

Does the Digitalization of Tax Administration Promote Corporate Innovation?

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Abstract: Since the beginning of the 21st century, the rapid advancement of modern information technology has provided new avenues for tax administration reform. The relationship between tax administration and corporate innovation has not been extensively investigated in existing research. Moreover, current literature often assumes that strengthening tax administration suppresses corporate innovation. The research selects A-share listed firms from 2008 to 2021 as the study sample and utilizes the "Golden Tax Phase III" initiative as a quasi-natural experiment. Employing the difference-in-differences (DID) technique, this study examines the effects of tax administration digitalization on corporate innovation. The results suggest that the modernization of tax administration facilitates improvements in corporate innovation. This paper enriches the research on the economic impact of tax administration on enterprises and provides empirical evidence for government departments to leverage digitalization in innovating management approaches, enhancing regulatory capacity, unlocking corporate innovation potential, and deepening tax reform.

Keywords: Tax Administration Digitalization, Golden Tax Phase III, Corporate Innovation

1. Introduction

Currently, various emerging information technologies are driving the digital transformation of China's tax administration sector. This transformation not only significantly improves tax administration efficiency [1] but also has a profound impact on corporate innovation. Academically, while previous research has examined the economic implications of tax administration digitalization from various angles, studies specifically addressing its connection with corporate innovation remain scarce. Among the relevant studies, there is no consensus or in-depth conclusion on how tax administration digitalization specifically affects corporate innovation. Using A-share listed companies in China from 2008 to 2021 as the research sample, this study treats the "Golden Tax Phase III" project as a quasi-natural experimental framework and employs the difference-in-differences (DID) approach to analyze its influence on corporate innovation. Corporate innovation levels are measured from both innovation input and output dimensions. Furthermore, this study examines the heterogeneous effects of tax administration digitalization on enterprises with different levels of marketization and digital transformation. Additionally, it explores the transmission mechanisms of improved corporate governance and optimized tax business environments in this context. This research aims to provide theoretical and practical guidance for tax policy formulation and corporate innovation development, contributing to China's high-quality economic growth.

2. Institutional background and theoretical analysis

2.1. Institutional background

The digitalization of tax administration in China began in the early 1990s. As one of the "Twelve Golden" national e-government projects, the Golden Tax Project is a comprehensive tax management information system initiative. The Golden Tax Phase III project, with the goal of achieving "one platform, two-level processing, threefold coverage, and four system categories," leverages modern digital technologies to establish a new tax administration system centered on taxpayers. It focuses on major tax administration tasks, workflow optimization, and role responsibilities, marking China's transition into an era of data-driven tax governance.

2.2. Theoretical analysis and research hypothesis

Tax administration, as a critical external force influencing enterprises, can enhance corporate governance effects through digital transformation [2]. First, based on agency theory, tax administration can help mitigate corporate information asymmetry [3], enhance corporate transparency [4], and alleviate principal-agent problems between corporate management and owners. By aligning the objectives of management and shareholders—maximizing corporate value—tax administration digitalization strengthens management's incentive to invest in innovation as a means of reducing tax burdens. Additionally, it reduces internal information asymmetry, thereby lowering agency costs [5][6]. Second, improved external governance mechanisms lead to an increase in corporate resource availability [7]. By curbing self-serving behaviors of managers and shareholders, such as related-party transactions and fund misappropriation, digitalized tax administration effectively restricts managerial expropriation of corporate interests [8][9]. This allows more resources to be allocated toward corporate innovation.

Furthermore, tax administration digitalization represents a profound integration of digital tools and government management innovation. The adoption of big data, the internet, and other technologies facilitates faster information exchange and sharing, significantly enhancing government information disclosure and transparency [10]. These advancements also strengthen public oversight of government actions, reducing tax authorities' discretionary power and ensuring a more impartial and transparent tax enforcement process. This shift plays a crucial role in addressing information asymmetry between tax authorities and enterprises. In the past, due to information asymmetry, enterprises faced tax risks, while tax authorities struggled to make accurate decisions due to insufficient information. However, with the establishment of digitalized tax administration systems, enterprises' tax-related data are now more comprehensively and accurately recorded and tracked, enabling tax authorities to access this information more efficiently. This reduces information asymmetry between both parties, facilitates more precise tax policy implementation, and fosters a fairer and more transparent tax environment for enterprises.

Additionally, tax administration digitalization optimizes the tax business environment that enterprises operate in, effectively reducing corporate tax compliance costs and thereby lowering institutional transaction costs [11]. By simplifying tax filing procedures and improving tax services, tax authorities create a more convenient tax-paying experience for enterprises. Businesses can complete tax-related processes more efficiently, reducing time and financial costs associated with cumbersome administrative procedures. These transformations align closely with the New Public Management Theory, which advocates for a service-oriented government that prioritizes taxpayer needs. The implementation of digitalized tax administration enables tax authorities to better cater to corporate demands, offering more personalized and precise tax services. This not only helps enterprises allocate and utilize resources more efficiently, lowering innovation costs, but also

stimulates corporate innovation, encouraging businesses to develop new technologies and products to enhance their core competitiveness.

Drawing on the aforementioned theoretical framework, this research formulates the following hypothesis:

H1: Digitalized tax administration contributes to the improvement of corporate innovation.

3. Research design

3.1. Model design

This research investigates the influence of tax administration digitalization, as reflected in the Golden Tax Phase III initiative, on corporate innovation levels. Adopting the framework of Yong Fan and Haonan Li [12], it formulates the Heterogeneous Timing Difference-in-Differences (DID) model:

$$Innovation_{i,t} = \beta_0 + \beta_1 POST_{i,t} + \beta_2 Control_{i,t} + \eta_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

where $Innovation_{i,t}$ is the outcome variable, representing the innovation level of firm i in year t . The key explanatory variable is $POST_{i,t}$, a binary indicator, whose coefficient β_1 is the primary focus of this study, indicating the impact of the Golden Tax Phase III policy implementation on corporate innovation levels. $X_{i,t}$ represents a set of control variables, η_i denotes firm fixed effects, δ_t represents year fixed effects, and $\varepsilon_{i,t}$ is the error term.

3.2. Variable description

Table 1: Variable Description

Variable Type	Variable Name	Symbol	Definition and Description
Dependent Variable	Corporate Innovation [13]	CII	Natural logarithm of R&D expenses
	[14]	CIO	Natural logarithm of patent applications plus one [15]
Key Explanatory Variable	Golden Tax Phase III	$POST_{i,t}$	Equals 1 if the policy was implemented in the firm's region during the research period; otherwise, 0.
Control Variables	Firm Size	$SIZE$	Natural logarithm of total assets
	Firm Age	AGE	Natural logarithm of years since firm establishment
	Return on Assets	ROA	Net profit / Total assets
	Profit Margin	$NETPROFIT$	Net profit / Revenue
	Firm Value	$TOBINQ$	Market value / Total assets
	Financial Development Level	LFD	Province-level loan and deposit balance / GDP
	Property Rights Protection	LPP	Technology market transaction volume / GDP
	Economic Development	$GDP Per Capita$	Provincial per capita real GDP

3.3. Sample selection and data sources

A-share listed firms are examined in this study, with the sample period spanning from 2008 to 2021 to ensure data integrity. The research adheres to specific selection standards to reinforce the validity of the conclusions:

- (1) Omitting publicly traded firms in the financial and insurance sectors
- (2) Filtering out ST, ST, and PT category stocks* from the sample
- (3) Removing companies with a listing history of less than one year, those delisted, or those suspended from trading
- (4) Excluding firms with incomplete or irregular data entries
- (5) Applying a 1% Winsorization at both ends of all continuous variables to eliminate extreme outliers

After filtering the raw data based on the above criteria, the final dataset consists of 17,864 valid observations. Corporate financial data is sourced from the CSMAR (China Stock Market & Accounting Research) database. Patent data is obtained from the CNRDS (China Research Data Services) database. Provincial-level annual data is collected from the National Bureau of Statistics of China. This study conducts empirical analysis using Stata 18.0 software.

4. Empirical results

4.1. Descriptive statistics

Table 2 summarizes the descriptive statistics of the variables. The data reveal that, in general, firms demonstrate modest levels of innovation input and output. The average value of the Golden Tax Phase III (POST) variable stands at 0.575, with a standard deviation of 0.494, indicating that 57.7% of the firms in the sample were impacted by the policy. This reflects a well-balanced distribution throughout the sample period. The statistical characteristics of other variables align with previous research, supporting the objectivity and representativeness of the sample selection.

Table 2: Descriptive Statistics

Variable	N	Mean	P50	Sd.	Min	Max
<i>CII</i>	17864	15.095	17.842	6.977	0.000	25.025
<i>CIO</i>	17864	1.798	1.792	1.720	0.000	9.358
<i>POST</i>	17864	0.575	1.000	0.494	0.000	1.000
<i>SIZE</i>	17864	22.428	22.220	1.337	19.050	28.640
<i>AGE</i>	17864	2.859	2.893	0.347	0.846	4.220
<i>ROA</i>	17864	0.042	0.040	0.068	-1.240	0.604
<i>NETPROFIT</i>	17864	0.079	0.070	0.220	-5.431	5.566
<i>TOBINQ</i>	17864	2.057	1.623	1.455	0.641	31.400
<i>LFD</i>	17864	3.356	3.058	1.067	1.445	7.578
<i>LPP</i>	17864	0.026	0.005	0.061	0.000	0.593
<i>GDP Per Capita</i>	17864	6.180	5.522	3.156	0.970	18.753

4.2. Baseline regression analysis

Columns (1) and (3) of Table 3 display the results without incorporating control variables, revealing that POST is positively associated with both CII and CIO at a 5% significance level, lending preliminary support to Hypothesis H1. To verify the robustness of the empirical conclusions, Columns (2) and (4) include control variables related to corporate innovation. Even with these

adjustments, the regression coefficients for POST on CII and CIO remain significantly positive at the 1% level, reinforcing Hypothesis H1. These findings indicate that tax administration digitalization, as implemented through the Golden Tax Phase III initiative, drives firms to enhance both innovation input and output, ultimately fostering higher corporate innovation levels.

Table 3: Baseline Regression and Robustness Test Results

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	<i>CII</i>	<i>CII</i>	<i>CIO</i>	<i>CIO</i>	R&D Intensity	Invention Patent Ratio
<i>POST</i>	0.304** (2.00)	0.315** (2.12)	0.080** (2.07)	0.077** (2.00)	0.013** (2.09)	0.019** (2.00)
<i>Control</i>	No	Yes	No	Yes	Yes	Yes
<i>Constant</i>	5.367*** (17.33)	-0.009 (-0.002)	1.392*** (31.72)	0.678 (0.75)	0.689*** (3.54)	0.172 (1.06)
<i>Year & Firm</i>	YES	YES	YES	YES	YES	YES
<i>Observations</i>	17864	17864	17864	17864	17,864	17,864
<i>R-squared</i>	0.384	0.389	0.021	0.022	0.357	0.009

*Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

4.3. Robustness tests

4.3.1. Parallel trend assumption test

To verify the parallel trend assumption, this study follows Beck et al. [16] and constructs a series of time dummy variables representing the five years before, the year of, and the five years after the Golden Tax Phase III implementation. The year before implementation serves as the base period, and the control variables from Model (1) are included. The explanatory variable in the model is replaced with the generated time dummy variables for regression analysis. Figures 1 and 2 display the parallel trend test results for corporate innovation input and output, respectively. The results show that before the implementation of Golden Tax Phase III, the estimated coefficients for all periods relative to the base period are not significant, confirming that the parallel trend assumption holds under the Difference-in-Differences (DID) framework.

After the implementation, the difference in innovation levels between periods becomes significantly greater than zero, suggesting that tax administration digitalization positively influences firms' innovation input and output.

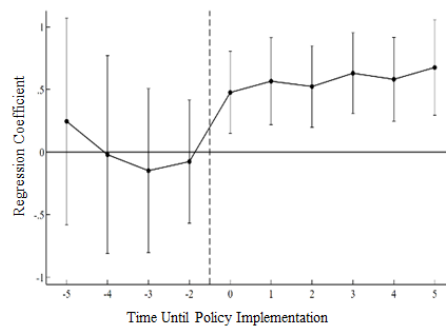


Figure 1: Parallel Trend Test for Innovation Input

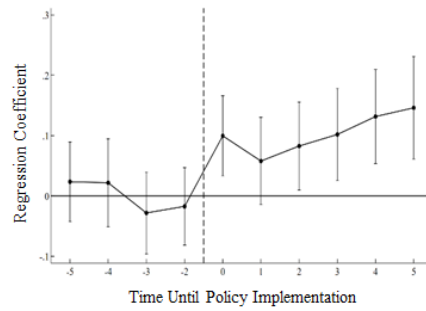


Figure 2: Parallel Trend Test for Innovation Output

4.3.2. Placebo test

To eliminate the possibility that the results are driven by external random factors, this paper adopts the method of Cornaggia and Li [17] for a placebo test. A random policy implementation year is assigned to each firm, and the regression is repeated. As shown in Figures 3 and 4, across 500 random samples, the t-value distribution of the key explanatory variable (POST) follows a normal distribution, with a mean close to zero. This confirms that the test satisfies the randomization assumption. Moreover, the actual t-values from real data regressions (3.17 and 9.64, respectively, from Columns 2 and 4 in Table 3) fall outside the placebo test distribution, further validating that the observed improvement in corporate innovation is due to the implementation of tax administration digitalization policies, rather than unobserved confounding factors.

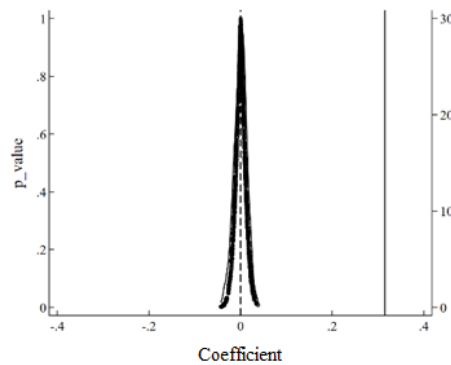


Figure 3: Placebo Test for Innovation Input

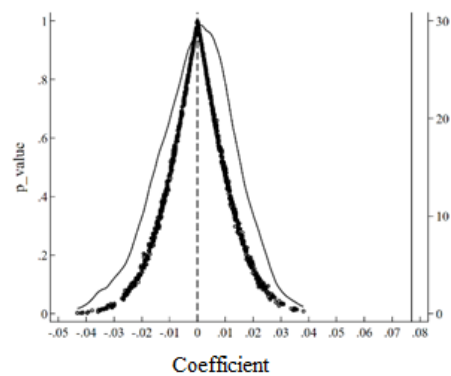


Figure 4: Placebo Test for Innovation Output

4.3.3. Alternative measures of innovation

To ensure robustness, this study replaces the innovation input variable with R&D investment intensity (R&D expenses as a proportion of total assets). Additionally, following Genfu Feng et al. [18], the annual count of invention patents serves as an alternative metric for corporate innovation output.

The regression outcomes in Columns (5) and (6) of Table 3 reveal that, despite employing alternative metrics for innovation, the Golden Tax Phase III initiative continues to exhibit a significant positive relationship with corporate innovation levels, aligning with previous research.

5. Conclusion and policy implications

5.1. Research conclusions

This research utilizes the Golden Tax Phase III policy rollout as a quasi-natural experiment and applies a Difference-in-Differences (DID) framework to analyze the effect of tax administration digitalization on corporate innovation. Using data from A-share listed companies between 2008 and 2021, the findings indicate that Golden Tax Phase III significantly enhances both corporate innovation input and output. This conclusion remains robust after a series of robustness tests, including parallel trend tests, placebo tests, and alternative innovation measurement methods.

Mechanism tests further reveal that Golden Tax Phase III promotes corporate innovation by reducing agency costs and institutional transaction costs. The results confirm that the ongoing digitalization of tax administration is highly effective and plays a positive role in fostering corporate innovation. These findings offer insights for further optimizing tax services, building a service-oriented government, stimulating corporate innovation vitality, and enhancing firms' core competitiveness.

5.2. Policy implications

This study provides several important policy implications:

First, the digitalization of tax administration can strengthen corporate governance effects, improve internal corporate governance structures, and enhance the tax business environment. Firms should recognize the trend of tax administration digitalization, accelerate digital transformation, optimize internal governance, and leverage an improved tax environment to increase investment in research and innovation.

Second, tax authorities should continue advancing tax administration digitalization. This requires increased investment in digital tax governance, enhanced precision in tax enforcement, and reduced tax policy uncertainty. Additionally, improving taxpayer services will contribute to the modernization of tax governance in China, paving the way for a more transparent, efficient, and innovation-friendly tax system.

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