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What types of publicly listed firms evade taxes? Evidence from China

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Abstract

Using the mandatory disclosure of detected corporate tax evasion cases in China, we examine the types of publicly listed firms that evade taxes. We use a bivariate probit model to account for the partial observability of tax evasion. Our regression results are different from those using the reduced form probit model that ignores the partial observability of tax evasion. Our results are also different from those of prior research on the determinants of corporate tax avoidance using the effective tax rate (ETR) as a proxy for tax avoidance, suggesting that ETR may not be a good proxy for aggressive tax avoidance.

Key words: Tax Avoidance; Tax Evasion; China; Government Ownership

JEL: H26, K42, G3

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1. Introduction

The objective of this study is to provide an empirical examination on the types of publicly listed firms that engage in tax evasion. Corporate tax evasion, which represents intentional actions at the most aggressive end of the corporate tax avoidance continuum, is a worldwide problem. In addition to its direct impact on the tax revenues lost, tax evasion could cause significant horizontal inequity and efficiency losses, resulting in taxpayers' distrust in a nation's tax system (Feldstein 1999; 2008). Despite its importance and interest for research and tax policy, tax evasion remains an under-explored area in empirical research (Hanlon and Heitzman 2010). Prior research in accounting and finance identifies firm-specific determinants of cross-sectional variation in tax avoidance using measures constructed from financial statement tax expenses or cash taxes paid (e.g., Manzon and Plesko 2002; Dyreng, Hanlon, and Maydew 2008), but few studies have examined the types of firms that engage in tax evasion (Slemrod 2007).[1] We fill this void in the literature by identifying the types of publicly listed firms that evade taxes using a novel dataset from China and a new empirical methodology that deals with the partial observability of tax evasion.

There are two key reasons for the lack of research on tax evasion. First, there is little publicly available data on *detected* corporate tax evasion cases in most countries. For example, in the U.S. tax examinations are performed in secrecy and firms are not publicly identified even when they are charged with tax deficiencies under the IRS audit (Graham and Tucker 2006). Corporate disclosure of tax-related events is voluntary in nature and thus exhibits substantial cross-sectional variation in terms of completeness. For example, Gleason and Mills (2002) find that firms often fail to disclose IRS claims for tax deficiencies. Blouin, Gleason, Mills, and Sikes (2010) find that not all firms disclose the dollar value of a tax

[1] Slemrod (2007) provides a comprehensive discussion of the development of tax evasion literature.

settlement. In the case of a large tax payment recorded on a firm's financial statements, the firm is often not forthcoming about the reasons (Bauer and Klassen 2017).

Second, many corporate tax evasion activities remain *undetected* due to their inherent secrecy or inadequate enforcement by the resources-constrained tax authority. As suggested in Shevlin (2002), an ideal tax shelter is one that is not (easily) detectable. Hence, the observed tax evasion cases could represent the tip of the iceberg (referred to as the partial observability problem) and it is econometrically challenging to model the determinants of corporate tax evasion using only observed tax evasion cases.

We test our research question in China because publicly listed Chinese firms have been mandated to disclose all detected tax evasions via tax adjustments in their annual reports since 2002. Our novel dataset covers comprehensive cases of tax evasion that are economically significant: the dollar amount of evaded taxes for our sample has a mean (median) of approximately RMB 12.2 million (4.2 million) and ranges from RMB 10,000 to about RMB 170 million. Among firms that were imposed a monetary penalty, the mean (median) dollar amount of the penalty is RMB 1.5 million (1.59 million). To deal with the partial observability of corporate tax evasion, we use a bivariate probit model to simultaneously model the determinants of corporate tax evasion (referred to as the commitment model) and the determinants of corporate tax evasion detection conditional on the occurrence of a tax evasion (referred to as the detection model).

With regard to our commitment model, we use the motivation-ability-opportunity framework from the criminology literature to select our explanatory variables, referred to as *MOTIVATION*, *ABILITY*, and *OPPORTUNITY*.[2] With regard to *MOTIVATION*, we take advantage of our unique setting by examining the effect of government ownership (i.e., state-controlled enterprises (SOEs) vs. non-SOEs) on tax evasion (e.g., Tang, Mo, and Chan 2017).

[2] Wilde and Wilson (2018) adopt a similar conceptual framework in their review of corporate tax avoidance.

We also include a comprehensive list of proxies for other tax evasion incentives based on prior research, including corporate income and non-income tax rates, alternative tax shields resulting from a firm's capital structure and business model (e.g., leverage, PPE), and incentives resulting from financing and external product market competition (e.g., Graham and Tucker 2006; Hasan, Hoi, Wu, and Zhang 2014; Kubick, Lynch, Mayberry, and Omer 2015). We use firm size and accounting profitability to proxy for a firm's tax evasion ability (*ABILITY*). With regard to *OPPORTUNITY*, we are interested in the effects of a firm's external corporate governance quality, including external auditor's quality, past tax enforcement intensity, and overall local law enforcement quality (McGuire, Omer, and Wang 2012; Chan, Luo, and Mo 2016; Hoopes, Mescall, and Pittman 2012). While we attempt to develop distinctive proxies for each of the three theoretical constructs, we wish to emphasize in advance that some of the empirical proxies could represent more than one construct and therefore their coefficients should be interpreted with caution.

We consider two types of explanatory variables for the detection model. First, we consider incentive factors that may facilitate or impede the detection of tax evasion, including ownership structure, auditor quality, overall local law enforcement quality, and public pressure (e.g., McGuire et al. 2012; Chan et al. 2016; Dyreng, Hoopes, and Wilde 2016). Second, we examine the impact of the concurrent tax enforcement intensity on detection (Hoopes et al. 2012).

With regard to the commitment model, we find evidence consistent with the motivation-ability-opportunity framework. We wish to highlight the following three key results. First, SOEs are more likely to evade taxes than non-SOEs. Second, high quality auditors help reduce the likelihood of corporate tax evasion. Third, we find no evidence that past tax enforcement intensity has a deterrence effect on corporate tax evasion, but there is

strong evidence that a region's overall law enforcement quality is negatively associated with tax evasion.

With regard to the detection model, we find three key results. First, as expected, both the government's *concurrent* tax enforcement intensity and overall local law enforcement quality have a positive impact on tax evasion detection. Second, tax evasion is more likely to be detected when a firm employs a high quality audit firm. Third, conditional on the firms that have committed a tax evasion, SOEs are less likely to be detected than non-SOEs. Overall, the results for the detection model are consistent with those for the commitment model.

To demonstrate the importance of adopting a bivariate probit model, we also run a reduced form probit model of tax evasion without considering the possibility of undetected tax evasion. We find that inferences change significantly using this reduced form probit model. For example, we no longer find evidence that SOEs or firms employing lower quality auditors are more likely to evade taxes. This latter finding may not be surprising because the effects of ownership structure and audit quality go in opposite ways in the commitment model and detection model and hence these effects would be netted out in the reduced form probit model.

To provide further support for the importance of ownership structure (SOEs vs. non-SOEs) in corporate tax evasion, we also examine the impact of ownership structure on the magnitude of penalties for detected tax evasion. We find that even if caught for tax evasion, SOEs are subject to smaller penalties than non-SOEs. Overall, this result along with the results from the commitment and detection models are consistent with the following hypotheses: (1) SOEs are more likely to evade taxes than non-SOEs; (2) conditional on committing a tax evasion, SOEs are less likely to be detected for tax evasion than non-SOEs; and (3) even if caught for tax evasion, SOEs are less likely to be punished than non-SOEs.

We contribute to the tax literature in several important ways. First, we contribute to the broad literature on corporate tax avoidance. Hanlon and Heitzman (2010) conceptualize corporate tax avoidance along a continuum that ranges from perfectly legal strategies (e.g., investment in tax exempt municipal bonds) at one extreme to illegal strategies such as tax evasion at the other. Due to lack of data, most existing tax research examines legal corporate tax avoidance or does not distinguish legal tax avoidance from illegal (or aggressive) tax avoidance. We contribute to this broad literature by identifying the types of publicly listed firms that evade corporate taxes and showing preliminary evidence that drivers of tax evasion are different from the drivers of legal tax avoidance.

Our second contribution is to the stream of research that focuses on the most aggressive types of tax avoidance (e.g., Graham and Tucker 2006; Wilson 2009; Chan, Lin and Mo 2010; Lisowsky 2010; Brown 2011; Lisowsky, Robinson, and Schmidt 2013). These studies overcome the data limitation on aggressive tax avoidance by using either confidential data from the IRS (e.g., Lisowsky 2010; Lisowsky et al. 2013) or searching Tax Court dockets and news articles (e.g., Graham and Tucker 2006; Wilson 2009). Studies relying on confidential IRS data limit subsequent replication and follow-up studies while studies relying on voluntarily disclosed tax sheltering activities suffer from potential biases resulting from data omission. We extend this literature in several important ways. First, we have a complete list of *detected* corporate tax evasion cases that are required to be publicly announced in annual reports. Second, we are the first study to simultaneously model the commitment and detection of tax evasion which is observable only if detected and disclosed.

Our third contribution is to the literature on the deterrence effects of tax enforcement. Hoopes et al. (2012) show that stricter tax enforcement helps deter tax avoidance of publicly traded U.S. firms. We find no evidence that past tax enforcement deters tax evasion, even though concurrent tax enforcement does lead to greater detection of tax evasion. While it is

beyond the scope of this study to reconcile the different results between Hoopes et al. and this study, we do notice a key difference between the two studies: Hoopes et al. use the cash ETR (effective tax rate) to proxy for tax avoidance and hence their proxy is more likely to capture both legal and aggressive tax avoidance; in contrast, we examine tax evasion, the most serious form of tax avoidance.[3] In addition, Chinese firms face a much weaker legal enforcement environment and therefore it is possible that the deterrence effect of tax enforcement may not be as significant as in the U.S.

Finally, we extend the extant tax evasion literature, which is largely limited to U.S. firms, to China, a country with a weak institutional environment and rampant tax evasion. We show that Chinese SOEs are more likely than non-SOEs to not only evade taxes but also avoid detection of tax evasion. This finding is significant because there is a widely held belief that Chinese SOEs have no incentives to evade taxes simply because both the dividends and taxes paid by the SOEs belong to the government. Our finding is consistent with Tang et al. (2017) but opposite to those from Bradshaw, Liao, and Ma (2018) and Jian, Li, and Zhang (2013) that use the ETR as a tax avoidance proxy. An important contribution of our study is to reconcile these conflicting findings by highlighting the differences between legal tax avoidance from illegal (aggressive) tax avoidance. In particular, we find that an imputed tax evasion probability is *positively* correlated with the *ETR*, suggesting that *ETR* may not be a reliable proxy for tax evasion, the most aggressive form of tax avoidance.

[3] Prior research has studied the limitations of ETR as a proxy for aggressive tax avoidance. Hanlon (2003) and Schwab, Stomberg, and Xia (2018) discuss how the inherited differences between tax rules and financial accounting give rise to distortions in using ETR as a measure of firms' tax liability or tax avoidance. Dhaliwal, Gleason, and Mills (2010) and Comprix, Mills, and Schmidt (2012) show that firms' financial reporting behaviors can add another layer of measurement error as the tax expense account is often used to manage earnings. De Simone et al. (2018) and Henry and Sansing (2018) suggest how the standard procedure of data truncation and the elimination of loss firms in computing ETR-type proxies can affect the inferences of the results. Using confidential tax return data from the IRS, Lisowsky et al. (2013) show that none of the commonly used tax proxies, including both the GAAP ETR and cash ETR, reflect US firms' participation in reportable and listed transactions. Austin (2018) shows that cash ETR mismeasures managers' intentional tax avoidance because of the mechanical relation between cash ETR and the unanticipated tax deduction from employees' stock option exercises.

Since our sample firms are limited to publicly listed Chinese firms, our results may not be readily generalizable to other countries with different institutional environments. Nevertheless, China and other tax jurisdictions share one commonality: many corporate tax evasion cases are never detected. Hence, our key finding on the differences in inferences using the reduced form probit model versus the bivariate probit model with partial observability should be still highly relevant to other tax jurisdictions.

The rest of the paper is organized as follows. Section 2 proposes our conceptual models of corporate tax evasion commitment and corporate tax evasion detection and introduces the proxies for each model construct. Section 3 introduces the bivariate probit model with partial observability. Section 4 discusses the sample selection procedures and data sources. Section 5 presents the regression results for the bivariate probit model with partial observability and the common reduced form probit model of corporate tax evasion. Section 6 analyzes the determinants of tax evasion penalty and a reconciliation of our results with prior tax avoidance studies using *ETR* as a proxy. Section 7 concludes.

2. Hypothesis development

We examine two interrelated research questions: (1) What types of publicly listed Chinese firms evade taxes (the commitment model)? (2) Limiting to the firms that have committed a tax evasion, which firms are more likely to be detected (the detection model)? We discuss the relevant explanatory variables and hypotheses for the commitment model in section 2.1 and the relevant explanatory variables and hypotheses for the detection model in section 2.2.

2.1. The commitment model

To examine the first research question, we adopt the following regression model (firm and year subscripts are omitted for brevity):

$$EVASION^{*} = \alpha + \beta_1 MOTIVATION + \beta_2 ABILITY + \beta_3 OPPORTUNITY + year\ and\ industry\ fixed\ effects + \varepsilon \quad (1)$$

*EVASION** is a dummy variable that equals one if a firm year experiences a tax evasion, and zero otherwise. Please note that *EVASION** is observable only if detected. The choice of model (1)'s explanatory variables follows the popular motivation-ability-opportunity framework from the criminology literature (Cressey 1953; Braithwaite 1985; Fagan and Freeman 1999; Vaughn 1999).[4] According to this framework, a person's decision to commit a crime depends on whether the person has a motive (e.g., what benefit can the person obtain from the act), the ability (e.g., did the person have a gun), and opportunity (e.g., was the person at the crime scene). Hence, the explanatory variables include proxies for three sets of theoretical constructs: *MOTIVATION*, *ABILITY*, and *OPPORTUNITY*. Due to the multi-dimensional nature of the three theoretical constructs, we use multiple proxies for each construct (see appendix A for all variable definitions). However, we wish to note that some of the empirical proxies could represent more than one construct and therefore their coefficients should be interpreted with caution. In addition, our predictions are based on existing tax avoidance research which does not make a clear distinction between legal tax avoidance and illegal tax avoidance. Because of the fundamental differences between these two types of tax avoidance activities, there is a possibility that our predictions based on prior research may not exactly fit the case of tax evasion.

[4] A similar framework is also adopted by studies of accounting frauds (Cooper, Dacin, and Palmer 2014; Davis and Pesch 2013; Loebbecke, Eining, and Willingham 1989).

2.1.1. Proxies for *MOTIVATION*

Our key variable of interest is government ownership. In addition, we include a comprehensive list of competing proxies for *MOTIVATION* based on prior research, including corporate tax rates, alternative tax shields, and incentives resulting from financing and product market competition. We discuss each set of proxies below.

Ownership structure

Taking advantage of our unique setting, we examine the effect of government ownership (i.e., SOEs versus non-SOEs) on tax evasion. The effect of government ownership on tax evasion is difficult to predict due to multiple countervailing institutional forces. On one hand, SOEs may be less aggressive than non-SOEs in tax evasion because both dividends to the SOE parent and taxes paid by the SOEs would eventually flow to the government's coffers. Moreover, as the government's ownership in the publicly listed SOEs is less than 100%, the controlling shareholder (i.e., the government) may have a stronger preference for taxes to dividends. This is because dividends have to be shared with minority shareholders while taxes accrue 100% to the government. In addition, both Bradshaw et al. (2018) and Jian et al. (2013) argue that SOE managers have an incentive to pay more taxes in order to curry favor with government officials who have the ability to influence SOE managers' promotion opportunities. Consistent with this prediction, both Bradshaw et al. (2018) and Jian et al. (2013) find that SOEs face higher effective tax rates (an inverse proxy for tax avoidance) than non-SOEs. However, neither study examines tax evasion, the most egregious form of tax avoidance.

On the other hand, there are also reasons to believe that SOEs could be more aggressive than non-SOEs in tax evasion. First, rather than a monolithic entity, the Chinese government is comprised of a large number of different and equally powerful government

agencies with different and often conflicting incentives. For example, the Chinese SOEs are subject to the direct supervision of the State-owned Assets Supervision and Administration Commission (SASAC) who may not share the same agenda as the tax authority. Similarly, since more than half of the taxes paid by an SOE are flown to the central government coffer, local government officials may not be eager to encourage the SOEs within their jurisdictions to pay more taxes (Tang et al. 2017). In addition, each publicly listed SOE has a controlling parent company who may have its own personal agenda different from the SASAC and the tax authority. Moreover, many Chinese SOEs are known for severe managerial agency problems, not only between the top executives and the ultimate controller SASAC but also between the top executives and their subsidiary managers. SOE managers and their subordinates often have an incentive to pursue empire building and therefore they could have a strong desire to reduce taxes in order to have more free cash flows at their disposal (e.g., Sun and Feng 2016). This last incentive could be strong because Chinese SOEs were not required to turn over most of their free cash flows to the government in the form of dividends during our sample period.[5]

Second, SOEs have probably the strongest political connection with the government and therefore SOEs are always treated more favorably by government agencies. For this reason, SOEs are less afraid of being investigated for tax evasion; even if caught with tax evasion, SOEs could be less likely to be punished. Consistent with these arguments, Kim and Zhang (2016) find that politically connected firms are more tax aggressive than non-connected firms. In the context of China, Lin, Milles, Zhang, and Li (2018) find that political

[5] Chinese SOEs are not required to pay dividends to the government prior to 2007. A 2008 regulation issued by the Ministry of Finance states that (i) the SOEs in the select monopoly industries (petroleum, telecommunication, coal, electricity, and tobacco) are required to pay a dividend of 10% out of after-tax profit, (ii) the state-owned research institutes and military firms are not required to pay any dividend, and (iii) the rest of the SOEs are only subject to a 5% dividend rate.

connections weaken tax enforcement effectiveness.[6] In addition, an anonymous official from a local tax authority told us that the tax authority faces a much smaller pressure to detect tax evasion in SOEs because after all both the SOEs and the tax authority are part of the government.

Third, the same anonymous tax official told us that SOEs have already shouldered many political and social responsibilities on behalf of the government and therefore the tax authority may find it much more difficult to strictly enforce the tax code on the SOEs because strict tax enforcement could reduce the SOEs' financial capacity to fulfill many political and social responsibilities. Because of these conflicting institutional forces, we do not make any predictions for the two ownership structure variables.

China has two types of SOEs: SOEs controlled by the central government (*SOE_CENTRAL*) and SOEs controlled by a local government (*SOE_LOCAL*). Though we do not make any ex ante prediction, we consider the two SOE types separately in order to allow them to have differential effects on tax evasion.

Corporate tax rates

Our next proxy for *MOTIVATION* is a firm's tax rates because firms facing a higher tax rate may have a stronger incentive to evade taxes (Lin, Mills, and Zhang 2014).[7] Since our tax evasion sample includes both income taxes and non-income taxes, we include the following corporate tax rates in the commitment model: the top statutory income tax rate (*EITRATE*), the top statutory business tax rate (*BTRATE*), and the top statutory value-added

[6] Mills, Nutter, and Schwab (2013) find that the political costs of losing government contracts reduce firms' tax aggressiveness, but contractors with greater bargaining power (i.e., those face less competition for government contracts) incur less political costs.

[7] However, Yitzhaki (1974) argues that tax rate should have no impact on tax evasion if one assumes that the penalty for detected evasion is proportional to the tax understated.

tax rate (*VATRATE*).[8] In addition, we include a dummy variable indicating the presence of net operating loss (*NOL*) as an additional corporate income tax rate proxy.

Alternative tax shields

When firms have alternative ways to reduce taxes, they may be less likely to evade taxes, implying a substitution effect between tax evasion and alternative tax shields. Hence, we control for several alternative tax shields based on prior research. First, we include financial leverage (*LEV*) because Graham and Tucker (2006) find a negative association between firms' tax shelter participation and debt policy, consistent with tax shelters as a form of non-debt tax shields. Several other studies also find a negative relation between concurrent leverage and various proxies for tax avoidance (Dyreng et al. 2008; Wilson 2009; Lisowsky 2010).

Second, we include the market-to-book ratio (*MTB*) as a proxy for growth in the commitment model because a firm's motivation for tax avoidance may vary across the firm's growth. In particular, growth firms may devote less resources to tax avoidance activities because growth firms have substantial tax deferral opportunities and relatively less taxable income to shield (Edwards, Schwab, and Shevlin 2016; Heitzman and Ogneva 2018). Consistent with this argument, Klassen, Lisowsky, and Mescall (2016) find that firm's growth, as measured by market-to-book ratio, is negatively associated with firms' uncertain tax benefits, tax shelter participation, and the use of tax havens. Using sales growth as a proxy for growth, Robinsion, Sikes, and Weaver (2010) find that firms with higher sales growth have higher ETR.[9]

[8] For firm-years after 2007, we are able to calculate the simple average of the firm's VAT rate based on the firm's industry segments. Our results are not sensitive to using the average VAT rate as an alternative to the top statutory VAT rate.

[9] Some studies have documented a positive association between tax avoidance and firm's growth using market-to-book ratio as a proxy (Dyreng et al. 2008; Edwards et al. 2016; Cen, Maydew, Zhang, and Zuo 2017). This result is potentially due to the substantial tax deferral opportunities and the heavy use of stock options in

Third, we control for a firm's capital intensity (*PPE*). Investment favored economic policies such as accelerated depreciation deduction reduce the tax burden for capital intensive firms (Gupta and Newberry 1997). Existing literature documents a negative association between capital intensity and effective cash tax rates (e.g., Edwards, Schwab, and Shevlin, 2016; Cen et al. 2017). Because firms with greater capital intensity have lower tax burden, we expect those firms to have a lower incentive to engage in tax evasion.

Lastly, we include foreign sales (*FORESALE*) because firms with a greater extent of foreign activities enjoy more opportunities through multinational tax planning (Rego 2003; Cen et al. 2017). Therefore, all else equal, firms with higher foreign sales should have a lower incentive to evade taxes. As we show in Table 3, most Chinese firms have little foreign sales and therefore *FORESALE* may not be a meaningful control in our setting.

Financing

We include a dummy variable (*SEO*) indicating a firm's current and near future need for seasoned equity offerings. Prior research finds that SEO firms have an incentive to engage in upward earnings management via real and accrual earnings manipulation (Teoh, Welch, and Wong 1998; Cohen and Zarowin 2010). Therefore, SEO firms may also have similar capital market incentives to engage in tax evasion to boost current period after-tax earnings and/or cash flows. However, SEO firms in China may also have less incentive to engage in tax evasion because tax evasion, if detected by the securities regulator, would be treated as a red flag and therefore could jeopardize the capital raising effort of the firm (CSRC 2001, 2006).

compensation, both of which result in lower cash ETR (Edwards et al. 2016). Austin (2018) shows that cash ETR mismeasures managers' intentional tax avoidance because cash ETR mechanically decreases as the unanticipated tax deduction from employees' stock option exercises increases.

Product market competition

Finally, we include *COMP* to capture the impact of product market competition on tax evasion. Kubick et al. (2015) find that firms with higher product market power are more tax aggressive because these firms are insulated from competitive threats. However, Cai and Liu (2009) find that firms in more competitive environments avoid more taxes, consistent with the interpretation that competitive forces provide firms with stronger incentives to avoid taxes. Because of the conflicting results from prior research, we do not make a prediction for the coefficient on *COMP*.

2.1.2. Proxies for *ABILITY*

We use two proxies for a firm's ability to evade taxes: *LN_SALES* and *ROA*. Mills, Erickson, and Maydew (1998) find results consistent with economies of scale in tax planning such that larger firms invest more in tax planning. In their analysis of IRS deficiencies proposed upon tax audits, Hanlon, Mills, and Slemord (2007) find that the largest companies in their sample (those with assets greater than $5 billion) have the greatest percentage of firms with a tax deficiency and the highest proposed deficiency rate, consistent with larger firms enjoying more tax planning opportunities due to their more complex operations. Manzon and Plesko (2002) argue that profitable firms can make more efficient use of tax deductions, credits, and exemptions relative to less profitable firms, resulting in greater tax avoidance. Rego (2003) also finds that larger, more profitable, and multinational corporations exhibit greater tax avoidance than other firms. Consistent with prior research, we expect both *LN_SALES* and *ROA* to be positively associated with tax evasion.

2.1.3. Proxies for *OPPORTUNITY*

We are interested in the effects of a firm's external governance quality on tax evasion. Our first proxy for a firm's external governance quality is auditor quality (*BIGN*). We do not make a prediction for the coefficient on *BIGN* due to conflicting institutional forces. On one hand, large audit firms could be more sophisticated tax planners and therefore they may be able to help their clients design more sophisticated tax avoidance strategies.[10] Consistent with this argument, Treasury (1999) and U.S. Senate (2003) report that firms' use of tax shelter promoters such as Big 5 auditors could be an indication of tax sheltering. Consistent with Big 5 auditors being active tax shelter promoters, Lisowsky (2010) documents a positive association between the use of a Big Five auditor and tax shelter use in a sample of firms between 2000 and 2004. Using a sample firms that subscribe to auditor-provided tax services, McGuire et al. (2012) find that auditors with stronger tax expertise can help their client firms achieve greater tax avoidance.

On the other hand, aggressive tax avoidance activities may also impose significant reputation and regulatory risks to an audit firm (Chan et al. 2016) and therefore big audit firms who are more conscious about their reputation capital (Chan and Wu 2011) should have a stronger incentive to take actions to reduce such risks. Consistent with this argument, Chan et al. (2016) find that high-quality auditors are associated with client firms' better tax compliance in China. Donohoe and Knechel (2014) find a positive association between tax aggressiveness and audit fees. Goh, Lim, Shevlin, and Zang (2014) find that the likelihood of auditor resignation is higher among firms that are more tax aggressive, consistent with auditors' concerns with reputational and litigation risks related to their clients' tax aggressiveness. Klassen, Lisowsky and Mescall (2016) find that clients of Big 4 tax preparers are associated with lower levels of tax avoidance when the tax preparer is also the auditor,

[10] Chinese laws do not prohibit audit firms from providing tax consulting services to their audit clients in our sample period.

compared to when the tax preparer is not the auditor. In addition, increased corporate financial reporting transparency resulting from a tougher auditor may also facilitate other stakeholders' scrutiny of a firm's questionable tax planning strategies, resulting in a reduction in a firm's tax evasion activities.

A firm's incentive to evade taxes may also depend on the perceived toughness of regulatory tax enforcement. Taking advantage of the available data on the government's tax enforcement activities in China, we use the past tax enforcement intensity (*TARGET_INDUS* and *TAX_AUDIT*) as our second set of proxies for external governance quality. While there is considerable uncertainty on whether corporate tax avoidance varies systematically with tax enforcement intensity, Hoopes et al. (2012) find that IRS audits deter corporate tax avoidance proxied by the cash effective tax rate. Hence, we hypothesize that publicly listed Chinese firms are less likely to evade taxes if they are domiciled in provinces with tougher past tax enforcement. Our first tax enforcement intensity proxy is *TARGET_INDUS*, a dummy variable indicating the industries that are subject to stricter scrutiny by the tax authority in a year. The second tax enforcement intensity is *TAX_AUDIT*, which measures the amount of tax revenues collected as a result of tax audits scaled by the total tax revenues collected in a province. To avoid potential endogeneity and consistent with Hoopes et al. (2012), we lag the two tax enforcement variables by one year relative to the dependent variable. An untabulated analysis shows that the two tax enforcement variables are highly persistent over time. Hoopes et al. (2012) show in the U.S. setting that a substantial number of managers use historical data provided by the tax authority to gauge tax enforcement.

Our third proxy for a firm's external governance quality is the quality of the overall local law enforcement environment (*LAW*) in the province of a firm's headquarters. Consistent with the argument for the past tax enforcement proxies above, we predict the coefficient on *LAW* to be negative.

In addition to the aforementioned external corporate governance proxies, prior research indicates that the extent of a firm's tax evasion opportunities also depends on the firm's operating environment complexity. We use the number of industry segments (*SEGMENT*) and M&A activities (*M&A*) to proxy for a firm's operating environment complexity. Firms are better able to shield their tax avoidance activities when their business structure is more complex and therefore their true taxable incomes are more difficult to determine.

One may have noticed that our model (1) does not include the book-tax-difference (or other similar tax avoidance proxies) commonly used in prior tax avoidance literature. This is because our model (1) is a structural model that attempts to understand the causal drivers of tax evasion. On the other hand, the book-tax-difference itself is a consequence of corporate tax planning. While the book-tax-difference may be a useful indicator of tax evasion, but it is not a causal determinant of tax evasion. Therefore, we exclude the book-tax-difference from our commitment model.

2.2. The detection model

Conditional on the firms that have committed a tax evasion in a year, our second research question examines the types of firms that are more likely to be detected for tax evasion. Specifically, we adopt the following model (firm and year subscripts are omitted for brevity):

$$DETECTION \mid EVASION^{*} = X\beta + year\ and\ industry\ fixed\ effects + \varepsilon \qquad (2)$$

DETECTION is a dummy variable that equals one if a tax evasion committed in year *t* is subsequently detected by the tax authority or others. It is important to note that model (2) is tested conditional on using only the firms that have committed a tax evasion, regardless of whether a researcher can observe such tax evasion. Hence, explanatory variables that help

identify tax evasion firms only are no longer needed and should be excluded from model (2). For example, *LEV* could causally affect the likelihood of tax evasion. However, since model (2) starts with the tax evasion firms, it is no longer necessary to include *LEV* in model (2) again, unless we argue that *LEV* also has a separate effect on detection. For the same reason, model (2) should not include the non-causal indicators for tax evasion proposed by the extant tax avoidance literature (e.g., the book-tax-difference).

For model (2), we are interested in the effects of incentive factors that may facilitate or impede the detection of tax evasion, including ownership structure (*SOE_CENTRAL* and *SOE_LOCAL*), auditor quality (*BIGN*), overall local law enforcement quality (*LAW*), and public pressure (*ETR*). As argued in section 2.1, SOEs have a strong political connection with the government and therefore we expect the SOEs who have committed a tax evasion to be less likely detected. As argued in section 2.1, we expect big audit firms to deter their audit clients from committing tax evasion. However, even if audit clients do commit a tax evasion, the presence of a big audit firm may also help facilitate the tax authority's or other monitors' detection of such tax evasion due to more transparent financial reporting required by high quality audit firms. Similarly, we also expect the tax authority to find it easier to detect tax evasion in a stronger law enforcement environment (*LAW*). Finally, we include *ETR* as a proxy for public pressure because firms with lower *ETR*, which is readily observable to external parties, tends to attract more public attention and therefore the tax authority may be under greater pressure to investigate such firms.

As controls, we also examine the impact of the concurrent tax enforcement intensity (proxied by *TARGET_INDUS* and *TAX_AUDIT*) on detection. Because tax audits are typically performed after the submission of a company's tax return, all these enforcement proxies are measured one year after the dependent variable. We predict the coefficients on *TARGET_INDUS* and *TAX_AUDIT* to be positive. Finally, we include *LN_SALES* as a

control for size related effects because larger firms are likely subject to more frequent and routine audits (Hoopes et al. 2012). In addition, we include year and industry fixed effects.

3. Research method

One empirical challenge to estimating the models (1) and (2) is that *EVASION** is not always observable and therefore models (1) and (2) cannot be estimated directly. Prior tax evasion studies simply ignore this problem and instead use a reduced form of model (1) by substituting the detected tax evasion for *EVASION**. Since no one knows for sure the size of *EVASION**, it remains unknown how severe the bias is resulting from using the reduced form model (1). In addition, to our knowledge, no prior studies could estimate model (2) due to the partial observability of *EVASION**.

In this study we address this partial observability problem by estimating models (1) and (2) simultaneously using the bivariate probit model with partial observability. Non-linear models like our bivariate probit model do not require the exclusion restriction for model identification because identification is achieved by its functional form (e.g., Heckman 1979; Dong 2010; Escanciano, Jacho-Chavez, and Lewbel 2016; Gerakos, Hahn, Kovrijnykh, and Zhou 2016; Li, Poskitt, and Zhao 2017; Greene, Harris, Srivastava, and Zhao 2018). Nevertheless, as shown below, we do impose the exclusion restriction in our model to ensure that the model is better identified on data (Greene et al. 2018).

4. Sample selection procedures and data sources

Table 1 reports the sample selection procedures. We begin with an initial sample of 11,981 firm-years for all publicly listed Chinese firms on the Shanghai and Shenzhen stock exchanges from 2003 to 2010. We exclude financial firms due to their unique industry and regulatory differences. We start from 2003 because this is the first year when the *CSMAR*

database starts to collect the original texts of accounting error adjustments from annual reports that are used to determine the tax evasion cases.[11] The tax evasion data discussed in details below show that the time gap between the beginning year of a tax evasion case and the subsequent restatement year of the tax evasion is about 2.3 years, on average. Since we started the project in 2013, we end our sample in 2010 to avoid understating the disclosed tax evasion cases for the last few years of the sample period.

We obtain firm-level financial data, including auditor and ownership information, from the *CSMAR* database. We obtain firm income tax rate data from the *IFIND* database, another major database on publicly listed Chinese companies. We exclude 1,804 observations with missing values for the variables used in the analysis, resulting in a sample of 10,177 observations.

Our empirical analyses also require relevant country and province-level variables. We collect the data on tax enforcement measures from the State Administration of Taxation and Tax Bureaus, and the data on legal enforcement from the National Economic Research Institute (NERI) (Fan, Wang, and Zhu 2011). [12] The requirement of non-missing country and province-level information further reduces the sample size to 8,768 observations.

We identify the tax evasion firm years using the *CSMAR* database's original texts of the accounting error adjustments as disclosed in annual reports for all the years since 2003. We also use the *IFIND* database as a supplemental source for accounting error adjustments that could have been missed by the *CSMAR* database. Appendix B shows an example of the tax related accounting error adjustments disclosed in the annual report. These disclosed tax related financial statement adjustments represent the final settlement between a firm and a

[11] All publicly listed Chinese firms have been required to disclose accounting error adjustments, including tax adjustments, in their annual reports since 2002.
[12] The legal enforcement index, our measure of law enforcement, is a sub-index of NERI indices, reflecting the strength of law enforcement for each province (Fan et al. 2011; Jian and Wong 2010; Wang, Wong, and Xia 2008).

relevant tax authority, which must be disclosed in a tax enforcement decision issued by a tax authority.[13]

From the accounting error adjustment disclosures, we manually identify the tax adjustments due to tax evasion between 2003 and 2010 using the following procedures. Our discussions with relevant corporate insiders and anonymous tax officials confirm that our procedures for identifying tax evasion are reasonable. First, we identify all the firm years involving tax adjustments. Second, we exclude the tax adjustments due to the following reasons unrelated to tax evasion: (i) tax adjustments due to the delayed approval or disapproval of tax deductions or exemptions by the relevant tax authorities (e.g., the recognition or derecognition of high-tech company status for tax purposes); (ii) routine year-end tax adjustments by the tax authority resulting from errors in estimated income taxes; and (iii) negative adjustments due to tax overpayment.[14] Our final tax evasion sample contains 336 firm-years for 178 unique firms over the period 2003-2010, representing 3.8% of the full sample in Table 1.[15]

Panel A of Table 2 shows the frequency of detected tax evasion by year in our sample period. Except for the last two years, the tax evasion percentage hovers around 4% each year.

[13] The administrative procedures for determining a tax evasion case in China involve the following key sequential steps: (i) a tax authority issues a notice of tax deficiency along with the related penalties for a tax evasion (*tuoshui* and *loushui* in Chinese pinyin); (ii) a firm either accepts the verdict or appeal the case to a higher level tax authority; and (iii) if the firm is still not satisfied with the outcome of the appeal, the firm can still take the dispute to a court, which is rare in China. It is important to note that the firm is not required to make any disclosure or financial statement restatement until the firm has accepted the verdict.

[14] It is unlikely that the tax evasion cases in our final sample are due to financial reporting incentives. The reason is that financial reporting incentives would lead to higher taxable income and therefore higher taxes but our tax evasion cases are all about tax understatement.

[15] Using confidential tax audit adjustment data from China's tax authorities, several studies (i.e., Chan and Mo 2000, Chan et al. 2010, Chan et al. 2016, Tang et al. 2017) examine Chinese firms' tax noncompliance behavior. Though not explicitly stated in the papers, after discussing with relevant Chinese tax administration officials, we believe the income tax audit adjustments used by these studies are based on the immediate and routine income tax audit adjustments performed by the tax authority at the end of the year based on a firm's submitted annual tax return and other supporting documents. This process is known as the settlement and payment process (*Hui Suan Qing Jiao* in Chinese) and such tax adjustments do not necessarily imply tax evasion. In contrast, the tax audit adjustments considered in our study occur long after the settlement and payment process because the average time gap between the year of tax evasion and the year of restatement for the tax evasion is 2.3 years. The long time gap also suggests that the tax adjustments examined in our study are likely related to severe tax law violations.

The significantly lower tax evasion percentages for the last two years could be due to the fact that it takes time for some tax evasion cases to be detected.

Panel B of Table 2 reports the frequency of detected tax evasion by tax type. While income tax evasion cases rank first in frequency (41.2%), we also observe significant tax evasion cases in value added tax, business tax, housing property tax, among others.

Panel C of Table 3 shows the frequency of detected tax evasion by detector identity. While the majority of the detected tax evasion cases are uncovered by the tax authority, other government agencies also played a significant role in detection.[16]

5. Empirical results

5.1. Descriptive statistics

Table 3 shows the descriptive statistics for the regression variables included in models (1) and (2). Panel A shows the descriptive statistics for the full sample while Panels B-D the descriptive statistics for the central SOEs, local SOEs, and non-SOEs, respectively. For the full sample, 4% of the firm years experienced detected tax evasions. 17% of our sample firms are central SOEs and 32% are local SOEs. The frequency of detected tax evasion is 3% for central SOEs and 4% for both local SOEs and non-SOEs.

Table 4 reports the Pearson correlation matrix for all the regression variables in models (1) and (2) for the full sample. Though not tabulated, we also find that the variables *TARGET_INDUS*, *TAX_AUDIT*, and *LAW* all exhibit persistence over time as evidenced by the significantly positive correlation for each variable in year t-1 and year t+1.

[16] 6.2% of the tax evasions reported in Panel C of Table 2 are classified as "self-disclosed", which seems to suggest that the detector is the firm itself. However, several tax officials told us that most "self-disclosed" cases are actually detected by tax authorities. To reduce the tax penalties for the firms, the tax authorities sometimes allow the firms to disclose the detector as "self-disclosed".

5.2. Regression results

5.2.1. The results for the commitment model

Table 5 reports the regression results of models (1) and (2) using the bivariate probit model that addresses the partial observability of tax evasion. We report the regression results of model (1) in column (1) and the regression results of model (2) in column (2).

Let's first focus on the regression results of model (1) that is based on the motivation-ability-opportunity framework to explain tax evasion. With regard to *MOTIVATION*, we find that the coefficients on our key variables of interest, *SOE_CENTRAL* and *SOE_LOCAL*, are both significantly positive, suggesting that both central SOEs and local SOEs are more likely to evade taxes than non-SOEs. As for the other incentive variables from prior research, we find that the coefficient on *LEV* is significantly positive, contrary to our prediction. One potential interpretation of this positive coefficient is that highly levered firms may face a greater need for cash and therefore would have a stronger incentive to resort to aggressive tax avoidance behavior. As predicted, high *PPE* firms are less likely to evade taxes while firms in more competitive industries (*COMP*) are more likely to evade taxes, consistent with Cai and Liu (2009). The coefficients on *SEO*, *FORESALE*, *NOL*, *MTB*, and the three top statutory tax rates are all insignificant, though many of the coefficients are in the predicted directions.

With regard to *ABILITY*, we find that *LN_SALES* is not significant while *ROA* is significantly negative, contrary to our prediction. Similar to our ex post interpretation of *LEV*, one could argue that low *ROA* firms may face a greater need for cash and therefore would have a stronger incentive to evade taxes (Law and Mills 2015; Edwards et al. 2016).

With regard to *OPPORTUNITY*, we find that external corporate governance quality helps reduce tax evasion. Specifically, the coefficient on *BIGN* is significantly negative, consistent with the hypothesis that high quality auditors help reduce tax evasion. In addition, the significantly negative coefficient on *LAW* suggests that overall local law enforcement

quality helps deter tax evasion. However, we find little evidence that past tax law enforcement intensity has a deterrence effect of tax evasion because neither of the coefficients on *TAX_AUDIT* and *TARGET_INDUS* is insignificant. The insignificant coefficient is unlikely due to measurement error of *TARGET_INDUS* because the coefficient on the same variable loads as expected in the detection model.

5.2.2. The results for the detection model

Column (2) of Table 5 shows the regression results of the detection model conditional on the firms that have evaded taxes. We find strong evidence that incentives matter in tax evasion detection. Consistent with the results in model (1), we find that the coefficients on *SOE_CENTRAL* and *SOE_LOCAL* are significantly negative, suggesting that conditional on the firms that have committed a tax evasion, both central and local SOEs are less likely to be detected. In addition, we find that a firm's external governance quality matters in tax evasion detection. Specifically, firms with high quality audit firms (*BIGN*) or domiciled in stronger legal enforcement environments (*LAW*) are more likely to be detected for tax evasion. However, we find no evidence that public pressure (*ETR*) affects tax evasion detection.

There is also evidence that regulators' concurrent tax enforcement intensity matters in tax evasion detection, as evidenced by the significantly positive coefficients on *TARGET_INDUS* and *TAX_AUDIT*.

5.2.3. Income tax evasions only

The regression results in Table 5 include both income tax evasions and non-income tax evasions. As shown in Panel B of Table 2, income tax evasions represent only 41.2% of all tax evasions in our sample, even though income tax evasions are the most frequent type of tax evasion. Hence, we also replicate the model in Table 5 using income tax evasions only. The results are reported in Table 6. The inferences for all the regression variables are

qualitatively the same as in Table 5 except for the following few important exceptions. First, the coefficients on *BIGN* in both columns (1) and (2) are still as predicted but they are no longer significant. Second, the coefficient on *TARGET_INDUS* in the detection model (column (2)) is still as predicted but no longer significant. Third, the coefficients on *EITRATE* and *NOL* are now significant and as predicted, suggesting that using income tax evasion observations only in Table 6 sharpens the test power of the two income tax evasion incentive variables, *EITRATE* and *NOL*.

5.2.4. The results for the reduced form commitment model

Prior tax evasion research models corporate tax evasion using only the *detected* tax evasion observations, referred to as the reduced form commitment model. Hence, a natural question one may ask is whether there are significant differences in inference using the reduced form commitment model versus the bivariate probit model with partial observability. Column (1) of Table 7 reports the regression results of model (1) where the dependent variable is one if there is a detected tax evasion and zero otherwise. Compared with the coefficients on the same variables in column (1) of Table 5, we notice that the previously significant coefficients on *SOE_CENTRAL*, *SOE_LOCAL*, *BIGN*, *COMP* and *SEGMENT* in column (1) of Table 5 are no longer significant in column (1) of Table 7. These results suggest that we would have drawn substantially different inferences about tax evasion determinants had we used the reduced form model.

6. Further analyses

One most striking finding from Table 5 that is significantly different from prior research is that SOEs are not only more likely to evade taxes but also they are less likely to be detected for tax evasion. In this section, we provide further evidence consistent with this

finding in section 6.1. In addition, we attempt to directly reconcile our results for the ownership structure variables with those from prior research in section 6.2.

6.1. Tax evasion penalties

If both SOEs and non-SOEs are caught with tax evasion, which firms are punished more severely? The arguments in section 2 would predict SOEs to be less severely punished because they have the superior political connection with the government. Table 8 shows the OLS regression results for this prediction using only the firm years that have reported a tax evasion. Because we use fewer control variables in Table 8, the number of tax evasion observations is bigger than that in Table 1. For this sample of 425 firm-years of reported tax evasion, the mean (median) dollar amount of evaded taxes is approximately RMB 12.2 million (4.2 million). For the 33 cases where a monetary penalty is levied, the mean (median) dollar amount of the penalty is RMB 1.5 million (1.59 million).

The dependent variable is *LN_PENALTY*, defined as the natural logarithm of one plus the amount of tax penalties levied in year *t* on a firm for committing a tax evasion. Our key variables of interest are *SOE_CENTRAL* and *SOE_LOCAL*. We include *LN_SALES*, the severity of the tax evasion (*LN_EVADEDTAX*), dummies for the type of taxes evaded, dummies for the tax evasion detectors, and year and industry fixed effects as controls. See appendix A for all variable definitions. Consistent with our prediction, the coefficients on *SOE_CENTRAL* and *SOE_LOCAL* are significantly negative, suggesting that both types of SOEs are less likely to be penalized for tax evasion even if they are caught.

6.2. Reconciliation with prior tax avoidance literature

Both Bradshaw et al. (2018) and Jian et al. (2013) find that SOEs are less likely to avoid taxes than non-SOEs, contrary to our results in Table 5. How can we reconcile these

conflicting results? Our study differs from these two studies in two key aspects. First, these two prior studies use the effective income tax rate (ETR) as a proxy for tax avoidance while we use tax evasion. Because the effective tax rate could reflect the effects of both legal tax avoidance and some aggressive (or illegal) tax avoidance, the effective tax rate may not be comparable to our tax evasion measure. Second, ETR is readily observable to external parties while tax evasion is unobservable unless detected. Hence, SOEs could have lower incentives to lower their ETR due to the public pressure while they could become more aggressive in evading taxes, which is unobservable to outsiders.

To check the correlation between common tax avoidance measures and our tax evasion proxy, Table 9 tabulates the summary statistics (panel A) and pairwise Pearson correlations (panel B) of the following variables for the full sample as well as the three subsamples (central SOEs, local SOEs, and non-SOEs): *EVASION* (the detected tax evasion), *PRED_EVASION* (the predicted tax evasion probability based on the commitment model in column (1) of Table 5), *ETR* and *CashETR* per Bradshaw et al. (2018).[17] See appendix A for detailed definitions. There are two key findings. First, the predicted tax evasion frequencies are much higher than the observed tax evasion frequencies for both central SOEs and local SOEs. Second, the correlation between *PRED_EVASION* and *ETR* (or *CashETR*) is positive rather than negative, suggesting that neither *ETR* nor *CashETR* is a good proxy for tax evasion.

We next replicate the *ETR* model and *CashETR* model from Bradshaw et al. (2018) over our sample period 2003-2010. As shown in column (1) of Table 10, the coefficient on *SOE* is significantly positive, consistent with Bradshaw et al. (2018). In column (2), we break down *SOE* into central- and local- government owned (*SOE_CENTRAL* and *SOE_LOCAL*) and the results are also consistent with those reported in Bradshaw et al. (2018). Finally, we

[17] Inferences are qualitatively the same if we limit the tax evasions to income tax evasions only (untabulated).

estimate the *ETR* model and *CashETR* model using the same set of control variables in Table 5 and we continue to find similar results (see columns (5) to (8)). Overall, these regression results provide evidence that *ETR* and *CashETR* are unlikely to be good proxies for tax evasion, the most aggressive tax avoidance behavior.

7. Conclusion

Taking advantage of the mandatory disclosure of detected corporate tax evasions in China, we examine the types of publicly listed Chinese firms that evade taxes. To deal with the partial observability of corporate tax evasion, we simultaneously model the determinants of corporate tax evasion (referred to as the commitment model) and the determinants of corporate tax evasion detection conditional on the occurrence of a tax evasion (referred to as the detection model) using a bivariate probit model with partial observability.

With regard to the commitment model, we find three interesting results. First, SOEs are more likely to evade taxes than non-SOEs. Second, the presence of a big audit firm is associated with a reduced likelihood of corporate tax evasion. Third, we find no evidence of a deterrence effect of past tax enforcement intensity but there is evidence that overall law enforcement quality helps reduce tax evasion. With regard to the detection model, we find the following interesting results. First, as expected, the tax authority's concurrent tax enforcement intensity and overall local law enforcement quality have a positive impact on tax evasion detection. Second, SOEs are less likely to be detected for tax evasion than non-SOEs. Third, corporate tax evasion is more likely to be detected when a firm employs a big audit firm. Consistent with the results from the bivariate probit model with partial observability, we also find that even if caught for tax evasion, SOEs are subject to smaller penalties than non-SOEs.

Overall, our results are inconsistent with Bradshaw et al. (2018) and Jian et al. (2013) who find SOEs to be *less* likely to avoid taxes than non-SOEs. A key difference between these two studies and ours is the definition of tax avoidance. Specifically, we focus on tax evasion, the most opaque and egregious form of tax avoidance, but both Bradshaw et al. (2018) and Jian et al. (2013) use the effective tax rate (ETR) as a proxy for tax avoidance. In addition, ETR is readily observable to external parties while tax evasion is unobservable unless detected. Hence, the management of ETR and tax evasion could be quite different. While ETR can capture the effect of legal tax avoidance, our results suggest ETR does not capture tax evasion.

We contribute to the existing tax literature in several important ways. First, we contribute to the literature on aggressive corporate tax avoidance by being the first study to use a bivariate probit model to simultaneously model the determinants of partially observable tax evasion and the determinants of tax evasion detection. We show that taking into consideration undetected tax evasion could significantly alter a researcher's inferences. Second, we contribute to the literature on how past tax enforcement affects corporate tax avoidance behavior. To our best knowledge, we are one of the first few studies to examine how past tax enforcement affects corporate tax evasion. Third, we extend the extant tax evasion literature, which is largely limited to U.S. firms, to China, a country with a weak institutional environment and rampant tax evasion. We show that Chinese SOEs are more likely than non-SOEs to evade taxes, avoid detection even if they have committed a tax evasion, and be less severely punished even if they are caught with tax evasion.

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Appendix A. Variable Definitions

Variable name	**Definition**
*EVASION**	An indicator variable that equals one if a firm commits a tax evasion (regardless of whether the evasion is detected or not) in year *t*, and zero otherwise.
EVASION	An indicator variable that equals one if a firm is caught with a tax evasion in year *t*, and zero otherwise.
PRED_EVASION	The predicted value of the partially observable *EVASION** based on the bivariate probit model.
SOE_CENTRAL	A dummy variable that equals one if the firm's ultimate controller is the central government, and zero otherwise.
SOE_LOCAL	A dummy variable that equals one if the firm's ultimate controller is a local government, and zero otherwise.
EITRATE	The top statutory income tax rate of the firm.
BTRATE	The top statutory business tax rate of the firm.
VATRATE	The top value-added tax rate of the firm.
NOL	An indicator variable that equals 1 if the firm report a net operating loss, and 0 otherwise.
LEV	Long-term debt scaled by total assets.
MTB	Market to book ratio, the market value of equity divided by the book value of equity.
PPE	Property /total assets
FORSALES (%)	Foreign sourced income as a percentage of total sales.
SEO	A dummy variable that equals 1 if the firm has a seasoned equity offering between year *t* and year *t*+2.
COMP	The Herfindahl index of sales in different industries, where higher value means lower level of competition.
LN_SALES	Natural logarithm of total sales.
ROA	Pre-tax income divided by total assets.
BIGN	An indicator variable that equals 1 if the company is audited by a Big 4 firm or one of the Top 10 domestic audit firms in China in a year, according to the audit revenue data compiled by The Chinese Institute of Certified Public Accountants, and zero otherwise.
TARGET_INDUS	An indicator variable that equals 1 if a firm year belongs to one of the industries that are under stricter scrutiny by the tax authority, and zero otherwise.
TAX_AUDIT	The tax revenue collected through tax audit as a percentage of total tax revenue for each province year.
SEGMENT	The number of industry segments. This variable is truncated between 0 and 5, where 5 indicates firms with at least 5 segments. Missing value

	is coded as 0.
M&A	An indicator variable that equals 1 for merger and acquisition activities, and zero otherwise.
LAW	The law enforcement index developed by Fan et al. (2011). Each province receives an index value between 0-10 based on the province's law enforcement strength, with larger value of index indicates better enforcement.
ETR	Tax expense divided by pre-tax book income. Observations with negative pre-tax book income is set to missing. This variable is truncated at 0 and 1.
CashETR	Cash income tax paid divided by pre-tax income.
LN_PENALTY	The natural logarithm of one plus the amount of penalty levied on the firm for tax evasion committed in year *t*.
LN_EVADEDTAX	The natural logarithm of the amount of evaded tax for the tax evasion committed in year *t*.

Appendix B. An example of accounting adjustments due to detected tax evasion disclosed in the annual report (English translations)

Company name (stock code): Shanxi Xinghuacun Fen Wine Factory Co., Ltd. (600809)
Year of disclosure: 2003

According to the "Tax Enforcement Notice 2002" and the "Tax Punishment Notice NO. 036" issued by the Inspection Office of Lvliang Local Taxation Bureau, the Company paid back its evaded taxes for the years 2000 and 2001 as follows: (i) business tax: RMB 175,646.25 in 2001; (ii) urban construction and maintenance tax: RMB 5061.38 in 2001; (iii) educational surcharge: RMB 3,036.83 in 2001; (iv) price regulation fund charge: RMB 1,518.4 in 2001; (v) property tax: RMB 2,467.97 in 2001 and RMB 2,467.97 in 2000; (vi) stamp duty: RMB12,430.37 in 2001 and RMB 8,281.86 in 2000. The Company paid a financial penalty of RMB 100,000 for the tax avoidance. The Local Tax Bureau received the payment of past-due taxes and the penalty of RMB 310,911.05 in March 2003. Because of the above-mentioned adjustments, the Company restated its financial statements, leading to a reduction of RMB 264,274.40 in the year 2000 beginning balance of the retained earnings and a reduction of RMB 45,636.65 in the year 2000 beginning balance of the surplus reserve (including public welfare fund of RMB 15,545.55).

Table 1. Sample Selection

	No. of firm-year Observations
A-share companies between 2003 to 2010 in *CSMAR*	11,981
Less: observations with missing firm-level variables	(1,804)
	10,177
Less: observations with missing country and province-level variables	(1,409)
Final sample for the main analysis	**8,768**

Table 2. Sample Distribution

Panel A. Distribution of Tax Evasion Incidents by Commitment Year

Year	*EVASION*=1		*EVASION*=0	
	Firm-years involving a tax evasion	Percent	Firm-years involving a tax evasion	Percent
2003	49	6.0	771	94.0
2004	49	5.7	813	94.3
2005	39	4.5	837	95.5
2006	45	4.7	904	95.3
2007	51	4.1	1,187	95.9
2008	38	3.2	1,158	96.8
2009	38	2.8	1,299	97.2
2010	27	1.8	1,464	98.2
Total	336	3.8	8,432	96.2

Panel B. Distribution of Types of Tax Evaded

Tax Evaded	Percent of Tax Evasion Firm-years*
Enterprise Income Tax	41.2
Value Added Tax	18.2
Business Tax	13.8
Property Tax	12.1
Urban Land Use Tax	10.7
Urban Construction and Maintenance Tax	6.9
Stamp Duty	6.9
Education Surcharge	6.2
Land Value Added Tax	3.8
Vehicle Usage Tax	1.4
Tariff	1.2
Tax Rebate	0.5
Consumption Tax	0.2
Others	22.8

*Do not add up to 100% because a tax evasion firm year may involves more than one type of taxes evaded.

Panel C. Distribution of Identified Detectors of Tax Evasions

Identified Detector	Percent of Tax Evasion Firm-years*
Central Tax Bureau (State Administration of Taxation)	16.3
Local Tax Bureau	20.6
Local or Central Tax Bureau	18.7
Ministry of Finance	7.6
Self-Disclosed	6.2
Department of Audit	4.0
The Customs	0.9
SEC	0.7
Unknown	30.9

*Do not add up to 100% because a tax evasion firm year may involves more than one detecting agencies.

Table 3. Descriptive Statistics

Panel A. Descriptive Statistics for the Full Sample

Variable	N	Mean	S.D.	p10	p25	p50	p75	p90
$EVASION_t$	8,768	0.04	0.19	0.00	0.00	0.00	0.00	0.00
$SOE\_CENTRAL_t$	8,768	0.17	0.38	0.00	0.00	0.00	0.00	1.00
SOE_LOCAL_t	8,768	0.32	0.46	0.00	0.00	0.00	1.00	1.00
$EITRATE_{t-1}$	8,768	0.22	0.08	0.15	0.15	0.24	0.33	0.33
$BTRATE_{t-1}$	8,768	0.04	0.02	0.00	0.04	0.05	0.05	0.05
$VATRATE_{t-1}$	8,768	0.14	0.05	0.09	0.13	0.15	0.17	0.17
NOL_t	8,768	0.14	0.35	0.00	0.00	0.00	0.00	1.00
LEV_{t-1}	8,768	0.22	0.15	0.00	0.09	0.21	0.32	0.42
MTB_t	8,768	3.69	3.51	1.19	1.68	2.69	4.51	7.08
PPE_t	8,768	0.06	0.06	0.00	0.02	0.04	0.09	0.15
$FORESALE_t$	8,768	9.10	18.44	0.00	0.00	0.00	8.86	32.43
SEO_t	8,768	0.24	0.43	0.00	0.00	0.00	0.00	1.00
$COMP_t$	8,768	0.13	0.15	0.03	0.05	0.08	0.14	0.30
LN_SALES_t	8,768	20.94	1.38	19.33	20.07	20.89	21.73	22.69
ROA_t	8,768	0.06	0.05	0.01	0.02	0.05	0.08	0.12
$BIGN_t$	8,768	0.32	0.47	0.00	0.00	0.00	1.00	1.00
$TARGET\_INDUS_{t-1}$	8,768	0.11	0.32	0.00	0.00	0.00	0.00	1.00
TAX_AUDIT_{t-1}	8,768	0.01	0.01	0.00	0.01	0.01	0.02	0.02
LAW_{t-1}	8,768	8.05	4.49	3.69	4.67	6.61	10.64	14.23
$SEGMENT_t$	8,768	2.18	1.59	0.00	1.00	2.00	3.00	5.00
$M\&A_t$	8,768	0.40	0.49	0.00	0.00	0.00	1.00	1.00
$TARGET\_INDUS_{t+1}$	8,768	0.12	0.33	0.00	0.00	0.00	0.00	1.00
ETR_t	8,768	0.22	0.16	0.04	0.12	0.19	0.29	0.39
TAX_AUDIT_{t+1}	8,768	0.01	0.01	0.00	0.01	0.01	0.02	0.02
LAW_{t+1}	8,768	8.82	4.92	3.95	5.11	7.32	12.39	16.61

All continuous variables are winsorized at the 1st and 99th percentiles.

Panel B. Descriptive Statistics for Central SOE Subsample

Variable	N	Mean	S.D.	p10	p25	p50	p75	p90
$EVASION_t$	1,494	0.03	0.17	0.00	0.00	0.00	0.00	0.00
$SOE\_CENTRAL_t$	1,494	1.00	0.00	1.00	1.00	1.00	1.00	1.00
SOE_LOCAL_t	1,494	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$EITRATE_{t-1}$	1,494	0.20	0.07	0.15	0.15	0.15	0.25	0.33
$BTRATE_{t-1}$	1,494	0.04	0.02	0.00	0.04	0.04	0.05	0.05
$VATRATE_{t-1}$	1,494	0.14	0.04	0.10	0.15	0.17	0.17	0.17
NOL_t	1,494	0.13	0.34	0.00	0.00	0.00	0.00	1.00
LEV_{t-1}	1,494	0.20	0.16	0.00	0.06	0.18	0.30	0.44
MTB_t	1,494	3.76	3.29	1.27	1.79	2.87	4.56	7.18
PPE_t	1,494	0.06	0.06	0.01	0.02	0.05	0.09	0.14
$FORESALE_t$	1,494	10.99	19.86	0.00	0.00	0.00	13.82	40.47
$COMP_t$	1,494	0.14	0.16	0.03	0.06	0.08	0.14	0.31
SEO_t	1,494	0.26	0.44	0.00	0.00	0.00	1.00	1.00
LN_SALES_t	1,494	21.45	1.53	19.62	20.37	21.30	22.34	23.63
ROA_t	1,494	0.06	0.05	0.01	0.02	0.04	0.08	0.12
$BIGN_t$	1,494	0.49	0.50	0.00	0.00	0.00	1.00	1.00
$TARGET\_INDUS_{t-1}$	1,494	0.09	0.29	0.00	0.00	0.00	0.00	0.00
TAX_AUDIT_{t-1}	1,494	0.01	0.01	0.00	0.01	0.01	0.02	0.02
LAW_{t-1}	1,494	8.20	4.31	3.81	4.99	7.39	10.64	14.23
$SEGMENT_t$	1,494	2.04	1.60	0.00	1.00	2.00	3.00	5.00
$M\&A_t$	1,494	0.40	0.49	0.00	0.00	0.00	1.00	1.00
LAW_{t+1}	1,494	8.98	4.72	4.28	5.27	7.60	12.39	16.27
ETR_t	1,494	0.19	0.14	0.03	0.11	0.17	0.25	0.36
$TARGET\_INDUS_{t+1}$	1,494	0.09	0.29	0.00	0.00	0.00	0.00	0.00
TAX_AUDIT_{t+1}	1,494	0.01	0.01	0.00	0.01	0.01	0.02	0.02

All continuous variables are winsorized at the 1st and 99th percentiles.

Panel C. Descriptive Statistics for Local SOE Subsample

Variable	N	Mean	S.D.	p10	p25	p50	p75	p90
$EVASION_t$	2,770	0.04	0.20	0.00	0.00	0.00	0.00	0.00
$SOE\_CENTRAL_t$	2,770	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOE_LOCAL_t	2,770	1.00	0.00	1.00	1.00	1.00	1.00	1.00
$EITRATE_{t-1}$	2,770	0.23	0.08	0.15	0.15	0.25	0.33	0.33
$BTRATE_{t-1}$	2,770	0.04	0.02	0.00	0.04	0.05	0.05	0.05
$VATRATE_{t-1}$	2,770	0.14	0.05	0.09	0.12	0.15	0.17	0.17
NOL_t	2,770	0.12	0.32	0.00	0.00	0.00	0.00	1.00
LEV_{t-1}	2,770	0.22	0.15	0.01	0.09	0.21	0.32	0.42
MTB_t	2,770	3.37	3.14	1.20	1.64	2.48	4.07	6.27
PPE_t	2,770	0.06	0.06	0.01	0.02	0.05	0.09	0.15
$FORESALE_t$	2,770	7.41	15.79	0.00	0.00	0.00	7.09	25.09
SEO_t	2,770	0.23	0.42	0.00	0.00	0.00	0.00	1.00
$COMP_t$	2,770	0.12	0.12	0.03	0.05	0.08	0.13	0.25
LN_SALES_t	2,770	21.25	1.33	19.63	20.37	21.14	22.05	23.04
ROA_t	2,770	0.06	0.05	0.01	0.02	0.04	0.07	0.12
$BIGN_t$	2,770	0.28	0.45	0.00	0.00	0.00	1.00	1.00
$TARGET\_INDUS_{t-1}$	2,770	0.12	0.33	0.00	0.00	0.00	0.00	1.00
TAX_AUDIT_{t-1}	2,770	0.01	0.01	0.00	0.01	0.01	0.02	0.02
LAW_{t-1}	2,770	7.83	4.45	3.48	4.63	6.42	9.07	14.23
$SEGMENT_t$	2,770	2.25	1.68	0.00	1.00	2.00	4.00	5.00
$M\&A_t$	2,770	0.40	0.49	0.00	0.00	0.00	1.00	1.00
LAW_{t+1}	2,770	8.58	4.85	3.91	5.04	7.21	11.47	16.61
ETR_t	2,770	0.22	0.15	0.04	0.13	0.20	0.30	0.39
$TARGET\_INDUS_{t+1}$	2,770	0.13	0.34	0.00	0.00	0.00	0.00	1.00
TAX_AUDIT_{t+1}	2,770	0.01	0.01	0.00	0.01	0.01	0.02	0.02

All continuous variables are winsorized at the 1st and 99th percentiles.

Panel D. Descriptive Statistics for Non-SOE Subsample

Variable	N	Mean	S.D.	p10	p25	p50	p75	p90
$EVASION_t$	4,504	0.04	0.19	0.00	0.00	0.00	0.00	0.00
$SOE\_CENTRAL_t$	4,504	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOE_LOCAL_t	4,504	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$EITRATE_{t-1}$	4,504	0.23	0.09	0.15	0.15	0.25	0.33	0.33
$BTRATE_{t-1}$	4,504	0.04	0.02	0.00	0.04	0.05	0.05	0.05
$VATRATE_{t-1}$	4,504	0.14	0.04	0.09	0.15	0.17	0.17	0.17
NOL_t	4,504	0.16	0.37	0.00	0.00	0.00	0.00	1.00
LEV_{t-1}	4,504	0.22	0.15	0.00	0.10	0.22	0.33	0.42
MTB_t	4,504	3.86	3.78	1.15	1.68	2.83	4.78	7.69
PPE_t	4,504	0.06	0.06	0.00	0.02	0.04	0.09	0.15
$FORESALE_t$	4,504	9.50	19.37	0.00	0.00	0.00	8.54	35.44
SEO_t	4,504	0.25	0.43	0.00	0.00	0.00	0.00	1.00
$COMP_t$	4,504	0.14	0.16	0.03	0.05	0.08	0.14	0.31
LN_SALES_t	4,504	20.59	1.26	19.10	19.82	20.63	21.38	22.05
ROA_t	4,504	0.06	0.05	0.01	0.02	0.05	0.08	0.13
$BIGN_t$	4,504	0.29	0.45	0.00	0.00	0.00	1.00	1.00
$TARGET\_INDUS_{t-1}$	4,504	0.12	0.32	0.00	0.00	0.00	0.00	1.00
TAX_AUDIT_{t-1}	4,504	0.01	0.01	0.01	0.01	0.01	0.02	0.02
LAW_{t-1}	4,504	8.13	4.58	3.64	4.66	6.61	11.47	14.23
$SEGMENT_t$	4,504	2.18	1.53	0.00	1.00	2.00	3.00	5.00
$M\&A_t$	4,504	0.41	0.49	0.00	0.00	0.00	1.00	1.00
LAW_{t+1}	4,504	8.92	5.01	3.90	5.02	7.32	12.39	17.14
ETR_t	4,504	0.22	0.17	0.03	0.11	0.19	0.30	0.41
TAX_AUDIT_{t+1}	4,504	0.01	0.01	0.01	0.01	0.01	0.02	0.02
$TARGET\_INDUS_{t+1}$	4,504	0.13	0.33	0.00	0.00	0.00	0.00	1.00

All continuous variables are winsorized at the 1st and 99th percentiles.

Table 4. Correlations

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.
1. $EVASION_t$																					
2. $SOE\_CENTRAL_t$	**-0.01**																				
3. SOE_LOCAL_t	**0.02**	**-0.30**																			
4. $EITRATE_{t-1}$	**0.03**	**-0.11**	**0.06**																		
5. $BTRATE_{t-1}$	**0.01**	**0.04**	**0.04**	**-0.02**																	
6. $VATRATE_{t-1}$	**-0.01**	**-0.03**	**-0.06**	**-0.02**	**-0.03**																
7. NOL_t	**0.03**	**-0.05**	**-0.09**	**0.02**	**-0.06**	0.00															
8. LEV_{t-1}	**0.03**	**0.06**	**0.06**	**0.06**	**0.12**	**-0.23**	**-0.09**														
9. MTB_t	**-0.02**	0.01	0.00	0.01	**-0.02**	0.00	0.01	-0.01													
10. PPE_t	**-0.04**	**-0.02**	-0.01	0.00	**0.05**	**-0.04**	**-0.11**	**0.25**	-0.01												
11. $FORESALE_t$	**-0.02**	**0.01**	**-0.09**	**-0.06**	**-0.09**	**0.11**	0.00	**-0.07**	0.00	**0.08**											
12. SEO_t	**-0.03**	**0.03**	-0.01	**-0.03**	0.00	0.01	**-0.10**	**0.11**	0.00	**0.12**	**0.03**										
13. $COMP_t$	**-0.02**	**0.02**	**-0.05**	-0.01	**0.08**	**-0.04**	**0.04**	0.00	**-0.02**	**0.03**	**-0.03**	0.00									
14. LN_SALES_t	**-0.04**	**0.19**	**0.15**	-0.01	**0.18**	0.01	**-0.27**	**0.17**	**-0.02**	**0.10**	**0.05**	**0.17**	**-0.02**								
15. ROA_t	**-0.05**	0.01	**0.03**	**-0.05**	**0.05**	**0.03**	**-0.18**	**-0.04**	0.01	**0.21**	**0.03**	**0.13**	**-0.03**	**0.27**							
16. $BIGN_t$	**-0.04**	**0.11**	**-0.06**	**-0.10**	0.01	**0.02**	**-0.04**	0.00	0.00	0.01	**0.08**	**0.05**	**0.02**	**0.07**	**0.05**						
17. $TARGET\_INDUS_{t-1}$	**0.02**	**-0.04**	0.01	**0.02**	**0.04**	**0.08**	**0.03**	**0.07**	0.01	**-0.13**	**-0.07**	**0.05**	**-0.09**	**-0.04**	0.00	**-0.02**					
18. TAX_AUDIT_{t-1}	**0.02**	**-0.04**	**0.02**	**0.04**	**-0.03**	**-0.02**	0.00	**0.03**	-0.01	0.01	**-0.05**	**-0.02**	**0.02**	**-0.05**	**-0.04**	**-0.03**	**-0.10**				
19. LAW_{t-1}	**-0.09**	**0.04**	**-0.03**	**-0.13**	**0.05**	**0.08**	**-0.07**	**-0.05**	0.00	**-0.07**	**0.14**	**0.08**	-0.01	**0.19**	**0.12**	**0.21**	**0.10**	**-0.25**			
20. $SEGMENT_t$	0.01	0.00	**0.04**	0.01	**0.16**	**-0.06**	**-0.10**	**0.02**	**-0.01**	**-0.10**	**-0.05**	0.01	**0.07**	**0.20**	0.00	**0.03**	**0.06**	**-0.07**	**0.13**		
21. $M\&A_t$	-0.01	0.00	0.00	**-0.02**	**0.09**	**-0.01**	**-0.13**	**0.09**	**-0.01**	**0.09**	**0.02**	**0.13**	-0.01	**0.17**	**0.10**	**0.06**	**0.07**	**-0.03**	**0.10**	**0.10**	
22. ETR_t	**0.03**	**-0.06**	**0.04**	**0.33**	0.01	**0.02**	**-0.11**	**0.04**	0.01	**-0.07**	**-0.08**	**-0.08**	-0.01	**0.04**	**-0.16**	**-0.07**	**0.07**	**0.03**	**-0.05**	**0.08**	0.00

This table reports the Pearson correlations among the variables used in the analysis. Correlation coefficients marked in bold are significant at the 0.10 level or better (based on two-tailed tests).

Table 5. Determinants of Corporate Tax Evasion Commitment and Detection: Bivariate Probit with Partial Observability Estimation

	(1) Pr($EVASION^*_t$)	(2) Pr($DETECTION \mid EVASION^*_t$)
Motivation:		
$SOE\_CENTRAL_t$	1.2408**	-2.0695***
	(2.05)	(-3.58)
SOE_LOCAL_t	0.8021*	-1.3327***
	(1.89)	(-2.69)
$EITRATE_{t-1}$	0.1561	
	(0.38)	
$BTRATE_{t-1}$	2.1450	
	(1.28)	
$VATRATE_{t-1}$	-0.3611	
	(-0.52)	
NOL_t	-0.0696	
	(-0.72)	
LEV_{t-1}	0.4614**	
	-1.97	
MTB_t	-0.0009	
	(-1.37)	
PPE_t	-1.4669**	
	(-2.18)	
$FORESALE_t$	0.0036	
	(0.28)	
SEO_t	-0.1373	
	(-1.59)	
$COMP_{t-1}$	-0.5463**	
	(-2.20)	
Ability:		
LN_SALES_t	-0.1047	0.1249
	(-1.48)	(0.97)
ROA_t	-2.7956***	
	(-3.06)	
Opportunity:		
$BIGN_t$	-0.2841*	0.4691**
	(-1.75)	(2.09)
$TARGET\_INDUS_{t-1}$	-0.0556	
	(-0.48)	
TAX_AUDIT_{t-1}	-10.9464	
	(-1.22)	
LAW_{t-1}	-0.1173***	
	(-4.36)	
$SEGMENT_t$	0.0403*	
	(1.81)	
$M\&A_t$	0.0429	
	(0.64)	
LAW_{t+1}		0.0844*
		(1.87)
ETR_t		0.1709
		(0.47)
$TARGET\_INDUS_{t+1}$		0.6126*
		(1.82)
TAX_AUDIT_{t+1}		34.9342**
		(2.56)
Year & Industry Fixed Effects	Yes	
Prob > χ^2	0.00	
Observations	8,768	

This table presents the results of a joint estimation of Models (1) and (2) using a bivariate probit model with partial observability. Please refer to Appendix A for variable definitions. All continuous variables are winsorized at the 1st and 99th percentiles. z-statistics are in parentheses and are based on standard errors adjusted for firm- and year- clustering. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6. Determinants of Corporate Tax Evasion Commitment and Detection: Income Tax Evasions Only

	(1) Pr(*EVASIONT*$_t$*)	(2) Pr(*DETECTION* | *EVASION*$_t$*)
Motivation:		
SOE_CENTRAL$_t$	0.9069***	-1.6969***
	(2.92)	(-2.67)
SOE_LOCAL$_t$	0.4803**	-0.9816**
	(2.26)	(-2.54)
EITRATE$_{t-1}$	0.5912*	
	(1.68)	
BTRATE$_{t-1}$	-1.0714	
	(-0.76)	
VATRATE$_{t-1}$	0.3305	
	(0.47)	
NOL	-0.2335*	
	(-1.78)	
LEV$_{t-1}$	0.4593*	
	(1.85)	
MTB$_t$	-0.0001	
	(-0.12)	
PPE$_t$	-1.1799*	
	(-1.76)	
FORESALE$_t$	0.0073	
	(0.76)	
SEO$_t$	-0.0377	
	(-0.52)	
COMP$_{t-1}$	-0.5315**	
	(-2.00)	
Ability:		
LN_SALES$_t$	-0.1891**	0.4905**
	(-2.34)	(2.28)
ROA$_t$	-1.2371	
	(-1.32)	
Opportunity:		
BIGN$_t$	-0.1588	0.1613
	(-1.23)	(0.52)
TARGET_INDUS$_{t-1}$	-0.0139	
	(-0.18)	
TAX_AUDIT$_{t-1}$	-5.0975	
	(-0.76)	
LAW$_{t-1}$	-0.1002***	
	(-5.02)	
SEGMENT$_t$	0.0020	
	(0.18)	
M&A$_t$	0.0688	
	(1.12)	
LAW$_{t+1}$		0.1097***
		(2.65)
ETR$_t$		0.4941
		(0.96)
TARGET_INDUS$_{t+1}$		0.4841
		(1.26)
TAX_AUDIT$_{t+1}$		42.0292*
		(1.75)
Year & Industry Fixed Effects	Yes	
Prob > χ^2	0.00	
Observations	8,768	

This table presents the results of a joint estimation of Models (1) and (2) using a bivariate probit model with partial observability. We consider only income tax evasion observations. Please refer to Appendix A for variable definitions. All continuous variables are winsorized at the 1st and 99th percentiles. z-statistics are in parentheses and are based on standard errors adjusted for firm- and year- clustering. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 7. Determinants of Corporate Tax Evasion Commitment and Detection: Single Equation Probit Estimation

	All Evasions
	(1)
	Pr($EVASION_t$)
Motivation:	
$SOE\_CENTRAL_t$	-0.0740
	(-0.70)
SOE_LOCAL_t	0.0303
	(0.38)
$EITRATE_{t-1}$	0.3047
	(0.69)
$BTRATE_{t-1}$	2.4006
	(1.07)
$VATRATE_{t-1}$	-0.6150
	(-0.57)
NOL_t	-0.0065
	(-0.06)
LEV_{t-1}	0.6424*
	(1.69)
MTB_t	-0.0003
	(-1.47)
PPE_t	-1.4494**
	(-2.17)
$FORESALE_t$	0.0102
	(0.38)
SEO_t	-0.1154
	(-1.34)
$COMP_{t-1}$	-0.3390
	(-1.28)
Ability:	
LN_SALES_t	-0.0274
	(-0.94)
ROA_t	-2.3998***
	(-3.03)
Opportunity:	
$BIGN_t$	-0.0309
	(-0.39)
$TARGET\_INDUS_{t-1}$	0.0263
	(0.25)
TAX_AUDIT_{t-1}	2.1801
	(0.60)
$SEGMENT_t$	0.0103
	(0.66)
$M\&A_t$	0.0461
	(0.78)
LAW_{t-1}	-0.0556***
	(-4.52)
ETR_t	0.1462
	(0.79)
Year & Industry Fixed Effects	Yes
Observations	8,768
Pseudo R^2	0.06

This table presents the results of probit estimation of Model (1). Please refer to Appendix A for variable definitions. All continuous variables are winsorized at the 1st and 99th percentiles. *z*-statistics are in parentheses and are based on standard errors adjusted for firm- and year- clustering. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 8. OLS Regression Results on the Determinants of Tax Evasion Penalty

	Dependent variable = $LN\_PENALTY_t$
LN_SALES_t	-0.01817
	(-0.86)
$SOE\_CENTRAL_t$	-2.5651***
	(-4.17)
SOE_LOCAL_t	-1.1770*
	(-1.94)
LN_EVADEDTAX	0.5654***
	(3.74)
Constant	-4.9295
	(-1.06)
Dummies for Types of Evaded Taxes	Yes
Dummies for Detectors	Yes
Year & Industry Fixed Effects	Yes
Observations	425
Adjusted R^2	0.39

This table presents the results of an OLS regression of *LN_PENALTY* as a function of firm size, ownership, and the amount of evaded taxes. Please refer to Appendix A for variable definitions. All continuous variables are winsorized at the 1st and 99th percentiles. *t*-statistics are in parentheses and are based on standard errors adjusted for firm- and year- clustering. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 9. A Comparison of Tax Evasion, Predicted Tax Evasion, and Effective Tax Rates

Panel A. Descriptive Statistics

Variable	Mean	SD	p10	p25	p50	p75	P90
Full Sample							
$EVASION_t$	0.04	0.19	0.00	0.00	0.00	0.00	0.00
$PRED\_EVASION_t$	0.14	0.14	0.01	0.04	0.10	0.22	0.35
ETR_t	0.22	0.16	0.04	0.12	0.19	0.29	0.39
$CashETR_t$	0.21	0.23	0.00	0.07	0.16	0.27	0.42
Central SOEs							
$EVASION_t$	0.03	0.17	0.00	0.00	0.00	0.00	0.00
$PRED\_EVASION_t$	0.28	0.16	0.07	0.16	0.28	0.41	0.49
ETR_t	0.19	0.14	0.03	0.11	0.17	0.25	0.36
$CashETR_t$	0.19	0.18	0.02	0.08	0.15	0.25	0.39
Local SOEs							
$EVASION_t$	0.04	0.20	0.00	0.00	0.00	0.00	0.00
$PRED\_EVASION_t$	0.19	0.12	0.04	0.10	0.19	0.28	0.37
ETR_t	0.22	0.15	0.04	0.13	0.20	0.30	0.39
$CashETR_t$	0.22	0.19	0.02	0.09	0.18	0.29	0.45
Non-SOEs							
$EVASION_t$	0.04	0.19	0.00	0.00	0.00	0.00	0.00
$PRED\_EVASION_t$	0.05	0.06	0.00	0.02	0.05	0.09	0.14
ETR_t	0.22	0.17	0.03	0.11	0.19	0.30	0.41
$CashETR_t$	0.21	0.21	0.01	0.08	0.16	0.27	0.44

Panel B. Pearson Correlations

This table presents descriptive statistics and Pearson correlations for tax evasion, predicted tax evasion, effective tax rates (*ETR*), and cash effective tax rates (*CashETR*). The correlations in bold are significant at the 0.10 level (based on two-tailed tests). See the appendix for variable definitions.

Variable	1. $EVASION_t$	2. $PRED\_EVASION_t$	3. ETR_t	4. $CashETR_t$
Full Sample				
1. $EVASION_t$	**1.00**			
2. $PRED\_EVASION_t$	**0.05**	**1.00**		
3. ETR_t	**0.03**	0.02	**1.00**	
4. $CashETR_t$	**0.04**	**0.03**	**0.61**	**1.00**
Central SOEs				
1. $EVASION_t$	**1.00**			
2. $PRED\_EVASION_t$	0.04	**1.00**		
3. ETR_t	**0.06**	0.03	**1.00**	
4. $CashETR_t$	**0.08**	0.03	**0.67**	**1.00**
Local SOEs				
1. $EVASION_t$	**1.00**			
2. $PRED\_EVASION_t$	**0.07**	**1.00**		
3. ETR_t	0.01	**0.07**	**1.00**	
4. $CashETR_t$	0.01	**0.07**	**0.59**	**1.00**
Non-SOEs				
1. $EVASION_t$	**1.00**			
2. $PRED\_EVASION_t$	**0.15**	**1.00**		
3. ETR_t	**0.04**	**0.09**	**1.00**	
4. $CashETR_t$	**0.05**	**0.08**	**0.61**	**1.00**

Table 10. Replication of Bradshaw et al.'s (2018) *ETR* Regressions

	(1) ETR_t	(2) $CashETR_t$	(3) ETR_t	(4) $CashETR_t$	(5) ETR_t	(6) $CashETR_t$	(7) ETR_t	(8) $CashETR_t$
SOE_t	0.0097*	0.0085*			0.0082*	0.0168***		
	(1.86)	(1.72)			(1.83)	(3.36)		
$SOE\_CENTRAL_t$			0.0067	0.0177**			0.0018	0.0130*
			(0.93)	(2.28)			(0.29)	(1.88)
SOE_LOCAL_t			0.0164***	0.0208***			0.0104**	0.0188***
			(2.93)	(3.26)			(2.04)	(3.28)
LN_ASSETS_t	-0.0036	-0.0092***	-0.0043	-0.0107***				
	(-1.40)	(-3.87)	(-1.57)	(-3.85)				
LN_SALES_t					0.0027	-0.0002	0.0035*	-0.0001
					(1.45)	(-0.10)	(1.87)	(-0.06)
$FORESALE_t$	-0.0042***	-0.0049***	-0.0046***	-0.0054***	-0.0063***	-0.0069***	-0.0060***	-0.0069***
	(-4.18)	(-5.11)	(-4.64)	(-5.09)	(-6.67)	(-6.69)	(-6.35)	(-6.63)
ROA_t	0.4330***	0.3264***	0.3038***	0.1502***	0.2467***	0.0944***	0.2529***	0.0940***
	(14.09)	(11.24)	(8.47)	(3.77)	(10.21)	(3.20)	(10.43)	(3.18)
LEV_{t-1}	0.0374**	0.0436***	0.0408***	0.0496***	0.0356	0.0498*	0.0391*	0.0501*
	(2.49)	(2.91)	(2.58)	(2.83)	(1.62)	(1.92)	(1.78)	(1.93)
MTB_t	-0.0028***	-0.0038***	-0.0021***	-0.0030***	-0.0000	0.0000	0.0000	0.0000
	(-5.00)	(-6.03)	(-3.18)	(-3.76)	(-0.02)	(1.45)	(0.05)	(1.45)
PPE_t	-0.0942***	-0.0180	-0.1026***	-0.0090	-0.1470***	-0.0082	-0.1323***	-0.0091
	(-2.75)	(-0.51)	(-2.97)	(-0.22)	(-4.67)	(-0.22)	(-4.20)	(-0.24)
NOL_t	-0.0968***	-0.1169***	-0.1084***	-0.1310***	-0.0556***	-0.0734***	-0.0556***	-0.0733***
	(-10.41)	(-10.63)	(-11.30)	(-11.35)	(-7.46)	(-9.50)	(-7.51)	(-9.47)
$M\&A_t$	0.0028	-0.0034	0.0026	-0.0049	0.0060*	-0.0018	0.0073**	-0.0017
	(0.73)	(-0.73)	(0.68)	(-1.04)	(1.74)	(-0.41)	(2.11)	(-0.41)
$EQUOFFER_t$	-0.0142***	-0.0368***	-0.0154***	-0.0390***				
	(-3.46)	(-6.61)	(-3.77)	(-6.70)				
$CROSSLIST_t$	0.0014	0.0087	0.0030	0.0109				
	(0.16)	(0.93)	(0.34)	(1.02)				
$OWNCONCEN_t$	-0.0270	-0.0180	-0.0194	-0.0122				
	(-1.63)	(-1.17)	(-1.13)	(-0.64)				
$MGMTOWN_t$	-0.0038	-0.0022	-0.0024	-0.0013				
	(-0.80)	(-0.49)	(-0.49)	(-0.24)				
$DUALCEO_t$	-0.0039	-0.0072	-0.0055	-0.0086				
	(-0.54)	(-1.16)	(-0.75)	(-1.14)				

$TAXPREFERENCE_t$	-0.0678***	-0.0656***	-0.0699***	-0.0683***				
	(-14.41)	(-14.71)	(-14.13)	(-12.28)				
$EITRATE_{t-1}$					0.5082***	0.4630***	0.5020***	0.4605***
					(17.82)	(15.10)	(17.41)	(14.85)
$BTRATE_{t-1}$					0.2188*	0.1433	0.2167*	0.1433
					(1.85)	(1.07)	(1.84)	(1.07)
$VATRATE_{t-1}$					-0.0099	-0.0125	-0.0085	-0.0108
					(-0.19)	(-0.21)	(-0.16)	(-0.18)
SEO_t					-0.0218***	-0.0342***	-0.0207***	-0.0342***
					(-5.27)	(-7.49)	(-5.45)	(-7.49)
$COMP_{t-1}$					0.0275	-0.0057	0.0282	-0.0052
					(1.32)	(-0.27)	(1.36)	(-0.25)
$BIGN_t$					-0.0061	-0.0008	-0.0047	-0.0002
					(-1.37)	(-0.15)	(-1.05)	(-0.03)
$TARGET\_INDUS_{t-1}$					0.0124*	0.0145*	0.0124*	0.0144*
					(1.88)	(1.74)	(1.87)	(1.72)
TAX_AUDIT_{t-1}					0.3728*	0.3329	0.3729*	0.3290
					(1.65)	(1.26)	(1.66)	(1.25)
LAW_{t-1}					0.0003	0.0012*	0.0002	0.0012*
					(0.58)	(1.85)	(0.41)	(1.84)
$SEGMENT_t$					0.0013	-0.0003	0.0013	-0.0003
					(1.28)	(-0.28)	(1.32)	(-0.27)
Constant	0.4058***	0.5348***	0.4331***	0.5789***	0.0243	0.1313***	0.0102	0.1295***
	(5.96)	(8.56)	(5.72)	(5.60)	(0.55)	(2.66)	(0.23)	(2.62)
Year & Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,850	7,609	7,850	7,609	8,786	8,563	8,786	8,563
Adjusted R^2	0.15	0.10	0.14	0.10	0.14	0.10	0.14	0.10

This table reports the OLS estimation results of Bradshaw et al.'s (2018) ETR model over our sample period. The *t*-statistics are in parentheses and are based on standard errors adjusted for firm clustering. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. *SOE* is an indicator variable equal to one if a firm is controlled by the state, and zero otherwise. *EQUOFFER* is an indicator variable for seasonal equity offerings in a year. *CROSSLIST* is an indicator variable for firms that are also cross-listed in both A-share and H-Share stock markets. *MGMTOWN* is an indicator variable equal to one if the management has equity ownership, and zero otherwise. *OWNCONCEN* is the ownership percentage of the largest shareholder. *DUALCEO* is an indicator variable equal to one if the CEO is also the chairman of the board of directors, and zero otherwise. *TAXPREFERENCE* is an indicator variable for firms that potentially enjoy a preferential tax rate. Three major types of firms enjoy preferential tax rates: 1) firms domiciled in special locations, including hi-tech industry development zones and economic development zones (that sometimes receive preferential tax rates); 2) firm-years with foreign ownership that are eligible for preferential tax rates; 3) observations of firms younger than three years (that receive special deductions for start-up expenses). We omitted the variable *R&D* (research and development expense divided by total assets) because it requires hand collection. See the appendix for all other variable definitions.