# Tax Information Sharing and Debt Risk: Evidence from China's Public Firms

# Qingxi Meng

School of Management, Xiamen University <u>qxmeng@xmu.edu.cn</u>

# **Anting Zhang**

China Resources (Holdings) Co., Ltd. School of Management, Xiamen University <u>zhanganting1@crc.com.hk</u>

# Yi Yang

School of Accountancy, Shanghai University of Finance and Economics yiyang971210@163.com

# Linda H. Chen<sup>\*</sup>

College of Business and Economics, University of Idaho lindachen@uidaho.edu

\* Corresponding author. Department of Accounting & MIS, College of Business and Economics, University of Idaho, Moscow, Idaho, ID 83844, U.S.A.

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#### **Abstract:**

This study investigates the combined effect of two major government initiatives in China -- the Golden Tax Project III (GTP III) and the Bank-Tax Interaction (BTI) -- on overdue bank loans. Using manually collected data on bank loan defaults during the implementation of GTP III and the introduction of BTI, we document a significant reduction in corporate debt default risk. This improvement is attributed to enhanced information disclosure, better regulation of lending practices, and reduced agency costs. The impact of these initiatives is particularly notable among firms with strong tax credit ratings and in regions with weaker legal frameworks. State-owned and local banks benefit the most from these initiatives, while non-state-owned and non-local banks experience minimal to no gains. Additionally, the information-sharing mechanisms established between tax authorities and banks also help curb firms' involvement in risky external debt guarantees. This study underscores the benefits of enhanced data-sharing systems in reducing loan default risks and improving financial stability. However, it also highlights the need for better coordination to ensure equitable benefits across all banks, regardless of ownership structure or location. The findings indicate that optimizing data-sharing practices holds significant potential to create a more level playing field and further mitigate corporate debt risks in China's banking sector.

**Keywords:** digitalized tax administration; Golden Tax Project III; Bank-Tax Interaction; loan default risk; overdue loans

**JEL:** G21; H81; H32

#### I. Introduction

The implementation of the Golden Tax Project III (GTP III) and the Bank-Tax Interaction (BTI) in China followed a closely interconnected timeline, reflecting the government's coordinated effort to enhance tax administration and financial intermediation. GTP III, a phased initiative led by the State Taxation Administration (STA), focused on digitizing tax data and improving tax compliance through advanced information technology. Building on the infrastructure and data transparency established by GTP III, the Bank-Tax Interaction (BTI) initiative was introduced in 2015 as a collaborative effort between the STA and the China Banking Regulatory Commission (CBRC). BTI created a tripartite framework involving tax authorities, banks, and small and medium sized enterprises (SMEs), enabling tax authorities to share firms' historical tax records with banks to improve credit assessments. The alignment of these initiatives reflects a strategic government effort to utilize enhanced tax data systems to mitigate information asymmetries in lending, reduce corporate debt risks, and promote economic stability through improved coordination between financial and tax systems. However, whether this strategy has effectively achieved its intended outcomes remains an empirical question.

This paper explores two research questions: (1) Does the digitization of tax information contribute to reducing the risk of bank loan defaults in China? (2) If such an effect exists, what mechanisms underlie this relationship, and what are the broader policy implications? To the best of our knowledge, this study is the first to examine the joint effects of GTP III and BTI on bank loan default.

China is undergoing a critical transitional period of rectifying and refining its distinctive economic structure. Alongside external pressures such as trade tensions and the COVID-19 pandemic, compounded by internal economic structural imbalances stemming from real estate

bubbles, the risk of debt default among certain enterprises has surged significantly. The ramifications of corporate debt defaults extend beyond the affected enterprises, triggering ripple effects that affect both upstream and downstream businesses, guarantors, and financial institutions. Consequently, these defaults could potentially reverberate throughout the entire economy, including the financial markets. As a result, the most current Five-Year Plan published by the Central Government in 2020 has highlighted the importance of accountability in managing financial risks to prevent, predict, control, and mitigate the potential damages of debt default risks.<sup>1</sup>

Meanwhile, China's centralized administrative structure makes it possible for data sharing among different regulatory bodies, such as the tax authority – the State Taxation Administration (STA), and banking authority - China Banking Regulatory Commission (CBRC). In 2015, these two regulatory bodies jointly proposed information sharing between the banking system and the tax system to assist medium and small business enterprises with the so-called "Bank-Tax Interaction" (BTI).<sup>2</sup> Subsequently, these two regulatory bodies introduced additional clarifications to enhance information sharing through the digitization of the tax system.<sup>3&4</sup>

Although the ability for a firm to serve its corporate debt is largely determined by the firm's fundamentals (Zhao et al., 2022), its willingness to do so, as outlined in debt covenants, also depends on the enforceability of debt contracts and corporate practices when interacting with other stakeholders. Therefore, we consider the centralized administrative structure in China as a unique institutional environment for examining how information sharing among stakeholders influences companies' adherence to their obligations, such as tax payments and debt

<sup>&</sup>lt;sup>1</sup> https://www.gov.cn/zhengce/2020-11/03/content\_5556991.htm

<sup>&</sup>lt;sup>2</sup> https://www.chinatax.gov.cn/chinatax/n810341/n810765/n1465977/n1466032/c1812966/content.html

<sup>&</sup>lt;sup>3</sup> https://www.chinatax.gov.cn/n810341/n810755/c2653173/content.html

<sup>&</sup>lt;sup>4</sup> https://www.gov.cn/zhengce/zhengceku/2019-12/04/content\_5458262.htm

obligations. Specifically, we explore whether the digitization of tax data both locally and nationally can contribute to reducing the risk of corporate debt defaults.

The tax authority and banking authority operate with distinct administrative goals, creating an inherent tension in information sharing. At best, each can offer only supplementary data, and even that is hindered by the absence of incentive mechanisms compelling local tax authorities to share timely information with the banking sector. This disconnect becomes more pronounced in scenarios where financial constraints burden firms. In such cases, both stakeholders are driven by competing interests, as their payoffs depend on their respective shares of the firm's income. This clash of priorities sets the stage for a potential conflict of interest, where their claims to the firm could collide, intensifying the strain between tax authorities and banks. Therefore, whether and to what extent tax digitization can help mitigating firms' debt default risk remains an empirical question.

Using the Chinese Golden Tax Project III (GTP III)<sup>5</sup> rollout and the introduction of BTI as a quasi-experiment setting, we hand collected bank loan overdue data of non-financial A-share firms listed on the Shenzhen Stock Exchange and Shanghai Stock Exchange between 2010 to 2019. We find evidence that digitization of tax information can help reduce firms' debt default risk. We confirmed our result using a placebo test by randomly assigned the treatment period and confirm that random selections of treatment period do not yield any results. The findings are also robust if we use alternative loan overdue measures.

Next, we explore the underlying mechanism, namely information asymmetry reduction and corporate governance improvement respectively. The empirical results support the notion

<sup>&</sup>lt;sup>5</sup> Following Golden Tax Phase I and II, the Chinese Golden Tax III has been fully implemented in 2017 to establish a cloud-based consistent tax administration. The upgraded VAT invoicing system allows online issuance of digitalized VAT invoices and e-invoicing that are directly connected to the tax administration and shared with other administrative authorities. Please refer to https://www.gov.cn/xinwen/2016-12/26/content\_5153148.htm

that the digitization of tax information aids in mitigating loan default risk primarily by improving the prompt disclosure of "bad news" at the firm level, thus alleviating debt overhang. Additionally, enhanced information transparency leads to a decrease in agency costs, as evidenced by a reduction in related party transactions and management expense ratio.

Considering that the Chinese banking sector encompasses more than 4,000 banks across various categories including state-owned, joint-stock, city commercial, and rural commercial banks, we further explore which types of banks and loan guarantee structures benefit the most in reduction in loan default with the implementation of GTP III and BTI. We document that the five state-owned banks<sup>6</sup> and local banks benefit the most from the digitalization of tax information. In addition, we also provide evidence that the digitalization of tax information is associated with the loan overhang reduction mainly for guaranteed loans.

We further explore circumstances that amplify the impact of implementing GTP III and BTI on reducing overdue bank loans. We examine how differences in tax credit ratings<sup>7</sup>, media scrutiny, and regional legal environments affect the negative association between the implementation of GTP III and BTI and overdue bank loans. We find evidence that the impact of the digitalization of tax information on reducing bank loan overhang is more pronounced for firms with high-quality tax credit ratings. In addition to better overall credit ratings for this subset of firms, the information provided by these firms is also more comprehensive. Consequently, banks can utilize relevant information and more effectively monitor firms' loan default risk. We also find evidence that the digitalization of tax information is primarily observed among firms subject to low media scrutiny. Therefore, GTP III and BTI had a more pronounced effect on

<sup>&</sup>lt;sup>6</sup> The five state-owned banks are Bank of China, Industrial and Commercial Bank of China, China Construction Bank, Agricultural Bank of China, and Bank of Communications.

<sup>&</sup>lt;sup>7</sup> Since 2014, Chinese tax authorities have initiated tax credit ratings for businesses, evaluating tax liability fulfillment, and making this information publicly available.

reducing bank loan default risks for firms with minimal media attention. Moreover, we provide limited evidence that the effect of the implementation of GTP III and information sharing through BTI on mitigation bank loan default risks is more pronounced in regions with poor legal protection, which suggests that the digitalization of tax information can serve as a supplement to law enforcement.

We have contributed to literature in several aspects. Firstly, the use of manually collected bank loan overdue data offers a more refined measure of loan default than using estimation of bankruptcy risk (Altman, 1968; Ohlson, 1980; Zmijewski, 1984; Hull and White, 1995; and Beaver, McNichols, and Rhie, 2005). Moreover, the detailed information pertaining to bank loan defaults aids in our exploration of whether variances in both bank and loan characteristics can influence the negative association between the digitalization of tax information and bank loan overdue risk.

Secondly, while there has been significant attention given to the risk of corporate debt defaults in China, current literature predominantly focuses on two main areas. The first area is how market forces (Brogaard, Li, and Xia, 2017) and corporate governance (Cao, Leng, Feroz, and Davalos, 2015; Switzer and Wang, 2013; Darrat, Gray, Park, and Wu, 2016; and Fernando, and Li, and Hou, 2019) can affect firms debt default risk. The second area is how macroeconomic fluctuations and policy uncertainties (Wang, Hou, and Liu, 2019; Luo and Li 2023, Xu and Li, 2020; and Yang and Jiang, 2022) and soft budget constraints (Kornai, 1980) embedded in state-owned enterprises structure (Tian and Estrin, 2007; Allen, Qian, and Qian, 2005; Chen, Liu, and Dong, 2013; Song, Ai, and Lie, 2015; and Ye, 2016) will affect firms debt risk (Allen et al., 2005; Song et al., 2015, and Ye, 2016) and agency costs (Tian and Estrin, 2007; Chen et al., 2013; and Song et al., 2015). However, research on the external benefits stemming

from the ongoing enhancement of digitalized tax information beyond tax administration remains scarce. Our study provides evidence to understand the spillover effect of digitalized tax information on reducing information asymmetry in the banking sector, as well as the supplementary effects of digitalized tax information when combined with media monitoring and legal protection.

Thirdly, despite the benefits of mitigating bank loan default risk through the implementation of the digitalized tax information, our evidence suggests that this positive effect varies among different bank ownerships. It appears that regional and non-local banks do not have equal access to digitalized tax information, with regional information barrier posing as one of the obstacles in the status of tax information digitalization. Our results echo the assertion by Liu, Zhang, and Xie (2022) that continued assessment of the implementation of digitalizing tax information is critical to improve the current system, not only by enhancing the efficiency of the tax administration but also by improving financial market environment, mitigating circular loans, and increasing firms' accountability.

In summary, information asymmetry in bank financing leads to "adverse selection," where high-risk borrowers are more likely to obtain loans, while low-risk borrowers are deterred by higher costs. Our analysis shows that the joint initiatives of GTP III and BTI help mitigate "adverse selection" for small and midsize enterprises (SMEs). However, "adverse selection" among state-owned enterprises (SOEs) remains unresolved due to the policy-driven lending preferences of state-owned banks, which prioritize loans to SOEs with implicit government guarantees. This favoritism can be exploited by inefficient or financially weaker SOEs, a challenge that GTP III and BTI have not effectively addressed.

The remainder of the paper is organized as follows: Section II provides background

information, literature review, and hypothesis development. Section III outlines the empirical research design. Section IV presents the empirical analyses, including baseline regression results, robustness tests, and analyses of underlying mechanism. Section V explores additional factors, including moderating effects and heterogeneity analyses. Section VI concludes.

# II. Background Information, Literature Review, and Hypothesis Development II.1. Background Information – GTP III and BTI

The establishment of the modern China Tax Administration Information System (CTAIS) started in 1990s and has gone through three phases: CTAIS-1 (1990-2000), CTAIS-2 (2001-2012), and CTAIS-3 (2013-) (He and Yi, 2023).<sup>8</sup> Starting from 2013, the Golden Tax Project III (GTP III) underwent a phased rollout across various provinces and cities<sup>9</sup>, culminating in its nationwide online launch in 2017 (Li et al., 2020). GTP III fully integrates the China Tax Administration Information System (CTAIS), encompassing all tax categories, national and local tax bureaus, as well as major tax-related functions. This initiative facilitates the electronic and online execution of diverse tax affairs and procedures. The updated information system is capable of gathering and verifying data pertaining to firms' business operations and transactions from their trading partners and other governmental entities (Xiao and Shao, 2020).

Two key policy rollouts facilitated information sharing between tax authorities and banks,

<sup>&</sup>lt;sup>8</sup> In 1994 the State Taxation Administration (STA) of China initiated the "the Golden Tax Project I" with an emphasis to implement administration of VAT invoices (Li, Wang, and Wu, 2020). During this phase, the monitoring ability of the SAT is very limited (Ye, Zeng, Tao, and Yun, 2023). In 2001, the "Golden Tax Project II" was introduced to computerize tax system and to monitor all invoices digitally (Fan, Liu, Qian, and Wen, 2018). At this stage, the CTAIS provided support for core tax administration functions such as registration, tax returns, payment processing for both corporate income tax (CIT) and value added tax (VAT) (Li, et al., 2020).

<sup>&</sup>lt;sup>9</sup> In 2013, GTP III was adopted in Chongqing. In2014, GTP III was adopted in Shanxi, and Shandong (except City of Qingdao). In 2015, it was adopted in Guangdong (except City of Shenzhen), Henan, and Inner Mongolia. In 2016, it was adopted in Hebei, Ningxia, Guizhou, Yunnan, Guangxi, Hunan, Qinghai, Hainan, Tibet, Gansu, Anhui, Xinjiang, Sichuan, and Jilin. In 2017, it was adopted in Liaoning, Jiangxi, Fujian, Shanghai, City of Qingdao, Beijing, Tianjin, Heilongjiang, Hubei, Shaanxi, Jiangsu, Zhejiang, and City of Shenzhen.

each following a distinct timeline. The first timeline corresponds to the phased implementation of GTP III across provinces, spearheaded by the State Taxation Administration (STA). The second timeline relates to the rollout of the Bank-Tax Interaction (BTI) initiative to facilitate cooperation between banks, tax authorities, and small and midsize enterprises (SMEs). Launched in 2015 by the State Tax Administration (STA) and the China Banking Regulatory Commission (CBRC), BTI leverages tax data to address information asymmetry in lending (Chen and Yang, 2020). The chart below illustrates how these two timelines align with each other.

Timeline of the Golden Tax Project (GTP III) and Bank-Tax Interaction (BTI)



Note: Solid arrows represent the timeline for the GTP III rollout by the State Administration of Taxation. Dotted arrow represents the timeline for the BTI rollout through the collaboration between the China Banking Regulatory Commission and the State Administration of Taxation.

GTP III essentially establishes the groundwork and provides the necessary conditions for

the implementation of Bank-Tax Interaction (BTI).<sup>10</sup> BTI involves a tripartite agreement amongst bank, tax authority, and small and midsize enterprises (SMEs), in which the tax authority shares the firm's historical tax payment records with the lending bank.<sup>11</sup> The BTI model utilizes emerging information technology to enable stakeholders to supplement and crossvalidate data, enhancing the accuracy of shared information. However, whether this improved information-sharing system can effectively reduce firms' debt default risk and mitigate issues of "adverse selection" across different types of banks remains an empirical question, which forms the primary motivation for this study.

#### **II.2.** Literature Review

#### Information Effect of GTP III

Considerable attention has been directed towards the economic consequences associated with the digitalization of tax administration through the implementation of China's GTP III. Existing literature leverages this quasi-experimental framework to investigate the economic effects of upgrading digitalized tax administration from multiple perspectives.

First of all, the integration of GTP III has led to improved tax compliance. Analyzing data from 2010 to 2017 and using a tax sheltering measure<sup>12</sup>, Li et al. (2020) documented a 1.88 percentage point of decrease after the implementation of GTP III. They also found that the effect is particularly stronger for firms with greater incentives for tax evasion. They attribute this outcome and provide further evidence that the mitigation of tax evidence is due to third-party

<sup>&</sup>lt;sup>10</sup> GTP III provide the integration of data from industrial and commercial sectors with information on enterprise registration, dissolution, operational status, customs and tariffs, liabilities, and external or mutual guarantees.

<sup>&</sup>lt;sup>11</sup> The firm's historical tax payments serve as a basis for determining both the interest rate and credit limit (Luo, Song, and Chen, 2020). The objective of the BTI initiative is to leverage emerging information technologies to allow stakeholders to supplement and cross-validate enterprise data, ensuring its accuracy and reliability.

<sup>&</sup>lt;sup>12</sup> The tax sheltering measure used is the book-tax difference and its remaining component that cannot be explained by earnings management.

reporting verification. During the early stage of GTP III rollout starting from 2013, Xiao and Shao (2020) found similar evidence that firms' tax evasion has significantly reduced, and the effect is particularly stronger for smaller firms, non-state-owned firms, firms located in regions with higher fiscal pressures. The deterring mechanism of the GTP III is mainly achieved by a reduction of underreporting of account receivables and over-reporting of account payable, inventory and number of employees, which can be easily verified by third party reporting after the digitalization of tax information. Other studies have reached similar conclusions regarding the decrease in tax evasion and increase in tax revenues (Fan and Li, 2020; Fan, Liu, Qian, and Zhao, 2020, and Zhang et al., 2020). Therefore, the digitalization of the tax information has significantly improved tax compliance and enforcement.

Second, the increase of tax monitoring is likely to compel firms to disclose more reliable financial information, hence leads to an increase in financial information quality. Using the information disclosure quality index developed by Lin, Lin, and Lei (2020), Ye, Zeng, Tao, and Yun (2023) found an improvement in disclosure quality after the adoption of GTP III, and this effect is more pronounced for firms with weak internal and external governance, firms located in non-eastern regions and regions with lower fiscal pressure. Further, Ye et al. (2023) also attribute to the improvement in information disclosure quality to third party verification with the digitalized tax information. Similarly, the digitalization of tax information is found to be associated with a reduction of corporate earnings management (Sun, Zhai, and Yu, 2021; Zhao, 2021, and Zhu, Pang, and Hu, 2021), increase in accounting conservatism (Ye, Li, and Yun, 2021), and consequently lowers audit risk (Zheng and Sun, 2021). Information transparency also led to reduced compensation differences within firms (Wei, Wang, and Cai, 2022).

In addition, the improved information environment can serve as an alternative mechanism

to increase managers accountability and improve firm performance, measured by improved investment outcome. Zhang et al. (2023) provided evidence of enhanced corporate investment efficiency following the adoption of GTP III, attributed to decreased information asymmetry and enhanced accounting information quality. They noted a decline in excessive investment expenditures, which is particularly significant for firms with heightened local government fiscal constraints, inferior information environments, weaker corporate governance, and greater tax avoidance tendencies after the implementation of GTP III. These results are more pronounced for acquirers with inadequate internal corporate governance and are faced with greater information asymmetry, especially in regions where local governments have stronger incentives for tax enforcement. Furthermore, Cai, Lin, and Gao (2021) provide evidence suggesting the alleviation of financing constraints following the implementation of GTP III.

It is important to note that although Fan and Li (2020) found the increase in tax revenue accompanied with GTP III implementation is mainly from prior noncompliant firms, He and Yi (2023) documented an overall increase of tax burden across all business enterprises. He and Yi (2023) concluded that the unintended consequences of GTP III are reduction of new investment, escalated financial distress, and decrease of firms operating income. In other words, the increased tax revenue has cut into firms' current profit and future business expansion. Therefore, the overall effect of GTP III remains unclear, subject to ongoing investigation and analyses across various domains to gain insights into its multifaceted effects.

#### Corporate Governance and Debt Default Risk

Corporate governance, both internal governance such as ownership structure, board composition and CEO power and external governance such as regulatory factors, play an

important role in affecting firms' default risk (Switzer and Wang, 2013). Studies have documented that board independence and effectiveness, financial transparency, board diversity, and low ownership concentration have a positive effect on lowering a firm's default risk (Cao et al., 2015; Switzer and Wang, 2013; Darrat et al., 2016; and Fernando et al., 2019). Baghdadi, Nguyen, and Podolsky (2020) documented that weak corporate governance, measured by the ratio of board members appointed after firms' CEOs assuming office (co-opted ratio), is associated with increase in firms' default risk. They attributed the results to co-opted boards are less engaged and involved in firms' strategic decision-making.

External corporate governance can sometimes help mitigate the failure of internal corporate governance and assure firms' overall financial sustainability. For example, improvement in equity market conditions such as liquidity can help mitigate firms' debt default risk to a certain extent (Brogaard et al., 2017). Brogaard et al. (2017) argue that the reduction in default risk linked to the increase in stock liquidity primarily stems from enhanced information efficiency, they contended that the improvement in corporate governance by block holders also contributes to this effect, similar to the findings by Edmans (2009) and Edmans and Manso (2011).

For a transformative economy such as China, the hybrid ownership of state-owned enterprises (SOE) and private ownership often blurs the boundary of ownership, therefore poses challenges in effective corporate governance. Tian and Estrin (2007) provided evidence that increase in the size of bank loans in China is often associated with the increase of managerial perks, free cash flows, and decrease of investment efficiency. When firms have soft budget constraints (Kornai, 1980), they enjoy lower financing costs, more favorable terms, debt overhang becomes less of a concern because of possibility of loan re-negotiation and possible

government bailout (Allen, Qian et al., 2005; Bussolo et al., 2022). Similarly, politically connected firms also tend to face less financing constraints (Song et al., 2015). As a result, these firms are more likely to have higher default risk due to the possibility of favorable loan restructuring and refinancing (Ye, 2016). Firms with high social costs are often faced with higher debt default risk (Chen, Liu, and Dong, 2013).

Furthermore, macroeconomic fluctuations and policy uncertainties can amplify information asymmetry, consequently impacting the risk of debt default for enterprises (Wang, Hou, and Liu, 2019). The cyclical variations within the financial system and the enactment of economic policies can affect firms' debt default risk, measured loan accessibility and debt ratios (Luo and Li, 2020; Xu and Li, 2020; Yang and Jiang, 2022).

If the digitalization of tax information has an impact on the information environment and corporate governance, whether the effect can spillover to firms' commitment in serving their debt obligation remains an empirical question.

#### **II.3.** Hypothesis Development

#### The Information Effect of GPT and BTI

"Adverse selection" arises when information asymmetry in lending causes higher-risk borrowers to disproportionately seek or accept loans, while lower-risk borrowers are discouraged from participating. In the Chinese banking sector, "Adverse selection" is exacerbated by its structural characteristics, regulatory framework, and economic conditions. A significant portion of the Chinese banking sector is state-owned, with banks often directed to prioritize loans to state-owned enterprises (SOEs) as part of policy-driven mandates. This creates a lending bias toward SOEs, many of which have implicit government guarantees. However, some SOEs may exploit this preferential treatment despite being inefficient or financially unsound, increasing the risk of "adverse selection" (Cull and Xu, 2000; Brandt and Li, 2003; Allen, Qian, and Qian, 2005; and Bailey, Huang, and Yang, 2011). Smaller private enterprises, despite often being more innovative and profitable, often face difficulties in securing loans due to perceived higher risk (Allen et al., 2005).

In addition, Chinese banks heavily depend on collateral as a primary tool for risk control, prioritizing borrowers with tangible assets, such as real estate or machinery, over those with robust business models but limited physical assets (Tan, Huang, and Woo, 2016). This practice disproportionately affects private firms and SMEs, which tend to be less asset-rich, forcing them to seek alternative, often riskier, financing channels (Beck, Demirgüç-Kunt, and Maksimovic, 2008; Cull, Xu, and Zhu, 2009). At the same time, inadequate or manipulated financial disclosures by SMEs can exacerbate information asymmetry, leading banks to overestimate the creditworthiness of riskier firms while undervaluing more stable ones (Brandt and Li, 2003). Local banks, which primarily cater to SMEs and rural communities, are particularly susceptible to adverse selection due to their weaker risk assessment capabilities and limited access to reliable credit data (Allen et al., 2005; Claessens and Tzioumis, 2006; Fungáčová and Weill, 2015).

Furthermore, "adverse selection" has significantly contributed to the expansion of the shadow banking sector, as private firms excluded from formal bank financing increasingly rely on alternative funding channels (Elliot, Kroeber, and Qian, 2015). These shadow banks often serve as a refuge for high-risk borrowers who are unable to secure traditional credit, thereby deepening the fragmentation of the financial system and amplifying systemic risk (Acharya, Qian, and Yang, 2016; Chen, Ren, and Zha, 2018).

To tackle the issue of "adverse selection," the introduction of GTP III and BTI has created

a framework for comprehensive information sharing on SME firms. This includes details on registration, cancellation, operational status, customs duties, liabilities, and external or mutual guarantees. These measures are designed to enhance credit assessments by equipping banks with more reliable borrower information, thereby reducing the risks linked to "adverse selection." Whether this enhanced information system effectively reduces firms' debt default risks and mitigates "adverse selection" across different types of banks needs to be empirically validated.

Prior literature has provided evidence that the digitalization of tax administration enhances transparency for businesses by improving tax authorities' ability to access, verify, and monitor tax-related information, thereby increasing the costs of opportunistic behaviors (Wei et al., 2022). GTP III curtails profit transfers, risk concealment, and manipulative practices such as fictitious transactions, tax evasion, and earnings manipulation (Fan and Li, 2020; Li et al., 2020; Zhang et al., 2020; Xiao and Shao, 2020). This leads to greater accounting conservatism, improved information environment (Ye et al., 2021), and reduced audit risks (Zheng and Sun, 2021). Building on this research, we aim to explore whether the improved information environment can help banks to mitigate default risks, as better information environments can help creditors assess operational and credit risks more effectively, supporting timely credit decisions.

#### The Governance Effect of Digitalized Tax Administration

Tax authorities, recognized as significant stakeholders in business enterprises, possess the capacity to exert influence over corporate governance (Dyck and Zingales, 2007). Through their monitoring capabilities, tax authorities can mitigate opportunistic behaviors in firms involved in related-party transactions and resource transfers (Desai, Dyck, and Zingales, 2007; Zeng and

Zhang, 2009; Mironov, 2013; and Pan, Wang, and Dai, 2013). When there is a dominant shareholder, minority shareholders' interests are not protected, and they are less likely to be engaged in corporate governance. The agency costs due to wealth transfer and related party transactions by controlling shareholders not only hurt other stakeholders but also undermine firm value (Johnson, La Porta and Lopez-de-Silanes, 2000; Li, Sun, and Wang, 2004; Jiang and Yue, 2005; and Qian and Yeung, 2015). With information asymmetry, creditors cannot access accurate and complete information about firms' financial condition, which resulted in controlling shareholders having both the motive and ability to encroach on creditor interests as well (Hollander and Verriest, 2016).

In advanced economies like the United States, tax enforcement has been shown to enhance the quality of financial information (Hanlon, Hoopes, and Shroff, 2014; Mason and Williams, 2022), thereby reducing information asymmetry and subsequently lowering the cost of capital for both debt (Guedhami and Pittman, 2008) and equity financing (El Ghoul, Guedhami, and Pittman, 2011). The improved information environment resulting from tax enforcement also contributes to the stability of the financial system and helps mitigate stock crash risk (Bauer, Fang, and Pittman, 2021).

With the ease of information acquisition and verification, tax authorities can accurately assess the true state of a firm's operating condition through electronic invoices received and issued during the business process, compare financial data with business records, and track information about business partners, thereby significantly reduces firms' ability in making fictitious economic transactions and/or omitting real transactions (Li, Yang, and Chen, 2020). It has been documented that after the digitalization of tax information, the misappropriation by major shareholders through related-party transactions or tax evasion are mitigated to a certain

extent (Liu et al, 2022).

In summary, this paper aims to explore how tax enforcement serves a governance role and improve information environment in a transitioning economy like China, examining the spillover effect of GTP III into capital market. Specifically, how the digitalization of tax information through GTP III can mitigate corporate default risk, and the hypothesis that we want to test is as follows:

H<sub>1</sub>: The digitalization of tax information is negatively associated with firms' bank loan default risk.

H<sub>2</sub>: The underlining mechanisms of H1 are the result of both information effect and corporate governance effect.

#### III. Research Design

#### **III.1. Data Source and Sample Selection**

We selected the time frame spanning from 2010 to 2019 to examine non-financial Ashare listed companies on the Shanghai and Shenzhen stock exchanges, aligning with the rollout of the GTP III from 2013 to 2017 with three years before, the year of, and two years after the implementation of the policy. For instance, Chongqing, the first province to implement GTP III in 2013, has an event window spanning from 2010 to 2015, which includes 2015. Conversely, Liaoning, one of the last provinces to implement GTP III in 2017, has an event window from 2014 to 2019. As a result, we have 2015 data – the starting year of BTI information sharing between banking and tax authorities -- for the entire sample, enabling us to evaluate the joint impact of GPT III and BTI on bank loan defaults. We excluded companies delisted prior to GTP III, the ones listed after the complete implementation of GTP III, and the ones with incomplete data, which resulted in a sample comprising of 12,455 firm-year observations.

We manually gathered data on bank loan overdue incidents from firms' annual reports

and the mandatory announcements regarding overdue loans. This information encompasses details such as the overdue amount, interest rates, and the sums owed by firms to banks. The time frame specific to regional differences in the implementation of the GTP III was determined through regional news announcements and corroborated by relevant literature (Li et al., 2020; Ye, et al., 2023). Other financial data used in the study are from the CSMA database.

#### **III.2.** Research Model and Variable Definitions

Since the rollout of the GTP III includes multiple periods, we use the difference in difference model (Liu et al., 2022) and take into the account of time effect and firm fixed effect. Specifically, we test the following model:

$$Loan Overdue_{i,j,t} = b_0 + b_1 Treated_{j,t} + b_2 Control_{i,j,t-1} + \sum Year_t + \sum Firm_i + \varepsilon_{i,j,t}, \quad (1)$$

where *i*, *j*, and *t* denote firm, region, and year respectively,  $\varepsilon$  is the error term. We use two *Loan Overdue* measures, namely *ln*(*Overdue Loan*) and (*Overdue Ratio*) respectively. *ln*(*Overdue Loan*) is the natural logarithm of the total overdue loans of the listed firm and its consolidated subsidiaries plus 1. *Overdue Ratio* is the percentage of total overdue loans of the listed firm and its consolidated subsidiaries divided by the firm's total assets at the beginning of the period. *Treated* is the dummy variable set to 1 for firm *i* and region *j* during and after the GTP III project was implemented, and 0 otherwise. Similar to those of Zhang, Ou, and Li (2020) and Zhu et al. (2021), if GTP III was implemented in a region during the first half of the year *t*, we designate year *t* as the implementation year. Otherwise, we designate year *t*+*1* as the implementation year. In addition, for both Shenzhen and Qingdao, the policy implementations in these two cities differ from the rest of their respective regions. Therefore, we analyze firms registered in these two cities separately.<sup>13</sup>

We expect  $b_1$  to be negative, suggesting that with the implementation of the GTP III in each region, the digitization of tax information reduces information asymmetry, resulting in lower loan overdue at firm level. In essence, digitizing tax information can help mitigating agency cost between lenders and borrowers, enabling banks effectively manage firms' debt default risk.

Following Zhang et al. (2020), Liu et al. (2022), and Zhu et al. (2021), we control firm characteristics and corporate governance considerations in Model (1). For firm characteristics, *Age* is the natural logarithm of a firm's listing years plus 1, *Leverage* is the total debt to asset ratio at the end of the period, *ROA* is return on total assets, *BTM* is the book-to-market ratio, *Cash* is total cash over total assets at the end of the period, *Size* is the natural logarithm of a firm's total assets, and *Growth* is the revenue growth rate in a given period. For corporate governance considerations, *Top1* is the percentage of ownership of a firm's largest shareholder, *iOWN* is the percentage of institutional ownership, *Dual* is a dummy variable that is set to 1 when the CEO is also the Chairman of the Board and 0 otherwise, *Independent* is the percentage of independent directors, and *Negative Opinion* is dummy variable set to 1 for qualified audit report and 0 otherwise. *Rating* is a firm's credit rating, assigned to 1 if a firm's credit rating is AAA and 0 otherwise. *Ret Vol* is the standard deviation of daily stock returns with one year window. *Z-Score* is the financial distress measure based on Altman's Score (1968).<sup>14</sup> *Abs\_DAC* 

<sup>&</sup>lt;sup>13</sup> "Golden Tax Phase III" was implemented in different regions with the following time frame: in 2013, it was implanted in Chongqing. In 2014, it was implemented in Shanxi, and Shandong (except City of Qingdao). In 2015, it was implemented in Guangdong (except City of Shenzhen), Henan, and Inner Mongolia. In 2016, it was implemented in Hebei, Ningxia, Guizhou, Yunnan, Guangxi, Hunan, Qinghai, Hainan, Tibet, Gansu, Anhui, Xinjiang, Sichuan, and Jilin. In 2017, it was implemented in Liaoning, Jiangxi, Fujian, Shanghai, City of Qingdao, Beijing, Tianjin, Heilongjiang, Hubei, Shaanxi, Jiangsu, Zhejiang, and City of Shenzhen.

<sup>&</sup>lt;sup>14</sup> *Z-Score* = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 0.999X5, where X1 = Working Capital/Total Assets, X2 = Retained Earnings/Total Assets, X3 =EBIT/Total Assets, X4 = Market Value of Equity/Book Value of Total Liabilities, and X5 = Revenue/Total Assets.

is the absolute value of discretionary accruals, measuring the extent of earnings management (Dechow, 1995). *Cash Vol* is the standard deviation of the ratio of operating cash flow to total assets over a three-year rolling window. *Loss* is a dummy variable set to 1 if a firm incurred operating loss in a given year, and 0 otherwise. *Loan Growth* is a regional control variable capturing the growth rate of loans issued by financial institutions within the respective province. *GDP Growth* is a regional control variable representing the GDP growth rate of the respective province. Variable definitions are tabulated in Appendix A. To mitigate the effect of outliers, all continuous variables are winsorized at 1% level.

#### **III.3.** Descriptive Statistics

Table 1 displays the descriptive statistics for the primary variables. The mean (and median) of *ln(Overdue Loan)* is 0.533 (0.000), with only 3% of the sample observations with overdue bank loans, i.e. the dependent variables are truncated. Consequently, we adopt Tobit regressions for all loan overdue models. *Overdue Ratio*, for the top one percentile of firms is 4.21% of total assets. Meanwhile, *Leverage* reaches 93.5% for the top one percentile. This highlights that our measure of bank loan overdue is specific to each loan.

[Insert Table 1 here]

#### IV. Empirical Results and Analysis

#### **IV.1. Baseline Regression Results – H**1

Table 2 presents the baseline findings regarding the impact of the GTP III implementation on overdue bank loans using Tobit regressions. The coefficients of *Treated* are negative and significant across all model specifications, indicating a reduction in bank loan default risk following the implementation of the GTP III. In terms of economic significance, first, considering the mean of *ln(Overdue Loan)* for the entire sample as 0.533 (as shown in Table 1), the implementation of the GTP III corresponds to a reduction of 56.8% (0.303/0.533) based on the sample's mean of overdue bank loans. Second, regarding overdue bank loans relative to a firm's total assets, the mean of *Overdue Ratio* across the entire sample stands at 0.160 (as shown in Table 1), and with the implementation of the GTP III, there is a 40% (0.064/0.160) reduction of *Overdue Ratio*. These baseline findings substantiate H1, affirming that the digitization of tax administration is associated with a decrease in corporate debt default risk, thereby contributing to an enhancement in the credit market environment.

As for control variables, risk measures such as Leverage, *Negative Opinion* are positively associated with bank loan default risk, while firms' profitability (*ROA*) and cash holdings (*Cash*) are negatively associated with bank loan default risk. Surprisingly, firm size (*Size*) is also positively associated with bank loan default risk, which contradicts the findings in prior literature. We think this is very likely because many large, listed companies in China are state controlled firms with soft budget constraints.

#### [Insert Table 2 here]

#### IV.2. Robustness Test – H<sub>1</sub>

#### Parallel Trend Test

The validity of a difference-in-differences (DID) model relies on the parallel trends assumption, which requires that the bank loan default rates of the treatment and control groups follow similar trajectories prior to the implementation of GTP III. Failing to satisfy this assumption, the policy's net effect cannot be accurately estimated. To test parallel trends, we include a series of dummy variables relative to the implementation year of GTP III: *Year*<sub>t-2</sub> denotes two years before implementation, *Year*<sub>t-1</sub> represents one year before, *Year*<sub>t</sub> denotes the implementation year, *Year*<sub>t+1</sub> captures one year after, and *Year*<sub>t+2</sub> captures two years after. These variables replace *Treated* in Model (1) to assess the parallel trends assumption. As mentioned before, *Treated* is a dummy variable set to 1 for firm i and region j during and after the GTP III project was implemented, and 0 otherwise. Therefore, *Treated* takes the value of 1 for all years following the introduction of GTP III. As such, dummies of *Year*<sub>t</sub>, *Year*<sub>t+1</sub>, and *Year*<sub>t+2</sub> are all the same as *Treated*.

The regression results of the parallel trends test are presented in Table 3. As shown in columns (1) and (2), the coefficients for *Year*<sub>t-2</sub> and *Year*<sub>t-1</sub> are statistically insignificant, indicating no significant differences in the trends of bank loan default rates prior to the implementation of GTP III. This satisfies the parallel trends assumption. In contrast, the coefficients for *Year*<sub>0</sub>, *Year*<sub>t+1</sub>, and *Year*<sub>t+2</sub> are generally significant, with only one exception being *Year*<sub>t+2</sub> in Column (1). These results suggest that bank loan defaults began to decline in the treatment group only after the implementation of GTP III. Together, these findings provide further evidence of the causal relationship between GTP III and reductions in bank loan default rates.

#### [Insert Table 3 here]

#### Placebo Test

To confirm the association between Treated and the reduction of bank loan default risk,

we conducted a placebo test. Specifically, following the approach by Cornaggia and Li (2019), the placebo implementation times of the GTP III were randomly generated for each region within the 2010-2019 period in estimating Equation (1). The randomly assigned values and estimations of Equation (1) were repeated independently for multiple iterations. Figure 1 displays the t-value distribution of the coefficients of *Treated* with 500 iterations. For both dependent variables, *ln(Overdue Loan)* and *Overdue Ratio*, which gauge bank loan default risk, the t-value distributions of coefficient of *Treated* are centered around 0. This indicates that there is no discernible association between the placebo value and bank loan default risk. In essence, the primary explanatory variable *Treated* carries information that is indeed linked to bank loan default risk.

#### [Insert Figure 1 here]

#### Alternative Overdue Loan Magnitude Measures

As noted previously, *Overdue Ratio* is the total overdue bank loans divided by a firm's total assets at the beginning of the period. We also apply alternative measures of the magnitude of overdue bank loans. *Net Proportion* is the percentage of total default loan amount of the firm and its consolidated subsidiaries over a firm's total assets. *Income Proportion* is the percentage of total default loan amount of the firm and its consolidated subsidiaries over a firm and its consolidated subsidiaries over the firm's net income in the current year. The regression results using alternative measures of loan default magnitude are reported in Table 4. The coefficients of *Treated* are both negative and significant. The results are consistent with those reported in Table 2, implying that our model specification is robust to various measures of overdue loan magnitude.

#### [Insert Table 4 here]

#### Additional Years Added after Treatment Period (2020-2021)

As previously mentioned, the GTP III was gradually implemented across different provinces from 2013 to 2017. To conduct a before-and-after comparison, we use a six-year event window for our analysis, covering three years before, the year of, and two years after the implementation of GTP III within each province. This approach resulted in a sample covering the years 2010 to 2019.

To mitigate concerns regarding the two-year post-implementation observation may not fully capture the impact of the policy shock, we extended the sample period by including 2020 and 2021, which expanded dataset to 17,754 observations. As noted previously, the phased implementation of GTP III across different provinces from 2013 to 2017 necessitated a provincespecific, three-year pre- and post-implementation window for analysis. The updated results, presented in Table 5, corroborate the findings obtained from the initial analysis.

#### [Insert Table 5 here]

#### **Concurrent Policy Events**

To rule out the concern of concurrent events are driving the results, we identified two concurrent events possibly related to loan defaults during the sample period (2010-2019). The first is the Green Credit Guidelines issued in 2012,<sup>15</sup> which mandated banks to align their

<sup>&</sup>lt;sup>15</sup> https://www.gov.cn/gongbao/content/2012/content\_2163593.htm

lending practices with national energy conservation and emission reduction objectives. This policy directly impacted lending practices in nine industries, including nuclear power generation, hydropower generation, water conservancy and inland port engineering construction, coal mining and washing, oil and gas extraction, ferrous metal mining, non-ferrous metal mining, nonmetallic mining, and other mining industries.

We include the control variable *Green Finance* to account for this concurrent event. *Green Finance* is a dummy variable denoting firm affected by green loan policies. It is assigned to 1 for firms in the nine industries subject to green loan policies following the implementation of the Green Credit Guidelines, and 0 otherwise.

The second major event was the implementation of the 2018 tightened financial regulation policy (Guiding Opinions on Regulating Asset Management Business of Financial Institutions,<sup>16</sup> commonly known as the "New Regulations on Asset Management"). Prior to the regulation, asset management in China often entails alternative financing channels for firms with difficulties in raising capital via traditional means such as public offerings or bank loans. Consequently, many asset management products associated with alternative financing means often featured complex, multi-layered structures that obscured underlying risks and increased financing costs. The new regulation introduced several reforms, including net asset value accounting, the elimination of implicit guarantees, and stricter leverage limits. These reforms fundamentally changed the capital market environment and firms' financing behavior.

We include the control variable *Asset Reg* to account for this concurrent event. First, we calculate the ratio of financial assets to total assets for each firm-year, starting from 2018, the year the "New Regulations on Asset Management" were introduced. Financial assets encompass

<sup>&</sup>lt;sup>16</sup> https://www.safe.gov.cn/big5/big5/www.safe.gov.cn/hunan/2018/0528/675.html

trading financial assets, financial assets under resale agreements, available-for-sale financial assets, held-to-maturity investments, and investment properties. *Asset Reg* is a dummy assigned to 1 for firms where the ratio of financial assets to total assets is above average and 0 otherwise. Therefore, *Asset Reg* represents firms affected by the tightened financial regulation policies. The results accounting for the above two concurrent events are reported in Table 6, and the main findings remain robust after controlling for these concurrent events.

[Insert Table 6 here]

#### **IV.3. Underlying Mechanism – H**<sub>2</sub>

Baghdadi et al. (2020) find that external oversight mechanisms, in the form of institutional investors, financial analysts, media coverage, and takeover susceptibility, mitigate weak internal governance. Our second hypothesis (H2) is that the underlining mechanisms of the observed negative association between the implementation of GTP III and reduction in bank loan overdue (H1) are the result of both information effect and corporate governance effect. Our premise is that digitalizing tax information can improve information quality, foster enhanced information sharing, and consequently diminish transaction costs associated with information asymmetry. Initially, the digitalization of tax information will render firms' financial data readily accessible to tax authorities in a machine-readable format, simplifying verification and audit processes. Consequently, this initiative can bolster firms' accountability in furnishing timely and accurate financial information, thereby augmenting the overall quality of financial data. When information is readily accessible to lenders, the information asymmetry between lenders and borrowers will be significantly reduced. Banks that are better informed are in a superior position to accurately assess borrowing costs and mitigate losses linked with firms' loan defaults.

Furthermore, information transparency facilitated by the digitalization of tax information can serve as a deterrent to opportunistic behaviors among firm managers and/or major shareholders. When tax information is readily accessible and easily verifiable, it becomes more challenging for individuals within a firm to engage in deceptive or self-serving actions. This increased transparency is a checks-and-balances mechanism thereby it can serve as an alternative corporate governance device.

We explore the two underlying mechanisms, i.e. information effect and governance effect separately.

#### Information Effect

Directly measuring the information effect is challenging. To address this, we use proxy variables, *Conservatism* and *Debt Overhang*, to approximate the information effect associated with GTP III and BTI implementations.

The lenders' payoff function depends on the borrowers' ability to fulfill their debt obligations, including both interest and principal payments, through ongoing operations. Consequently, lenders are more sensitive to a firm's bad news than to its good news, since "bad news" directly affects the borrowers' capacity to service their debt. Conversely, lenders are less responsive to a firm's upside potential, as such gains are not directly tied to their payoff. Timely acquisition of information about borrowers' bad news helps reduce information asymmetry from the lenders' perspective. Therefore, a measure capturing the asymmetry between a firm's good news and bad news provides critical insights for lenders, thereby Conservatism reflects the information effect.

Previous studies have highlighted the significant role of accounting conservatism in

protecting creditor interests and mitigating default risks (Diamond, 1984; Watts, 2003; Lu et al., 2008). To measure accounting conservatism, we employ the piecewise-linear accrual model developed by Ball and Shivakumar (2006), which estimates the timeliness of a firm's accounting information in responding to "bad news." *Conservatism* is represented by the coefficient of the interaction term between the current period cash flow measure and a dummy variable indicating negative cash flow.<sup>17</sup> A higher coefficient for the treated group indicates more timely recognition of "bad news," signifying greater accounting conservatism. If the implementation of GTP III and BTI enhances the financial reporting environment, this improvement should manifest as increased accounting conservatism following its implementation, thereby strengthening the information effect.

Banks' ability to assess loan defaults relies heavily on the quality of the information they possess. With the implementation of GTP III and BTI, if banks gain access to timelier and more comprehensive information about borrowers' cash outflows, they will be better equipped to evaluate the likelihood of debt default. This enhanced insight enables banks to take proactive measures to mitigate excessive risk by declining additional debt financing when necessary (Harford, Klasa, and Walcott, 2009; Denis and Mckeon, 2012; Chang et al., 2014; and Lu et al., 2015). *Debt Overhang* serves as a precision indicator and is calculated as the residual from a leverage determinants model, following the methodology described by Chang et al. (2014) and Lu et al. (2015).<sup>18</sup>

<sup>&</sup>lt;sup>17</sup> Specifically, we estimated the piecewise-linear regression by Ball and Shivakumar (2006),  $Accrual_{it} = \beta_0 + \beta_1 DCFO_{i,t} + \beta_2 CFO_{i,t} + \beta_3 DCFO_{i,t} + \varepsilon_{it}$ , where, DCFO is a dummy variable that is set to 1 if the current period cash flow is negative, and 0 otherwise. *CFO* is the current period cash flow scaled by total assets. The coefficient  $\beta_3$  is the measure for *Conservatism*.

<sup>&</sup>lt;sup>18</sup> Following Chang et al, 2014, and Lu et al., 2015, we estimate the following leverage determinants model:  $LEVB_t = \alpha 0 + \alpha_1 SOE_{t-1} + \alpha_2 ROA_{t-1} + \alpha_3 INDLEVB_{t-1} + \alpha_4 GROWTH_{t-1} + \alpha_5 FATA_{t-1} + \alpha_6 SIZE_{t-1} + \alpha_7 FIRST_{t-1} + \varepsilon$ . *LEVB* is the ratio of total debt to total asset, *SOE* is a dummy variable that is set to 1 for state-owned-enterprise, and 0 otherwise. *ROA* is net income divided by total asset. *INDLEVB* is the rank of *LEVB* within the firm's industry, *GROWTH* is the difference of total asset between the end period and the beginning period scaled to the beginning

The results are reported in Table 7. The main explanatory variable *Treated* is positively associated with *Conservation* and negatively associated with *Debt Overhang*. Therefore, the regression results confirm that the digitalization of tax information and information sharing prompt more conservative financial information reporting at firm level. From lenders' perspective, banks can incorporate timely financial information into their lending decisions, thereby reducing debt overhang.

[Insert Table 7 here]

#### **Corporate Governance Effect**

We use two agency cost measures, namely, the related party transaction and management expense ratio, to assess the corporate governance effect with digitalized tax information. *Related Party* is the sum of a firm's total related party transactions amount in the current year divided by its year-end operating income. A higher value of *Related Party* signifies more severe expropriatory behavior by major shareholders. *Mgmt Expense Ratio* is the total administrative expense<sup>19</sup> divided by sales revenue. A higher value of *Mgmt Expense Ratio* signifies a higher agency cost because a part of management expense can be viewed as rent extraction. The regression results are reported in Table 7. The main explanatory variable *Treated* is negatively associated with both agency costs measures, *Related Party* and *Mgmt Expense Ratio*. The results confirm that the digitalization of tax information reduces agency costs, which leads to improved

period total asset. *FATA* is the ratio of PPE scaled by beginning period total asset. *SIZE* is the natural logarithm of end period total asset. *FIRST* is the percentage of shares owned by the largest shareholder. Residual value  $\varepsilon$  is the measure for *Debt Overhang*.

<sup>&</sup>lt;sup>19</sup> According to the Chinese accounting standards, administrative expenses include costs incurred for organization and management of a firm's production and business operations. These expenses are usually detailed in the notes to the financial statements, which typically include 1) management salaries, 2) social insurance and retirement expenses such as social security contributions, housing provident fund, and union dues, 3) office expenses, travel expenses, conference expenses, and business entertainment expenses, and 4) consulting fees for board of directors such as stipend and conferences allowances, and 5) consulting fees, fees for intermediary agencies, and litigation costs.

corporate governance.

Our findings show that the digitization of tax information enhances the timeliness of disclosing "bad news," reduces debt overhang, limits related party transactions and curtails management rent extraction. However, even if these mechanisms function effectively, firms may still face loan overdue issues. To address this, we examine the impact of tax information digitization on firms' loan default risks, incorporating information and corporate governance measures as moderating variables.

Specifically, as mentioned before, we use *Conservatism* and *Debt Overhang* as proxies for the information effect. We use *Related Party* and *Mgmt Expense Ratio* as proxies for the governance effect. These variables are interacted with *Treated*, and the regression results, summarized below, are presented in Table 8.

Column (1) of Table 8 shows a significantly negative coefficient for *Treated\*Conservation* suggests that the implementation of GTP III and BTI improved timely information disclosure, thereby reducing the risk of bank loan defaults. Column (2) of Table 8 shows a significantly positive coefficient for *Treated \*Debt Overhang* indicates that GTP III and BTI strengthened the association between debt overhang and loan default risk, likely reflecting the enhanced precision of *Debt Overhang* measure following the implementation of GTP III and BTI. Similarly, Column (3) of Table 8 shows a positive and significant coefficient for *Treated\*Related Party* demonstrates that GTP III and BTI amplified the negative impact of related-party transactions on loan default risk, with *Related Party* serving as a proxy for weak governance. Column (4) of Table 8 shows a significantly positive coefficient for *Treated\*Mgmt Expense Ratio* suggests that GTP III and BTI amplified the negative impact of the management expense ratio on loan default risk, with the management expense ratio serving as a measure of agency costs and a proxy for weak governance.

In summary, the empirical findings highlight that GTP III and BTI jointly serve as a moderating mechanism, amplifying the impact of both informational and governance effects on loan default risk.

[Insert Table 8 here]

# V. Further Analyses

# **V.1. Moderating Factors**

In this sub-section, we explore the conditions under which the impact of implementing GTP III on the reduction of overdue bank loans is more prominent. We specifically analyze how variations in tax credit ratings, media scrutiny, and regional legal environments influence the relationship between the implementation of GTP III and the decrease in overdue bank loans.

#### Tax Credit Rating

Since 2014, Chinese tax authorities have initiated tax credit ratings for businesses, evaluating tax liability fulfillment, and making this information publicly available. In the initial phase of the bank-tax interaction program, provincial tax authorities exclusively furnished Alevel business enterprises to banks. However, inclusion gradually expanded to encompass Blevel and other businesses after 2017. Consequently, banks possess more comprehensive financial data on A-level enterprises. Thus, we anticipate that the digitalization of tax information will have a more pronounced impact on reducing overdue bank loans among A-level enterprises.

We gathered data on enterprise tax credit ratings. The dummy variable, *Level A*, is assigned a value of 1 for firms with an "A" tax credit rating and 0 otherwise. Regression results

in columns (1) and (2) of Table 9 indicate that the coefficient of the interaction term *Treated\*Level A* is negative and statistically significant. However, neither of the main effects, *Treated* and *Level A*, are statistically significant. This suggests that the impact of implementing GTP III is concentrated among firms with high-quality tax credit ratings, as the digitization of tax information is more comprehensive for this subset of firms. Consequently, banks can utilize relevant information and more effectively monitor firms' loan default risk.

[Insert Table 9 here]

#### Media Scrutiny

Previous studies suggest that intense media scrutiny can improve corporate governance (Li and Shen, 2010). Assuming all other factors remain constant, when a firm receives limited media attention, its external oversight capabilities tend to be diminished, leading to increased information asymmetry between the firm and its creditors. However, with the digitization of tax administration, banks can access more comprehensive information through tax departments, thereby enhancing their monitoring capabilities and reducing the risks of loan defaults. Consequently, it is reasonable to anticipate that the implementation of GTP III will have a more significant effect on reducing bank loan default risks for firms with minimal media scrutiny.

Low Media is a dummy variable that is set to 1 if the number of media-related reports on the firm is below the median in the sample, and 0 otherwise. Regression results presented in columns (3) and (4) of Table 9 indicate that the coefficient of the interaction term *Treated\*Low Media* is negative and statistically significant. However, neither of the main effects, *Treated* and *Level A*, show statistical significance. This implies that the impact of implementing GTP III is primarily observed among firms subject to low media scrutiny. Therefore, GTP III had a more pronounced effect on reducing bank loan default risks for firms with minimal media attention.

#### Legal Environment in Regions

Previous studies have identified challenges for creditors in China to be effective in firms' corporate governance because of insufficient legal protection and bankruptcy law enforcement (Baily et al., 2011; Fan, Huang, and Zhu, 2013; Allen et al., 2005). However, bankruptcy enforcement differs amongst regions. In regions with inadequate legal frameworks and weak law enforcement for bankruptcy, the loan default costs for creditors can be substantially higher. Therefore, with the implementation of the GTP III, in regions with weak legal environment, banks can get access to more comprehensive financial information through tax departments to monitor firms' debt repay capability and to limit the amount of loans granted to questionable firms, especially with revolving loans.

Utilizing the Legal Environment Index introduced by Wang, Fan, and Hu (2021), *Poor Law* is a dummy variable that is set to 1 if the Legal Environment Index of the province falls below the median in the sample, and 0 otherwise. Regression results in columns (5) and (6) of Table 9 indicate that the coefficient for the interaction term *Treated\*Poor Law* is negative and statistically significant at the 5% levels in both cases. Overall, this suggests limited evidence indicating that the legal environment acts as a moderating factor in the association between the implementation of GTP III and BTI and the mitigation of bank loan default risks.

#### V.2. Heterogeneity Analyses

So far, our investigation into the association between the implementation of GTP III and the reduction of bank loan default risks has not taken the differences in banks and loan types into consideration. Notably, Chinese tax authorities operate under a territorial management system. Consequently, the digitization of tax information may yield differing effects on local and nonlocal banks. For bank loans, there are two major loan types, i.e. with or without external guarantees.

#### State-owned versus Non-State-Owned Bank Loans

As stated earlier, the banking sector in China comprises over 4,000 banks, classified into various categories such as state-owned, joint-stock, city commercial, and rural commercial banks. Among them, the five state-owned banks are Bank of China, Industrial and Commercial Bank of China, China Construction Bank, Agricultural Bank of China, and Bank of Communications. These five banks rank highest in terms of size and financial strength, measured by indicators such as total assets, profitability, capital adequacy ratio, total deposits, and coverage of non-performing loan provisions.

State-owned banks in China are owned by the central government, making their stability crucial to the country's economic management and reputation. Their performance reflects not only financial stability but also the government's ability to govern effectively, maintain public trust, and uphold China's image as a global economic power. The government offers implicit guarantees for these banks, meaning it is expected to support them during difficulties, tying their stability closely to the government's financial and economic credibility. As a result, state-owned banks enjoy privileged access to information from government agencies, including tax authorities, giving them a significant advantage in credit assessment. This edge is particularly evident in government-driven initiates such as GTP III and BTI. In contrast, non-state-owned banks often face difficulties in obtaining sufficient information from governmental agencies due

to their weaker ties with the government.

We classify overdue loans based on whether these loans are owed to state-owned banks (SOBs) or non-state-owned banks (Non-SOBs). *ln(Overdue Loan)* for SOBs is the natural logarithm of the total amount of overdue borrowing from state-owned banks plus 1, and *Overdue Ratio* for SOBs is the ratio of the total amount of overdue loans owed to state-owned banks to the beginning period total assets of the firm. Similarly, *ln(Overdue Loan)* for non-SOBs is the natural logarithm of the total amount of overdue borrowing from non-state-owned banks plus 1, and *Overdue Ratio* for non-SOBs is the ratio of the total amount of overdue borrowing from non-state-owned banks plus 1, and *Overdue Ratio* for non-SOBs is the ratio of the total amount of overdue borrowing from non-state-owned banks plus 1, and *Overdue Ratio* for non-SOBs is the ratio of the total amount of overdue loans owed to non-state-owned banks to the beginning period total assets of the firm. Detailed analysis results are tabulated in Table 10.

Table 10 shows that the reduction in overdue bank loans due to the digitalization of tax information and BTI is significant only for state-owned banks, with little or no effect observed for non-state-owned banks. At first glance, this may seem counterintuitive, as state-owned banks already had an information advantage compared to non-state- owned banks before the implementation of GTP III and BTI. Consequently, one might expect the incremental effect of these initiatives on SOB bank loans to be smaller relative to non-SOB bank loans. However, our findings indicate state-owned banks continue to benefit from preferential access to tax authority data even after the implementation of GTP III and BTI, further reinforcing their advantage.<sup>20</sup>

[Insert Table 10 here]

#### Local versus Non-local Banks

<sup>&</sup>lt;sup>20</sup> In Appendix B, we present anecdotal evidence from the State Taxation Administration (STA) website to show how tax authorities support state-owned banks through the BTI initiative.

For local versus non-local banks, those operating within the same geographical area as their borrowers generally have closer ties and easier access to local tax authorities with the implementation of GTP III and BTI, giving local banks an advantage in obtaining financial information. In contrast, non-local banks face geographical barriers that often lead to both formal and informal networking challenges, significantly restricting information sharing.

We classify overdue loans based on whether these loans are owed to local banks or nonlocal banks. *ln(Overdue Loan)* for local banks is the natural logarithm of the total amount of overdue borrowing from local banks plus 1, and *Overdue Ratio* for local banks is the ratio of the total amount of overdue loans owed to local banks to the beginning period total assets of the firm. Similarly, *ln(Overdue Loan)* for non-local banks is the natural logarithm of the total amount of overdue borrowing from non-local banks plus 1, and *Overdue Ratio* for non-local banks is the ratio of the total amount of overdue loans owed to non-local banks to the beginning period total assets of the firm. Detailed results are tabulated in Table 11.

Table 11 highlights the differences between loans issued by local banks and those from non-local banks. The results indicate that the digitalization of tax information and BTI significantly reduce overdue bank loans for local banks but not for non-local banks. This suggests that the implementation of GTP III and BTI is more effective in mitigating debt default risks for local bank loans. This is likely because when firms and banks operate within the same tax jurisdiction, banks benefit from closer relationships and easier access to information from local tax authorities. In contrast, due to challenges of cross-jurisdictional communication, nonlocal banks still face greater difficulties in accessing financial information from firms located in different tax jurisdictions.<sup>21</sup>

<sup>&</sup>lt;sup>21</sup> In Appendix B, we present anecdotal evidence from the State Taxation Administration (STA) website to show how local tax bureaus support local banks through the BTI initiative.

#### [Insert Table 11 here]

Although GTP III and BTI aim to improve the financial information environment by enhancing lenders' access to tax-related data, our results indicate that non-state-owned banks and local banks do not fully benefit from these reforms. From a policy perspective, while reforms like GTP III enhance transparency and reduce information asymmetry, they may unintentionally deepen disparities between financial institutions, potentially causing inefficiencies in the credit market. Bridging these gaps is crucial to ensure non-state-owned and non-local banks, which are vital for financing SMEs, can contribute effectively to economic development, and to promote equitable benefits across the financial sector.

#### V.3. External Guarantees Loans

The Chinese securities market is still evolving and currently lacks the full range of services to meet all financing needs of business enterprises. Consequently, bank loans remain the primary source of financing for these entities. Particularly among listed firms, it's common for firms to establish reciprocal guarantees, where firms mutually guarantee each other's loans. However, in the absence of stringent provisions in security laws, these reciprocal guarantees can sometimes evolve into complex circular arrangements, making it challenging for banks to monitor fund flows and prevent loan defaults. If a firm defaults on its debt, this could trigger a ripple effect affecting guarantors, thus amplifying systemic debt default risks. The implementation of GTP III and BTI enable banks to better assess the credit risk of both borrowers and guarantors, potentially enhancing their ability to mitigate loan default risks.

We construct two loan guarantee measures, Guaranteed ln(Overdue Loan) is the natural

logarithm of the total overdue guaranteed loans of the listed firm and its consolidated subsidiaries plus 1. *Guaranteed Overdue Ratio* is the percentage of total guaranteed overdue loans of the listed firm and its consolidated subsidiaries divided by the firm's total assets at the beginning of the period. The regression results are reported in Table 12. The results reported in Columns (1) and (2) of Table 12 reveal a negative association between the digitalization of tax information and guaranteed loans. We deem this as evidence that the digitalization of tax information can help banks to access and monitor the flow of funds within enterprises and mitigate default risk associated with circular guarantees.

[Insert Table 12 here]

# VI. Conclusion and Implications

In the context of advocating for data interconnection and sharing, this study investigates the positive spillover effect of digitalized tax information on reduction of overdue bank loans. Utilizing manually collected overdue bank loan data of publicly listed companies during the phased rollout of China's Golden Tax Project III and the introduction of BTI, our study reveals that the digitalization of tax information significantly curtails corporate debt defaults. This is achieved through bolstering the level of enterprise information disclosure, curbing excessive lending by banks, and reducing agency costs for enterprises. The efficacy of the digitalization of tax administration is particularly notable in instances where firms have higher tax credit ratings, face less external scrutiny, and operate in regions with weaker legal environments. Additionally, we find that the positive impact of digitalization of tax information varies. Specifically, stateowned banks and local banks benefit the most from information sharing. Conversely, there is minimal effect on non-state-owned banks and non-local banks. Moreover, the digitalization of

tax information acts as a constraint on enterprises providing high-risk external guarantees for other companies.

The empirical findings of this study carry several noteworthy policy implications. Firstly, amidst the escalating issue of corporate debt defaults in China in recent years, this research underscores the efficacy of digital tax administration in mitigating such defaults. This underscores the necessity for active engagement from various sectors beyond just the financial domain in preventing and addressing financial risks.

Secondly, in the age of big data, this study highlights the spillover effect of data sharing. Despite the potential benefits of digitization of tax information, a considerable amount of data remains untapped, awaiting further exploration. The recent introduction of the fourth phase of the Golden Tax Project in China underscores the need to integrate big data technology into tax administration and promote information sharing with other regulatory bodies and industries, all while safeguarding enterprises' rights and interests. These challenges persist and warrant ongoing exploration.

In conclusion, the interaction between banks and tax authorities is still in its early stages, with demonstrated positive impacts but areas for enhancement. Our study indicates that the digitalization of tax information has a more significant effect on managing debt risks for stateowned banks and local banks. While various regulatory bodies, both regional and central, may have distinct responsibilities and access different datasets, coordination and promotion of information sharing are essential. Breaking down regional barriers and enhancing information exchange among different regions will help further mitigate firms' loan default.

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**Appendix A Variable Definitions** 

Variable Types	Variable Name	Variable Definitions
Dependent Variables		
	ln(Overdue Loan)	The natural logarithm of the total overdue loans of the listed firm and its consolidated subsidiaries plus 1.
	Overdue Ratio	The percentage of total overdue loans of the listed firm and its consolidated subsidiaries divided by the firm's total assets at the beginning of the period.
	Net Proportion	The percentage of total default loan amount of the firm and its consolidated subsidiaries over a firm's total assets.
	Income Proportion	The percentage of total default loan amount of the firm and its consolidated subsidiaries over the firm's net income in the current year.
	SOB ln(Overdue Loan)	The natural logarithm of the total amount of overdue borrowing from state-owned banks plus 1
	NonSOB ln(Overdue Loan)	The natural logarithm of the total amount of overdue borrowing from non-state-owned banks plus 1.
	SOB Overdue Ratio	The ratio of the total amount of overdue loans owed to state-owned banks to the beginning period total assets of the firm.
	NonSOB Overdue Ratio	The ratio of the total amount of overdue loans owed to non-state-owned banks to the beginning period total assets of the firm.
	Local ln(Overdue Loan)	The natural logarithm of the total amount of overdue loans from local banks plus 1.
	NonLocal ln(Overdue Loan)	The natural logarithm of the total amount of overdue loans from non-local banks plus 1.
	Guaranteed ln(Overdue Loan)	The natural logarithm of the total overdue guaranteed loans of the listed firm and its consolidated subsidiaries plus 1.
	Guaranteed Overdue Ratio	The percentage of total guaranteed overdue loans of the listed firm and its consolidated subsidiaries divided by the firm's total assets at the beginning of the period.
	Local Overdue Ratio	The proportion of overdue loans from local banks to total assets at the beginning of the period
	NonLocal Overdue Ratio	The proportion of overdue loans from non-local banks to total assets at the beginning of the period.

Explanatory Variables		
	Treated	Dummy variable set to 1 for firm <i>i</i> and region <i>j</i> after the "Golden Tax Phase III" project was implemented, and 0 otherwise.
Mechanism Variables		
Information Effect		
	Conservatism	Based on the piecewise-linear regression by Ball and Shivakumar (2006), $Accrual_{it} = \beta_0 + \beta_1 DCFO_{i,t} + \beta_2 CFO_{it} + \beta_3 DCFO_{i,t} * CFO_{it} + \varepsilon_{it}$ , where, $DCFO$ is a dummy variable that is set to 1 if the current period cash flow is negative, and 0 otherwise. <i>CFO</i> is the current period cash flow scaled by total assets. The coefficient $\beta_3$ is the measure for <i>Conservatism</i> .
	Debt Overhang	The residual term of the following leverage determinants model: $LEVB_t = \alpha 0 + \alpha_1 SOE_{t-1} + \alpha_2 ROA_{t-1} + \alpha_3 INDLEVB_{t-1} + \alpha_4 GROWTH_{t-1} + \alpha_5 FATA_{t-1} + \alpha_6 SIZE_{t-1} + \alpha_7 FIRST_{t-1} + \varepsilon$ . LEVB is the ratio of total debt to total asset, $SOE$ is a dummy variable that is set to 1 for state-owned-enterprise, and 0 otherwise. $ROA$ is net income divided by total asset. INDLEVB is the rank of $LEVB$ within the firm's industry, $GROWTH$ is the difference of total asset between the end period and the beginning period scaled to the beginning period total asset. $FATA$ is the ratio of PPE scaled by beginning period total asset. $SIZE$ is the natural logarithm of end period total asset. $FIRST$ is the percentage of shares owned by the largest shareholder. Residual value $\varepsilon$ is the measure for <i>Debt Overhang</i> .
Governance Effect		
	Related Party	The sum of a firm's total related party transactions amount in the current year divided by its year-end operating income
	Mgmt Expense Ratio	The total administrative expenses divided by sales revenue. Total administrative expenses include: the total administrative expense divided by sales revenue. Administrative expenses include: 1) management salaries, 2) social insurance and retirement expenses such as social security contributions, housing provident fund, and union dues, 3) office expenses, travel expenses, conference expenses, and business entertainment expenses, and 4) consulting fees for board of directors such as stipend and conferences allowances, and 5) consulting fees, fees for intermediary agencies, and litigation costs.
Moderating Variables		
	Level A	Assigned a value of 1 for firms with an "A" tax credit rating and 0 otherwise.
	Low Media	Dummy variable that is set to 1 if the number of media-related reports on the firm is below

		the median in the sample, and 0 otherwise.
	Poor Law	Dummy variable that is set to 1 if the Legal Environment Index of the province falls below the median in the sample, and 0 otherwise.
<b>Control Variables</b>		
	Age	The natural logarithm of a firm's listing years plus 1
	Leverage	The ratio of total debt to total asset at the end of the period.
	ROA	Return on total assets.
	Cash	Total cash over total assets at the end of the period.
	Size	The natural logarithm of a firm's total assets.
	BTM	Book-to-market ratio
	Top1	The percentage of ownership of a firm's largest shareholder.
	iOWN	The percentage of institutional ownership.
	Dual	Dummy variable that is set to 1 when the CEO is also the Chairman of the Board and 0 otherwise.
	Negative Opinion	Dummy variable that is set to 1 for qualified audit report and 0 otherwise.
	Growth	Revenue growth rate in a given period.
	Independent	The percentage of independent directors.
	Rating	Firm's credit rating, assigned to 1 if a firm's credit rating is AAA and 0 otherwise.
	Ret Vol	The standard deviation of daily stock returns with one year window
	Z-Score	Financial distress measure based on Altman's Score (1968): Z-Score = $1.2X_1 + 1.4X_2$ + $3.3X_3 + 0.6X_4 + 0.999X_5$ , where $X_1$ = Working Capital/Total Assets, $X_2$ = Retained Earnings/Total Assets, $X_3$ =EBIT/Total Assets, $X_4$ = Market Value of Equity/Book Value of Total Liabilities, and $X_5$ = Revenue/Total Assets.
	Abs_DAC	The absolute value of discretionary accruals, measuring the extent of earnings management (Dechow, 1995).
	Cash Vol	The standard deviation of the ratio of operating cash flow to total assets over a three-year rolling window.

Loss	A dummy variable set to 1 if a firm incurred operating loss in a given year, and 0 otherwise.
Loan Growth	A regional control variable capturing the growth rate of loans issued by financial institutions within the respective province.
GDP Growth	A regional control variable representing the GDP growth rate of the respective province.
Green Finance	A dummy variable denoting firm affected by green loan policies. It is assigned to 1 for firms in the nine industries subject to green loan policies following the implementation of the Green Credit Guidelines in 2012, and 0 otherwise.
 Asset Reg	A dummy variable. It is assigned to 1 for firms where the ratio of financial assets to total assets exceeds the annual average starting from 2018, the year when the New Regulations on Asset Management were introduced, and 0 otherwise. Financial assets include trading financial assets, financial assets under resale agreements, available-for-sale financial assets, held-to-maturity investments, and investment properties.

# Appendix B Anecdotal Evidence of the Close Relationship Between Tax Authorities with State-Owned Banks, and Local Banks

# Case 1

The State Taxation Administration (STA), in an official update on its website dated July 3, 2015, commended the Hainan Provincial Tax Bureau for its outstanding efforts in implementing GTP III. This recognition was based on the Bureau's active engagement with major state-owned banks, including the Bank of China, China Construction Bank, and Agricultural Bank of China. The STA praised the collaboration between tax authorities and state-owned banks, highlighting their role in enhancing information sharing and fostering closer partnerships. However, the discussions notably excluded non-state-owned banks, including a lack of inclusivity in these collaborative efforts.

# Source: https://www.chinatax.gov.cn/chinatax/n810219/n810739/c1715786/content.html

# Case 3

On October 25, 2016, the provincial tax bureau of STA in Province of Guizhou highlighted its achievement in implementing GTP III with local bank -- Guiyang Bank. The provincial tax bureau further showed its willingness in collaboration by subsequently signed comprehensive cooperation framework agreements with several state-owned banks and local banks including China Construction Bank, Bank of Communications, Postal Savings Bank of China, and Guizhou Bank. These agreements led to the introduction of innovative financial service products based on tax payment credit to integrate tax data into lending practices.

Efforts to enhance collaboration and data sharing among departments included leveraging Guizhou's "Credit Cloud" platform. The tax authority coordinated with the Development and Reform Commission, the Bureau of Industry and Commerce, and others to share 16,842 pieces of tax credit information, including taxpayer credit ratings, "double disclosure" data, and major tax violation cases, with the Guizhou Integrity Network and the corporate credit aggregation platform.

Collaboration among 29 departments resulted in 41 reward measures for trustworthy behavior and 18 penalties for dishonesty. For example, the disclosure of information for 22 A-level taxpayers listed in the abnormal business directory was deferred, while 63 A-level taxpayers were given priority in government procurement projects.

However, non-state-owned and non-local banks were notably absent from these collaborative efforts.

# Case 3

In terms of credit monitoring, in an official update by STA on April 29, 2015, commended the Huzhou Municipal Tax Bureau in Zhejiang Province submitted the information of a "blacklisted" enterprise to the Huzhou branch of the People's Bank of China, a state-owned bank. The bank then entered the relevant information into the credit system, enabling commercial banks to impose credit restrictions on the enterprise.

Source::<u>https://www.chinatax.gov.cn/chinatax/n810219/n810724/n811741/c1587206/content.html</u>

# Case 4

On March 9, 2016, the Fujian Provincial Tax Bureau highlighted its progress in implementing GTP III by creating a "point-to-point" data-sharing channel with local banks. This system enables the timely exchange of information to assist banks in evaluating borrowers' creditworthiness. For firms eligible for credit support, local banks set unsecured, collateral-free loan limits based on metrics such as the firm's tax credit rating from the previous year, total tax payments, and cash flow ratios. Loan amounts could be increased up to seven times the assessed limit, with a maximum credit ceiling of 3 million yuan.

To improve service efficiency in the loan application process, local banks established "green channels" to expedite approvals. Additional initiatives included offering preferential interest rates and waiving fees such as loan commitment and fund management charges.

However, support for non-local banks was not addressed in this provincial initiative.

Source: https://www.chinatax.gov.cn/chinatax/n810219/n810739/c2030664/content.html



Figure 1 The Distribution of t-value of the Coefficients of Treated in Placebo TestsFigure 1.a DV = ln(Overdue Loan)Figure 1.b DV = Overdue Ratio

Note: The placebo implementation times of the "Golden Tax Phase III" were randomly generated for each region within the 2010-2019 period in estimating Equation (1). The randomly assigned values and estimations of Equation (1) were repeated independently for 500 iterations. Figure 1.a displays the t-value distribution of the coefficient of *Treated* for regressions with dependent variable of *ln(Overdue Loan)*, and Figure 1.b displays the t-value distribution of the coefficient of the coefficient of *Treated* for regressions with dependent variable of *Overdue Ratio*.

Variable Name	Ν	Mean	σ	1%	5%	25%	Median	75%	95%	99%
ln(Overdue Loan)	12,455	0.533	3.059	0.000	0.000	0.000	0.000	0.000	0.000	19.056
Overdue Ratio	12,455	0.160	1.850	0.000	0.000	0.000	0.000	0.000	0.000	4.210
Treated	12,455	0.577	0.494	1.000	0.000	0.000	0.000	1.000	1.000	1.000
Age	12,455	2.325	0.646	2.485	0.693	1.099	1.792	2.890	3.135	3.219
Leverage	12,455	0.477	0.200	0.474	0.089	0.160	0.323	0.623	0.814	0.935
ROA	12,455	0.028	0.056	0.029	-0.244	-0.063	0.010	0.054	0.107	0.167
Cash	12,455	0.153	0.101	0.129	0.013	0.035	0.083	0.196	0.355	0.501
Size	12,455	15.482	1.259	15.313	13.036	13.716	14.602	16.209	17.890	19.183
BTM	12,455	0.451	0.310	0.375	0.028	0.103	0.231	0.583	1.092	1.573
Top 1	12,455	0.335	0.151	0.314	0.000	0.123	0.218	0.434	0.609	0.743
iOWN	12,455	0.068	0.069	0.046	0.000	0.000	0.014	0.101	0.210	0.319
Dual	12,455	0.250	0.433	0.000	0.000	0.000	0.000	0.000	1.000	1.000
Negative Opinion	12,455	0.037	0.190	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Growth	12,455	0.214	0.558	0.112	-0.542	-0.271	-0.020	0.285	0.926	3.762
Independent	12,455	0.375	0.054	0.357	0.333	0.333	0.333	0.429	0.500	0.571
Rating	12,455	0.036	0.187	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Ret Vol	12,455	0.029	0.010	0.027	0.013	0.017	0.022	0.034	0.050	0.059
Z Score	12,455	3.682	3.582	2.612	-0.730	0.533	1.536	4.504	10.853	20.916
Abs_DAC	12,455	0.068	0.079	0.043	0.001	0.004	0.020	0.084	0.225	0.463
Cash Vol	12,455	0.045	0.038	0.034	0.003	0.007	0.019	0.058	0.121	0.210
Loss	12,455	0.115	0.319	0.000	0.000	0.000	0.000	0.000	1.000	1.000
Loan Growth	12,455	0.131	0.077	0.129	-0.208	0.044	0.101	0.161	0.226	0.474
GDP Growth	12,455	0.082	0.038	0.084	-0.074	0.015	0.066	0.097	0.165	0.193

Table 1 Descriptive Statistics (2010-2019)

Note: The dependent variable *ln(Overdue Loan)* is the natural logarithm of the total overdue loans of the listed firm and its consolidated subsidiaries plus 1. *Overdue Ratio* is the percentage of total overdue loans of the listed firm and its consolidated subsidiaries divided by the firm's total assets at the beginning of the period. *Treated* is the dummy variable set to 1 for firm *i* and region *j* after the "Golden Tax Phase III" project was implemented, and 0 otherwise. *Age* is the natural logarithm of a firm's listing years plus 1, *Leverage* is the ratio of total debt to total asset ratio at the end of the period, *ROA* is return on total assets, *BTM* is book-to-market ratio, *Cash* is total cash over total assets at the end of the period, *Size* is the natural logarithm of a firm's total assets, and *Growth* is the revenue growth rate in a given period. For corporate governance considerations, *Top1* is the percentage of ownership of a firm's largest shareholder, *iOWN* is the percentage of institutional ownership, *Dual* is a dummy variable that is set to 1 when the CEO is also the Chairman of the Board and 0 otherwise, *Negative Opinion* is a dummy variable that is set to 1 for qualified audit report and 0 otherwise, and *Independent* is the percentage of independent directors. *Rating* is firm's credit rating, assigned to 1 if a firm's credit rating is AAA and 0 otherwise. *Ret Vol* is the standard deviation of daily stock returns with one year window. *Z-Score* is the bankruptcy risk indicator based on Altman's *Z-Score* (1968). *Abs\_DAC* is the absolute value of discretionary accruals, measuring the extent of earnings management (Dechow, 1995). *Cash Vol* is the standard deviation of the ratio of operating cash flow to total assets over a three-year rolling window. *Loss* is a dummy variable set to 1 if a firm incurred operating loss in a given year, and 0 otherwise. *Loan Growth* is a regional control variable capturing the growth rate of loans issued by financial institutions within the respe

	(1)		(2)			
	ln(Overdue	Loan)	Overdue I	Ratio		
	Coefficient	t-Stat	Coefficient	t-Stat		
Treated	-0.303***	(-3.13)	-0.064***	(-2.85)		
Age	0.040	(0.16)	-0.035	(-0.70)		
Leverage	0.640	(1.49)	0.109	(1.11)		
ROA	-0.764	(-0.67)	-0.426	(-1.37)		
Cash	-0.587	(-1.44)	-0.092	(-1.02)		
Size	0.314***	(2.78)	0.065***	(2.71)		
BTM	-0.099	(-0.40)	-0.066	(-1.33)		
Top1	0.503	(0.64)	0.179	(0.94)		
iOWN	0.364	(0.63)	0.203*	(1.80)		
Dual	-0.037	(-0.33)	-0.036	(-1.20)		
Negative Opinion	2.117***	(5.80)	0.592***	(6.08)		
Growth	-0.061	(-0.89)	-0.029*	(-1.90)		
Independent	-1.975**	(-2.29)	-0.155	(-0.73)		
Rating	-0.247	(-1.25)	-0.029**	(-2.14)		
Ret Vol	5.131	(0.92)	0.871	(0.67)		
Z-Score	-0.020*	(-1.75)	-0.010***	(-3.69)		
Abs_DAC	4.218***	(7.20)	0.905***	(6.33)		
Cash Vol	1.212	(1.13)	0.419	(1.52)		
Loss	0.317**	(2.31)	0.024	(0.74)		
Loan Growth	-0.368	(-0.86)	0.038	(0.46)		
GDP Growth	-1.876*	(-1.74)	-0.279	(-1.12)		
<i>ln(Overdue Loan)</i> <sub>t-1</sub>	2.208***	(5.85)				
Overdue Ratio <sub>t-1</sub>			0.680***	(4.86)		
Intercept	-5.994***	(-2.99)	-1.198**	(-2.56)		
Firm Fixed Effect	Yes		Yes			
Year Fixed Effect	Yes		Yes			
Pseudo R <sup>2</sup>	0.148	0.148		0.400		

 Table 2 The Effect of the Implementation of the "Golden Tax Phase III" on Overdue Bank Loans

 -- Baseline Tobit Regression Results (N=12,445, 2010-2019)

	(1)		(2)			
	ln(Overdue	Loan)	Overdue I	Ratio		
	Coefficient	t-Stat	Coefficient	<i>t</i> -Stat		
Year <sub>t-2</sub>	0.035	(0.45)	-0.017	(-1.24)		
Year <sub>t-1</sub>	-0.007	(-0.08)	-0.028	(-1.62)		
Yeart	-0.168*	(-1.77)	-0.058***	(-2.94)		
Year <sub>t+1</sub>	-0.286**	(-2.26)	-0.076***	(-2.61)		
Year <sub>t+2</sub>	-0.115	(-1.06)	-0.051**	(-1.99)		
Age	0.040	(0.16)	-0.034	(-0.69)		
Leverage	0.642	(1.49)	0.108	(1.10)		
ROA	-0.763	(-0.67)	-0.429	(-1.38)		
Cash	-0.578	(-1.42)	-0.092	(-1.01)		
Size	0.318***	(2.81)	0.067***	(2.78)		
BTM	-0.107	(-0.44)	-0.069	(-1.39)		
Top1	0.489	(0.62)	0.172	(0.90)		
iOWN	0.367	(0.64)	0.205*	(1.82)		
Dual	-0.033	(-0.29)	-0.035	(-1.17)		
Negative Opinion	2.116***	(5.78)	0.591***	(6.08)		
Growth	-0.061	(-0.89)	-0.029*	(-1.90)		
Independent	-1.976**	(-2.29)	-0.160	(-0.75)		
Rating	-0.246	(-1.24)	-0.028**	(-2.08)		
Ret Vol	4.756	(0.85)	0.752	(0.57)		
Z-Score	-0.020*	(-1.77)	-0.010***	(-3.72)		
Abs DAC	4.208***	(7.19)	0.902***	(6.32)		
Cash Vol	1.193	(1.11)	0.417	(1.52)		
Loss	0.319**	(2.33)	0.025	(0.77)		
Loan Growth	-0.385	(-0.88)	0.034	(0.41)		
GDP Growth	-1.893*	(-1.77)	-0.264	(-1.08)		
ln(Overdue Loan) <sub>t-1</sub>	2.206***	(5.84)				
Overdue Ratio <sub>t-1</sub>			0.679***	(4.86)		
Intercept	-5.888***	(-2.95)	-1.199**	(-2.57)		
Firm Fixed Effect	Yes		Yes			
Year Fixed Effect	Yes		Yes			
Pseudo R <sup>2</sup>	0.146	0.146		0.397		

# Table 3 Parallel Trend Test (N=12,445, 2010-2019)

	(1)		(2)	
	Net Propor	tion	Income Propor	rtion
	Coefficient	t-Stat	Coefficient	t-Stat
Treated	-0.127***	(-3.19)	-0.139***	(-2.79)
Age	-0.093	(-1.04)	-0.123	(-1.17)
Leverage	0.292*	(1.66)	0.176	(1.02)
ROA	0.059	(0.11)	-0.454	(-0.80)
Cash	-0.241	(-1.59)	-0.285	(-1.57)
Size	0.117***	(2.62)	0.165***	(3.08)
BTM	-0.084	(-0.90)	0.011	(0.10)
Top 1	0.082	(0.25)	0.129	(0.32)
iOWN	0.178	(0.79)	0.442	(1.56)
Dual	-0.038	(-0.76)	-0.066	(-1.14)
Negative Opinion	0.988***	(5.41)	1.180***	(5.77)
Growth	-0.040	(-1.58)	-0.078**	(-2.54)
Independent	-0.406	(-1.11)	-0.688	(-1.57)
Rating	-0.060**	(-2.02)	-0.065*	(-1.95)
Ret Vol	3.884	(1.60)	3.657	(1.41)
Z-Score	-0.012**	(-2.53)	-0.015***	(-3.11)
Abs_DAC	1.445***	(5.74)	1.976***	(6.73)
Cash Vol	0.258	(0.50)	0.660	(1.20)
Loss	0.112*	(1.89)	0.104	(1.55)
Loan Growth	-0.056	(-0.35)	0.004	(0.02)
GDP Growth	-0.592	(-1.33)	-1.164**	(-2.20)
Net Proportion <sub>t-1</sub>	1.097***	(5.10)		
Income Proportion <sub>t-1</sub>			1.348***	(5.16)
Intercept	-2.180**	(-2.57)	-2.749***	(-2.67)
Firm Fixed Effect	Yes		Yes	
Year Fixed Effect	Yes		Yes	
Pseudo R <sup>2</sup>	0.228		0.223	

Table 4 The Effect of the Implementation of the "Golden Tax Phase III" on Overdue Bank Loans-- Alternative Measures of Loan Default Magnitude (N=12,455, 2010-2019)

	(1)		(2)		
	ln(Overdue	Loan)	Overdue I	Ratio	
	Coefficient	t-Stat	Coefficient	t-Stat	
Treated	-0.290***	(-2.96)	-0.088***	(-3.14)	
Age	0.132	(0.63)	-0.050	(-1.04)	
Leverage	0.528	(1.50)	0.111	(1.12)	
ROA	-0.529	(-0.60)	-0.636**	(-2.21)	
Cash	-1.102***	(-3.24)	-0.289***	(-2.97)	
Size	0.291***	(3.36)	0.072***	(3.20)	
BTM	-0.318	(-1.59)	-0.082**	(-1.96)	
Top l	-0.071	(-0.12)	-0.037	(-0.25)	
iOWN	-0.288	(-1.46)	-0.049	(-0.85)	
Dual	0.002	(0.03)	-0.006	(-0.23)	
Negative Opinion	0.370	(1.55)	-0.081	(-1.05)	
Growth	-0.169***	(-2.78)	-0.063***	(-3.84)	
Independent	-1.055	(-1.39)	0.048	(0.20)	
Rating	-0.080	(-0.48)	-0.015	(-0.75)	
Ret Vol	5.743	(1.18)	2.168*	(1.74)	
Z-Score	-0.037***	(-3.09)	-0.017***	(-4.40)	
Abs_DAC	3.976***	(7.14)	0.876***	(5.78)	
Cash Vol	0.889	(0.96)	0.663**	(2.23)	
Loss	0.420***	(3.42)	0.045	(1.28)	
Loan Growth	-0.480	(-1.07)	0.124	(1.19)	
GDP Growth	-1.225	(-1.33)	-0.296	(-1.29)	
ln(Overdue Loan) <sub>t-1</sub>	3.457***	(12.20)			
Overdue Ratio <sub>t-1</sub>			1.323***	(11.15)	
Intercept	-5.915***	(-3.99)	-1.422***	(-3.39)	
Firm Fixed Effect	Yes		Yes		
Year Fixed Effect	Yes		Yes		
Pseudo R <sup>2</sup>	0.141		0.321		

Table 5 Robustness Test: Expanding the Sample to Include 2020-2021 (N=17,754, 2010-2021)

	(1)		(2)			
	ln(Overdue	Loan)	Overdue I	Ratio		
	Coefficient	t-Stat	Coefficient	t-Stat		
Treated	-0.306***	(-3.16)	-0.063***	(-2.84)		
Green Finance	-0.554*	(-1.66)	0.033	(0.56)		
Asset Reg	0.028	(0.16)	-0.004	(-0.10)		
Age	0.042	(0.17)	-0.035	(-0.71)		
Leverage	0.635	(1.48)	0.109	(1.11)		
ROA	-0.702	(-0.61)	-0.430	(-1.39)		
Cash	-0.599	(-1.47)	-0.092	(-1.01)		
Size	0.320***	(2.82)	0.064***	(2.67)		
BTM	-0.102	(-0.41)	-0.066	(-1.33)		
Top 1	0.517	(0.66)	0.179	(0.93)		
iOWN	0.379	(0.66)	0.202*	(1.79)		
Dual	-0.036	(-0.33)	-0.036	(-1.20)		
Negative Opinion	2.103***	(5.77)	0.593***	(6.08)		
Growth	-0.060	(-0.87)	-0.029*	(-1.90)		
Independent	-1.978**	(-2.30)	-0.155	(-0.73)		
Rating	-0.242	(-1.22)	-0.029**	(-2.16)		
Ret Vol	5.084	(0.91)	0.875	(0.67)		
Z-Score	-0.019	(-1.63)	-0.010***	(-3.70)		
Abs_DAC	4.201***	(7.16)	0.906***	(6.33)		
Cash Vol	1.265	(1.17)	0.415	(1.51)		
Loss	0.325**	(2.37)	0.024	(0.73)		
Loan Growth	-0.367	(-0.85)	0.038	(0.46)		
GDP Growth	-1.880*	(-1.76)	-0.278	(-1.12)		
ln(Overdue Loan) <sub>t-1</sub>	2.208***	(5.85)				
Overdue Ratio <sub>t-1</sub>			0.680***	(4.87)		
Intercept	-6.132***	(-3.04)	-1.189**	(-2.51)		
Firm Fixed Effect	Yes		Yes			
Year Fixed Effect	Yes		Yes			
Pseudo R <sup>2</sup>	0.148	0.148		0.400		

Table 6 Robustness Test: Accounting for the Impact of Concurrent Policies (N=12,455, 2010-2019)

	Informa	tion Effect	Governance Effect	
	(1)	(2)	(3)	(4)
	Conservatism	Debt Overhang	Related Party	Mgmt Expense Ratio
Treated	0.155***	-0.005*	-0.119**	-0.006***
	(2.70)	(-1.66)	(-2.15)	(-3.05)
Age	0.072	-0.005	0.190	-0.011*
	(0.55)	(-0.59)	(1.21)	(-1.81)
Leverage	0.117	0.332***	0.705**	-0.004
	(0.71)	(24.44)	(2.44)	(-0.35)
ROA	0.106	0.881***	-1.023*	-0.079***
	(0.25)	(24.32)	(-1.70)	(-2.77)
Cash	0.031	-0.047***	-0.018	-0.006
	(0.15)	(-3.09)	(-0.06)	(-0.50)
Size	0.036	-0.068***	-0.078	-0.010***
	(0.84)	(-17.74)	(-1.11)	(-3.83)
BTM	-0.088	0.010	-0.281**	0.009*
	(-0.89)	(1.58)	(-2.15)	(1.78)
Top1	-0.056	0.058***	-0.140	0.003
	(-0.23)	(2.86)	(-0.38)	(0.25)
iOWN	-0.127	0.005	0.649*	0.004
	(-0.46)	(0.28)	(1.88)	(0.35)
Dual	-0.068	-0.003	-0.061	-0.004
	(-1.44)	(-0.88)	(-0.93)	(-1.62)
Negative Opinion	-0.059	0.021***	0.500***	0.040***
	(-0.76)	(2.62)	(3.21)	(5.44)
Growth	-0.041	-0.002	-0.133***	-0.010***
	(-1.49)	(-1.05)	(-3.11)	(-5.52)
Independent	-0.306	0.027	-0.517	-0.010
	(-0.72)	(1.04)	(-1.01)	(-0.55)
Rating	-0.226*	0.007	0.055	0.004**
	(-1.76)	(1.39)	(0.54)	(1.97)
Ret Vol	-7.684***	-0.060	-1.172	0.134
	(-2.97)	(-0.28)	(-0.34)	(0.97)
Z-Score	0.020***	-0.016***	-0.027**	0.001
	(3.13)	(-23.08)	(-2.34)	(1.43)
Abs_DAC	-0.970***	0.136***	1.187***	0.093***
	(-4.79)	(9.46)	(3.99)	(7.12)
Cash Vol	-0.508	0.006	0.607	0.078**
	(-1.09)	(0.15)	(0.73)	(2.07)
Loss	-0.000	-0.010**	0.029	-0.005
	(-0.01)	(-2.42)	(0.37)	(-1.56)
Intercept	-1.729**	0.858***	1.391	0.238***
	(-2.33)	(12.82)	(1.27)	(5.93)
Firm Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Ν	12,335	12,185	12,455	12,454
Adj.R <sup>2</sup>	0.042	0.363	0.039	0.116

Table 7 Information Effect and Corporate Governance Effect (2010-2019)

	Dependent Variable: In(Overdue Loan)				
	Informa	tion Effect	Gov	ernance Effect	
	(1)	(2)	(3)	(4)	
M=	Conservatism	Debt Overhang	Related Party	Mgmt Expense Ratio	
Treated	-0.432***	-0.222**	-0.524***	-0.515***	
	(-3.61)	(-2.41)	(-4.85)	(-4.05)	
M	0.085	1.735***	-0.009	5.004***	
	(1.49)	(4.20)	(-0.32)	(5.54)	
Treated*M	-0.299*	1.757***	0.207***	2.464***	
	(-1.91)	(4.51)	(5.30)	(2.64)	
Age	0.089	0.265	0.157	0.079	
	(0.35)	(1.10)	(0.63)	(0.32)	
Leverage	0.703	-0.652	0.555	0.686	
	(1.62)	(-1.56)	(1.28)	(1.61)	
ROA	-0.769	-2.276*	-0.625	-0.250	
	(-0.66)	(-1.84)	(-0.55)	(-0.22)	
Cash	-0.680*	-0.520	-0.575	-0.533	
	(-1.66)	(-1.33)	(-1.43)	(-1.33)	
Size	0.317***	0.434***	0.305***	0.381***	
	(2.75)	(3.85)	(2.75)	(3.35)	
BTM	-0.109	0.080	-0.107	-0.135	
	(-0.44)	(0.33)	(-0.44)	(-0.55)	
Top1	0.394	-0.205	0.450	0.442	
	(0.50)	(-0.27)	(0.58)	(0.57)	
iOWN	0.207	0.255	0.284	0.373	
	(0.36)	(0.46)	(0.51)	(0.65)	
Dual	-0.059	0.044	-0.042	-0.016	
	(-0.54)	(0.41)	(-0.38)	(-0.14)	
Negative Opinion	2.092***	1.621***	2.042***	1.907***	
	(5.76)	(4.61)	(5.64)	(5.30)	
Growth	-0.063	-0.055	-0.052	-0.004	
	(-0.90)	(-0.85)	(-0.76)	(-0.05)	
Independent	-2.080**	-1.518*	-1.901**	-2.005**	
*	(-2.39)	(-1.81)	(-2.23)	(-2.36)	
Rating	-0.248	-0.228	-0.204	-0.224	
0	(-1.25)	(-1.09)	(-1.05)	(-1.12)	
Ret Vol	4.161	5.795	3.564	4.286	
	(0.73)	(1.08)	(0.64)	(0.77)	
Z-Score	-0.016	0.021*	-0.018	-0.018	
	(-1.47)	(1.76)	(-1.60)	(-1.60)	
Abs DAC	4.168***	2.690***	4.055***	3.593***	
—	(7.07)	(5.09)	(7.02)	(6.36)	
Cash Vol	1.026	1.045	1.074	0.708	
	(0.95)	(1.02)	(1.01)	(0.69)	
Loss	0.307**	0.330**	0.306**	0.345**	
	(2.22)	(2.43)	(2.23)	(2.53)	
Loan Growth	-0.357	-0.246	-0.341	-0.325	
	(-0.82)	(-0.62)	(-0.79)	(-0.76)	
GDP Growth	-2.199**	-1.687	-1.771*	-1.639	
	(-2.07)	(-1.59)	(-1.67)	(-1.55)	

Table 8 The Underlying Mechanisms: The Moderating Roles of Information and CorporateGovernance Effects (2010-2019)

<i>ln(Overdue Loan)</i> <sub>t-1</sub>	2.120***	2.310***	2.153***	2.049***	
, , ,	(5.53)	(5.58)	(5.76)	(5.50)	
Intercept	-6.007***	-7.674***	-5.853***	-7.393***	
	(-2.95)	(-3.91)	(-2.98)	(-3.68)	
Firm Fixed Effect	Yes	Yes	Yes	Yes	
Year Fixed Effect	Yes	Yes	Yes	Yes	
Ν	12,335	12,185	12,455	12,454	
Adj.R <sup>2</sup>	0.148	0.147	0.149	0.151	

	(1)	(2)	(3)	(4)	(5)	(6)
	ln(Overdue Loan)	Overdue Ratio	ln(Overdue Loan)	Overdue Ratio	ln(Overdue Loan)	Overdue Ratio
M=	Leve	Level A		Low Media		Law
Treated	-0.024	-0.017	-0.113	-0.025	-0.256***	-0.056**
	(-0.21)	(-0.67)	(-1.02)	(-1.00)	(-2.61)	(-2.45)
M	0.020	0.009	0.059	0.015	0.077	-0.017
	(0.27)	(0.65)	(0.79)	(1.01)	(0.27)	(-0.27)
Treated*M	-0.463***	-0.101***	-0.350***	-0.070***	-0.476**	-0.073**
	(-4.53)	(-4.33)	(-3.87)	(-3.65)	(-2.26)	(-2.04)
Age	0.061	-0.029	0.102	-0.022	0.018	-0.036
	(0.22)	(-0.53)	(0.40)	(-0.44)	(0.07)	(-0.73)
Leverage	0.761*	0.154	0.641	0.109	0.648	0.111
	(1.77)	(1.55)	(1.50)	(1.12)	(1.51)	(1.13)
ROA	-1.252	-0.463	-0.698	-0.414	-0.794	-0.431
	(-1.06)	(-1.50)	(-0.61)	(-1.33)	(-0.69)	(-1.39)
Cash	-0.691	-0.098	-0.545	-0.084	-0.574	-0.090
	(-1.58)	(-1.00)	(-1.34)	(-0.93)	(-1.41)	(-1.00)
Size	0.311***	0.069***	0.275**	0.057**	0.310***	0.065***
	(2.70)	(2.88)	(2.41)	(2.35)	(2.74)	(2.71)
BTM	-0.023	-0.067	-0.056	-0.058	-0.088	-0.065
	(-0.09)	(-1.24)	(-0.23)	(-1.17)	(-0.36)	(-1.32)
Top1	0.303	0.166	0.547	0.188	0.516	0.180
	(0.39)	(0.87)	(0.70)	(0.98)	(0.65)	(0.94)
iOWN	-0.032	0.183*	0.403	0.212*	0.377	0.205*
	(-0.06)	(1.78)	(0.70)	(1.87)	(0.66)	(1.82)
Dual	-0.051	-0.042	-0.037	-0.036	-0.036	-0.036
	(-0.44)	(-1.30)	(-0.33)	(-1.20)	(-0.32)	(-1.20)
Negative Opinion	2.092***	0.548***	2.081***	0.585***	2.112***	0.590***
	(5.60)	(5.59)	(5.72)	(6.04)	(5.80)	(6.07)
Growth	-0.030	-0.025	-0.054	-0.027*	-0.061	-0.029*
	(-0.43)	(-1.53)	(-0.79)	(-1.81)	(-0.89)	(-1.90)
Independent	-1.465*	-0.161	-1.959**	-0.151	-1.933**	-0.147
	(-1.67)	(-0.71)	(-2.28)	(-0.72)	(-2.24)	(-0.70)
Rating	-0.269	-0.021*	-0.300	-0.040***	-0.243	-0.028**

Table 9 The Impact of GTP III on Overdue Bank Loans: Other Moderating Factors (2010-2019)

	(-1.42)	(-1.68)	(-1.51)	(-2.75)	(-1.22)	(-2.04)
Ret Vol	6.471	1.477	5.410	0.933	5.479	0.916
	(1.12)	(1.12)	(0.97)	(0.72)	(0.98)	(0.70)
Z-Score	-0.012	-0.008***	-0.023**	-0.011***	-0.019*	-0.010***
	(-0.99)	(-3.03)	(-2.01)	(-3.84)	(-1.72)	(-3.68)
Abs_DAC	4.367***	0.930***	4.139***	0.890***	4.232***	0.908***
	(7.28)	(6.38)	(7.14)	(6.29)	(7.23)	(6.35)
Cash Vol	1.061	0.425	1.138	0.404	1.265	0.425
	(0.92)	(1.42)	(1.06)	(1.48)	(1.17)	(1.55)
Loss	0.272*	0.029	0.307**	0.022	0.318**	0.024
	(1.91)	(0.84)	(2.24)	(0.69)	(2.32)	(0.75)
Loan Growth	-0.280	-0.002	-0.378	0.036	-0.404	0.036
	(-0.56)	(-0.02)	(-0.88)	(0.44)	(-0.97)	(0.46)
GDP Growth	-1.697	-0.256	-1.931*	-0.290	-2.035*	-0.306
	(-1.53)	(-1.05)	(-1.80)	(-1.17)	(-1.89)	(-1.22)
ln(Overdue Loan) <sub>t-1</sub>	1.896***		2.222***		2.196***	
	(4.33)		(5.89)		(5.83)	
Overdue Ratio <sub>t-1</sub>		0.654***		0.683***		0.678***
		(4.09)		(4.88)		(4.85)
Intercept	-5.371**	-1.149**	-5.476***	-1.101**	-5.869***	-1.189**
	(-2.51)	(-2.27)	(-2.72)	(-2.33)	(-2.91)	(-2.55)
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Ν	11,378	11,378	12,455	12,455	12,455	12,455
Pseudo R <sup>2</sup>	0.150	0.400	0.148	0.401	0.148	0.400

	SOB L	oans	Non-SOB	Loans
	(1)	(2)	(3)	(4)
	ln(Overdue Loan)	Overdue Ratio	ln(Overdue Loan)	Overdue Ratio
Treated	-0.064**	-0.002	-0.039	0.010
	(-2.39)	(-0.31)	(-0.96)	(0.43)
Age	0.084	0.010	-0.055	-0.045
	(1.06)	(0.61)	(-0.50)	(-0.87)
Leverage	0.020	-0.039	0.247	0.025
	(0.14)	(-0.48)	(1.28)	(0.25)
ROA	-0.971*	-0.457	-1.900***	-1.045**
	(-1.74)	(-1.16)	(-3.03)	(-2.08)
Cash	0.002	-0.013	-0.054	0.047
	(0.01)	(-0.31)	(-0.33)	(0.92)
Size	0.032	0.024*	0.025	-0.007
	(0.90)	(1.70)	(0.51)	(-0.22)
BTM	-0.078	-0.009	-0.172*	-0.048
	(-1.18)	(-0.40)	(-1.69)	(-1.43)
Topl	-0.041	0.080	0.162	0.249
1	(-0.18)	(1.25)	(0.56)	(1.56)
iOWN	-0.098	-0.032	-0.066	0.100
	(-0.56)	(-0.81)	(-0.31)	(0.93)
Dual	-0.069*	-0.027*	-0.004	-0.016
	(-1.84)	(-1.90)	(-0.08)	(-1.28)
Negative Opinion	-0.013	0.074	0.088	0.008
	(-0.07)	(1.39)	(0.42)	(0.13)
Growth	-0.008	-0.010	0.004	-0.006
	(-0.22)	(-1.35)	(0.09)	(-0.65)
Independent	-0.018	0.088	-0.562*	-0.231
	(-0.08)	(0.83)	(-1.95)	(-1.21)
Rating	0.032	0.016	-0.030	-0.005
i i i i i i i i i i i i i i i i i i i	(1.62)	(1.55)	(-1.15)	(-0.33)
Ret Vol	-1 608	-0 569	-0.180	0.795
	(-0.81)	(-0.67)	(-0.07)	(1.01)
7-Score	-0.000	-0.005*	0.007*	0.001
L-Score	-0.000	(-1.75)	(1.89)	(0.57)
Abs DAC	0 243	0.094	0 523**	0.165
nos_bnc	(1.30)	(1.33)	(2, 28)	(1.13)
Cash Vol	-0.380	(1.55)	-0.239	(1.13)
Cush voi	-0.380	(-1.40)	(-0.46)	(0.27)
Loss	(-0.99)	-0.018	-0.039	-0.060
2033	(0.22)	-0.018	(0.70)	(1.40)
Loan Crowth	(0.22)	(-0.08)	(-0.70)	(-1.49)
Loan Growin	$(0.00)^{\prime}$	0.038	-0.1/2	-0.009
CDP Growth	0.05)	0.051	0.145	(-0.90)
	-U.49/	-0.031	-0.143	0.2/4
In (Quandua I)	(-1.13)	(-0.52)	(-0.32)	(1.14)
in(Overaue Loan) <sub>t-1</sub>	$0.024^{**}$	0.105		
Ourseling Dati	(2.32)	(0.84)	0 550**	0 5/7*
Overaue Kallot-1			0.339**	0.36/*
T., ,	0 514	0.242*	(2.01)	(1.94)
Intercept	-0.514	-0.343*	-0.085	0.254

Table 10 Heterogeneity Analysis: Comparing State-Owned and Non-State-Owned Bank Loans (N=12,455, 2010-2019)

	(-0.80)	(-1.72)	(-0.11)	(0.44)
Firm Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Pseudo R <sup>2</sup>	0.226	0.497	0.198	0.269

-	Local Bank	Loans	Non-Local Bank Loans		
-	(1)	(2)	(3)	(4)	
	ln(Overdue Loan)	Overdue Ratio	ln(Overdue Loan)	Overdue Ratio	
Treated	-0.105***	-0.014	0.023	0.021	
	(-2.85)	(-0.69)	(0.67)	(1.57)	
Age	0.023	-0.035	0.096	-0.000	
	(0.21)	(-0.67)	(1.17)	(-0.01)	
Leverage	0.269	-0.014	-0.064	-0.000	
	(1.56)	(-0.14)	(-0.40)	(-0.00)	
ROA	-1.331**	-1.194**	-1.029*	-0.308	
	(-2.37)	(-2.18)	(-1.70)	(-0.83)	
Cash	0.055	0.023	-0.156	0.011	
	(0.29)	(0.37)	(-1.16)	(0.27)	
Size	0.028	-0.002	0.044	0.018*	
	(0.59)	(-0.05)	(1.15)	(1.70)	
BTM	-0.168*	-0.017	-0.088	-0.040	
	(-1.76)	(-0.49)	(-1.13)	(-1.36)	
Top1	-0.030	0.146	0.190	0.183	
	(-0.11)	(1.08)	(0.97)	(1.21)	
iOWN	-0.222	0.022	-0.036	0.047	
	(-1.00)	(0.21)	(-0.23)	(1.10)	
Dual	-0.072	-0.039*	0.030	-0.005	
	(-1.48)	(-1.83)	(0.77)	(-0.74)	
Negative Opinion	0.116	0.070	0.155	0.012	
	(0.54)	(1.44)	(1.11)	(0.18)	
Growth	-0.005	-0.006	-0.010	-0.010	
	(-0.12)	(-0.69)	(-0.26)	(-1.01)	
Independent	-0.551*	-0.151	-0.351*	0.008	
	(-1.72)	(-0.77)	(-1.77)	(0.07)	
Rating	0.006	-0.000	0.006	0.011	
	(0.21)	(-0.01)	(0.50)	(1.33)	
Ret Vol	-0.216	0.563	-0.632	-0.337	
	(-0.08)	(0.74)	(-0.36)	(-0.35)	
Z-Score	0.006	-0.001	0.005	-0.002	
	(1.18)	(-0.92)	(1.31)	(-1.26)	
Abs_DAC	0.503**	0.206	0.332	0.052	
	(2.17)	(1.46)	(1.62)	(0.57)	
Cash Vol	-0.720	-0.134	-0.110	-0.031	
	(-1.53)	(-0.40)	(-0.25)	(-0.22)	
Loss	-0.022	-0.082*	-0.014	0.004	
	(-0.36)	(-1.73)	(-0.37)	(0.22)	
Loan Growth	0.041	-0.111	-0.068	0.101	
	(0.15)	(-1.31)	(-0.36)	(0.95)	
GDP Growth	-0.215	0.006	-0.193	0.217	
	(-0.53)	(0.02)	(-0.43)	(0.99)	
ln(Overdue Loan)1-1	0.603**	0.581*	. ,	. /	
	(2.05)	(1.92)			
Overdue Ratio <sub>t-1</sub>	. ,	. /	0.270	0.091	
			(1.32)	(0.62)	
Intercept	-0.341	0.227	-0.700	-0.316*	
•	(-0.43)	(0.38)	(-1.25)	(-1.76)	

Table 11 Heterogeneity Analysis: Local vs. Non-Local Bank Loans (N=12,455, 2010-2019)

Firm Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Pseudo R <sup>2</sup>	0.209	0.235	0.190	0.653

	(1)		(2)		
	ln(Overdu	e Loan)	Overdue Ratio		
	Coefficient	t-Stat	Coefficient	<i>t</i> -Stat	
Treated	-0.238**	(-2.06)	-0.006**	(-2.50)	
Age	0.924***	(2.61)	-0.005	(-0.67)	
Leverage	1.491***	(3.13)	0.041***	(4.24)	
ROA	1.900	(1.62)	0.001	(0.02)	
Cash	-1.676***	(-2.96)	-0.019*	(-1.68)	
Size	1.582***	(12.13)	0.028***	(8.92)	
BTM	0.303	(1.15)	-0.003	(-0.54)	
Top1	-0.724	(-0.96)	-0.014	(-0.88)	
iOWN	1.356*	(1.96)	0.012	(0.81)	
Dual	-0.041	(-0.30)	-0.003	(-0.98)	
Negative Opinion	-0.212	(-0.97)	0.002	(0.34)	
Growth	0.075	(1.13)	-0.002	(-1.38)	
Independent	0.696	(0.67)	0.003	(0.13)	
Rating	-0.158	(-0.65)	-0.001	(-0.35)	
Ret Vol	-7.438	(-1.16)	-0.073	(-0.57)	
Z-Score	-0.144***	(-7.69)	-0.002***	(-5.97)	
Abs_DAC	-0.947**	(-2.24)	0.028***	(2.66)	
Cash Vol	-0.127	(-0.10)	-0.006	(-0.21)	
Loss	-0.060	(-0.43)	-0.003	(-1.02)	
Loan Growth	-0.950***	(-2.73)	-0.008	(-1.26)	
GDP Growth	0.498	(0.44)	0.008	(0.32)	
ln(Overdue Loan) <sub>t-1</sub>	0.054	(0.28)			
Overdue Ratio <sub>t-1</sub>			0.014**	(2.27)	
Intercept	-28.076***	(-10.34)	-0.546***	(-9.67)	
Firm Fixed Effect	Yes		Yes		
Year Fixed Effect	Yes		Yes		
Pseudo. R <sup>2</sup>	0.236		-0.691		

Table 12 Supplementary Analysis: Loans with External Guarantees Only (N=12,445, 2010-2019)