; second, we calculate the annual average workload of various grades of auditors (V_{-N}); and third, we define WS'' as the measurement of work stress in the regression analysis, where WS'' is equal to WS minus V_{-N} .

The results in Table 6 show that the coefficients of WS'' and $WS'' * FST$ are significantly positive, which means that auditors' work stress has a significantly negative effect on audit quality only in the initial audits of new clients. Furthermore, considering auditors' individual characteristics, empirical results that are not shown due to the limited space indicate that the stress reaction of partner auditors is more pronounced, but industry experts can partially alleviate the reaction. However, the stress reaction has no significant association with the gender or age of signature auditors.

7.3. Alternative measurement of audit quality

Following previous studies (Xie and Yan, 2014), audit failure (AF) is adopted as an alternative measurement of audit quality.¹³ Table 6 shows that the coefficient of WS'' is significantly positive only in the sample of

¹² The maximum and minimum numbers of *Years* are 0 and 20; *Years* = 0 is defined as the first year (N equals 1); *Years* = (1–3) is defined as the second year (N equals 2); *Years* > 18 is defined as the eighth year (N equals 8).

¹³ If the signature auditors issue a company with a clean opinion, but a financial restatement occurs after the disclosure of the annual financial report, AF equals 1, and 0 otherwise. The sample of firms with financial restatements is sorted manually from financial statement footnotes and restatements.

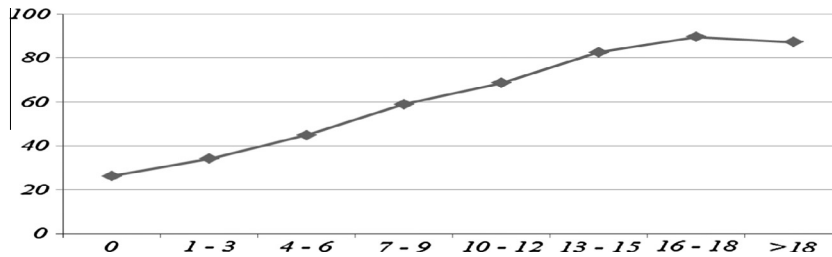


Figure 1. Diagram of auditors' working years and workload.

initial audits of new clients, and the coefficient of $WS'' * FST$ is significantly positive. In addition, according to the signature auditors' individual characteristics including their role, industry expertise, sex and age, the results (which are not shown due to limited space) are in accordance with the above.

8. Conclusions

Work stress can affect work quality and organizational performance. The auditing industry is a people-oriented industry and the work stress of auditors cannot be neglected. However, the literature on auditors' work stress reactions and coping mechanisms is insufficient, as it lacks studies with large samples and empirical evidence. This paper takes advantage of the favorable condition in the Chinese stock market, which requires mandatory disclosure of the signature auditors' personal information. With reference to the Job Demands–Control Model, we empirically examine the effects of auditors' individual work stress on audit quality using a sample of listed companies on the Chinese A-share market and their corresponding signature auditors from 2009 to 2013. The main findings are as follows. (1) In general, there is no pervasive deterioration in audit quality resulting from auditors' work stress that is under control. (2) There is a significant negative association between work stress and audit quality in the initial audits of new clients after setting apart different stages of audit tenure, due to the lack of comprehensive understanding of client and industry information. However, with the learning by doing effect brought about by ongoing auditing, the negative response reaction tends to be reduced. (3) Perceptions of work stress and related responses vary from person to person according to signature auditors' individual characteristics. The results suggest that auditors from international audit firms and those in the role of partner show a more distinct response to work stress while auditors with industry expertise demonstrate a weaker reaction. However, there is no evidence that gender or age affects auditors' stress response. Auditors also tend to be more sensitive and react more intensively when dealing with state owned, especially central government owned, enterprises.

In summary, based on a comprehensive analysis and discussion of the relationship between work pressure and audit quality at the individual level, this paper clarifies the mechanism by which work stress affects audit behavior and the coping system in response to stress. The findings not only make up for the shortage of empirical studies, but also offer a perspective on and evidence from the Chinese stock market. More importantly, our findings provide practical guidance on the standardization of auditors' behavior and the quality management of audit firms. Specifically, to ensure service quality, we recommend that experienced auditors be assigned to new clients because negative responses toward stress are most apparent in initial audits. Second, we favor the exchange of internal experience within audit firms, the ongoing accumulation of client and industry information and the cultivation of industry expertise. Third, we advise auditing regulators and supervising departments to consider the establishment of an upper limit on the number of clients during busy periods, with full consideration of multidimensional factors including the audit firm's features and individual auditors' capabilities. These measures should help to resolve the negative effects of overwhelming work stress on audit quality. We admit that these suggestions may contain certain biases and execution difficulties in audit practice, which concern problems that need prompt resolution, further analysis and practical examination.

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