Smart City Pilots and "Smart" Enterprise Behaviors

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Abstract. This essay examines the influence of the digital economy on company tax dodging behavior using the national intelligent city pilot project as a quasi-natural experiment. This study employs a difference-in-difference approach and concludes that the digital economy encourages companies to engage in tax dodging. We discovered that the digital economy is more effective in organizations with strong internal information quality. This article improves and supplements the theories related to digital economy and corporate behavior and enriches research in this field.

Keywords: Digital economy; corporate tax avoidance; related party transactions; internal information quality; DID

1 Introduction

The digital economy is currently a crucial factor driving the advancement and evolution of conventional sectors, impacting the general progress of the nation and influencing firms in many ways. Digital technology development can reduce information asymmetry between firms and financial institutions, expand financing options, alleviate financial restrictions, and decrease corporate tax evasion. Exploring the correlation between the digital economy and corporate tax avoidance is crucial. Quantifying its impact on enhancing the country's tax management system and optimizing firms' tax planning is essential.

Many studies focus on how the digital economy affects businesses through corporate digital transformation, but few explore this impact from a taxation standpoint. This article examines the national intelligent city pilot program as an external factor influencing the development of the digital economy in the pilot cities. The study utilizes the difference-in-difference paradigm to demonstrate that the digital economy encourages corporate tax evasion. Further research results show that the promotion effect of the digital economy on corporate tax avoidance is more significant in enterprises with good internal information quality, and the worse the external supervision environment, the more conducive it is for enterprises to implement tax avoidance through related-party transactions. This paper enhances empirical research on how the digital economy's development affects corporate behavior, offers a more comprehensive perspective on corporate tax avoidance, and helps clarify the connection between the digital economy and corporate tax avoidance.

Z. Wang et al. (eds.), *Proceedings of the 4th International Conference on Economic Development and Business Culture (ICEDBC 2024)*, Advances in Economics, Business and Management Research 299,
https://doi.org/10.2991/978-94-6463-538-6_4

2 Literature Review

2.1 The Economic Consequences of the Development of the Digital Economy

Many studies focus on the small-scale effects of the digital economy on businesses through the lens of digital transformation. He Fan and Liu Hongxia (2019) discovered that digital transformation can enhance corporate performance by reducing costs, improving efficiency, and driving innovation [7]. Wu Fei et al. (2021) innovatively measured the degree of digital transformation of enterprises with the help of Python crawler technology for text analysis [10]. They pointed out that with the improvement of digital transformation, the liquidity level of corporate stocks has increased significantly. Zhao Chenyu and colleagues (2021) utilized the expert scoring method to develop the digital transformation index for manufacturing companies through text analysis [13]. They outlined the process of enterprise digital transformation to enhance total factor productivity, focusing on enhancing innovation capability, optimizing human capital structure, reducing costs, and integrating advanced manufacturing and modern service industries.

However, some studies have examined the influence of the digital economy on businesses in terms of taxation. Existing research findings vary about the effect of the digital economy on enterprises' tax avoidance practices. Zhang et al. (2022) used the pilot of e-commerce demonstration cities to measure the development level of the digital economy [12]. They pointed out that the digital economy can promote corporate tax avoidance. In contrast, Zhou Tianhao and Zhang Youtang (2021) used the Peking University Digital Financial Inclusion Index to reach the opposite conclusion [14]. Hence, further research is required to examine the influence of the digital economy on corporate tax evasion.

2.2 Factors Influencing Corporate Tax Avoidance

Numerous research have been conducted on the elements that influence business tax avoidance. Chen Jun and Xu Yude (2015) established a connection between corporate internal control and tax avoidance [4]. They noted that companies with better internal control tend to engage in less tax avoidance, especially in areas with strict tax regulations. Cai Hongbiao and Rao Pingui (2015) discovered that institutional investors and tax collection and management operate as internal and external corporate governance mechanisms, respectively, and together they help reduce company tax avoidance [3]. Dai Bin and colleagues (2016) propose that corporate tax avoidance is associated with the proficiency and authority of management, since stronger management is less inclined to partake in assertive tax evasion strategies [5]. However, the increase in their power will promote aggressive tax avoidance behavior. Wang et al. (2018) discovered that A-share listed companies with controlling shareholders who pledged their shares were more inclined to engage in tax avoidance between 2007 and 2014 [9]. This behavior was observed as a strategy to reduce the danger of losing control.

3 Research Design

3.1 Institutional Background

National smart cities are thriving by using a new era of information technology and digital platforms, which represent an innovative urban governing model centered around information technology [6]. Smart cities can be regarded as intelligent digital economy applications [8]. During the sample period (2010-2020), three batches of nationally competent city pilots were included in January, August 2013, and April 2015. From the perspective of the scope of the pilot project, there is a general trend of expanding from the coastal areas to the interior and from the economically developed regions of a province to the economically underdeveloped regions.

3.2 Data Sources

The report analyzed all A-share listed businesses in Shanghai and Shenzhen from 2010 to 2020 as the research sample. The data processing processes involved eliminating certain enterprises in the banking sector, ST companies, organizations with incomplete data, and lowering all continuous variables by 1%. Following the mentioned procedures, 20,688 valid observations were collected, consisting of 3,291 enterprises, spanning 11 years from 2010 to 2020. The data of listed firms mentioned in this article are sourced from the CSMAR database, while the smart city pilot data are obtained from the official website of the Ministry of Housing and Urban-Rural Development of China.

3.3 Model Setting

This study utilizes a multi-period difference-in-difference model to examine the effects of policies on corporate tax avoidance as the competent city pilot is being gradually adopted in various locations.

$$Y_{i,t} = \beta_0 + \beta_1 TRIAL + \beta_2 Control + \sum Cor + \sum Year + \varepsilon_{i,t} \quad (1)$$

The subscripts i and t represent different companies and years, respectively, and ε represent random distractors. Y is the degree of enterprise tax avoidance, and TRIAL represents whether it is an innovative city pilot. Control stands for Control Variable. ∑ Cor and ∑Year represent firm and year fixed effects, respectively.

3.4 Variable Setting

3.4.1 Explanatory Variables.

(1) Difference in tax (BTD). The disparity between a company's pre-tax accounting profit and taxable income reflects the extent of tax avoidance, with a larger gap indicating more significant tax avoidance [4] [11]. The calculation is as follows:

$$BTD = \frac{\text{Accounting profit before tax for the current period} - \text{Taxable income for the current period}}{\text{Total assets at the end of the previous period}}$$

The procedure for calculating the income tax due in the current period is as follows:

3.4.2 Core Explanatory Variables.

This article uses the implementation of smart city pilots (TRIAL) to measure the development of the digital economy. From the second year after the city (district or county) where the enterprise is located becomes a smart city pilot area, TRIAL is 1, otherwise it is 0. The sample period of this article is set from 2010 to 2020, so the sample period includes three batches (2012, 2013, and 2014) of smart city pilots.

$$\text{Amount of income tax payable for the current period} = \frac{\text{Current income tax expense} - \text{Deferred income tax expense for the current period}}{\text{Nominal income tax rate}}$$

3.4.3 Control Variables.

This article uses enterprise characteristic variables from existing literature (Zhang Qian et al., 2022) as control variables: company size (SIZE), listing age (AGE), asset-liability ratio (LEV), fixed asset ratio (FIXED), current asset ratio (LIQUID), intangible asset ratio (INTANG), stock return rate (STKRET), operating income growth rate (GROWTH), two positions in one (DUAL), book-to-market ratio (BM), nature of equity (SOE), and institution investor shareholding ratio (IN) [12]. The primary variable symbols and definitions utilized in this article are presented in the table 1.

Table 1. Symbols and definitions of major variables

Variable symbol	definition
BTD	The tax difference is equal to (accounting profit before tax for the current period - taxable income for the current period) / total assets at the end of the period, where the taxable income = (current income tax expense - current deferred income tax expense) / nominal income tax rate.
DDBTD	The difference in tax after excluding the impact of earnings management is calculated according to Desai and Dharmapala's model [1].
TRIAL	Whether the city (district or county) where the enterprise is located in an intelligent city, the policy's value is 1 in the second year, and later; otherwise, it is 0.
SIZE	The enterprise's size is equal to the logarithm of total assets at the end of the period.
LEV	The debt-to-asset ratio is the ratio of total liabilities to total assets at the end of the current period.
FIXED	The ratio of fixed assets is equal to the ratio of net fixed assets to total assets at the end of the period.
LIQUID	The current assets ratio is equal to the ratio of current assets to total assets at the end of the period.
INTANG	The intangible assets ratio is equal to the ratio of net intangible assets to total assets at the end of the period.
GROWTH	The growth rate of operating income is equal to the difference between the operating income of the current year and the operating income of the previous year divided by the operating income of the previous year.

BM	The book-to-market value ratio is equal to the ratio of the total shareholders' equity to the market value of net assets at the end of the period.
STKRET	The stock yield is equal to the average of the stock returns for each month of the year.
DUAL	Whether the two positions are one, if the chairman and general manager of the company are the same person, take 1, otherwise take 0.
SOE	Whether it is a state-owned enterprise, if the actual controller of the enterprise is a state share or a state-owned legal person share, 1 will be taken, otherwise 0 will be taken.
IN	The shareholding ratio of institutional investors is equal to the shareholding ratio of institutional investors at the end of the year.

The descriptive statistical results for the main variables involved are shown in the table 2.

Table 2. Descriptive statistics of major variables

variable	Sample size	average value	standard deviation	minimum	maximum
BTD	20688	-0.0003	0.0250	-0.0682	0.0828
DDBTD	20688	-0.0005	0.0249	-0.0710	0.0783
TRIAL	20688	0.2567	0.4368	0.0000	1.0000
SIZE	20688	22.3478	1.2972	20.0128	26.3656
AGE	20688	2.2875	0.6609	1.0986	3.2958
LEV	20688	0.4319	0.1988	0.0590	0.8608
FIXED	20688	0.2169	0.1623	0.0019	0.6989
LQUID	20688	0.5629	0.2036	0.0914	0.9537
INTANG	20688	0.0466	0.0516	0.0000	0.3339
GROWTH	20688	0.1968	0.4164	-0.4650	2.7830
BM	20688	1.0979	1.1847	0.1027	7.1566
STKRET	20688	0.1359	0.4935	-0.5375	2.1173
DUAL	20688	0.2479	0.4318	0.0000	1.0000
SOE	20688	0.3913	0.4881	0.0000	1.0000
IN	20688	0.4191	0.2336	0.0019	0.8923

4 Empirical Analysis

4.1 Primary Regression Analysis

The regression results for model (1) are shown in Table 3. This paper calculates the abnormal tax probability difference (DDBTD) to represent corporate tax avoidance behavior, which reflects the institutional disparity between tax laws and accounting standards, or the accounting tax difference resulting from corporate earnings management, in order to strengthen the reliability of the core explanatory variables. This research utilizes the methodology of Desai and Dharmapala to gauge corporate tax avoidance by examining the variance in anomalous tax likelihood, removing the influence of accumulated gains [1]. A greater value indicates a larger level of corporate tax avoidance.

Columns (1) and (3) display the outcomes without include control variables. The positive coefficient before TRIAL suggests that the growth of the digital economy has encouraged firms to engage in tax dodging. After incorporating the control variables, the outcomes are displayed in columns (2) and (4). The TRIAL coefficient remains rather stable, while the innovative city pilot increases the corporation tax differential by 0.002, which is then multiplied by the average total assets (50). The amount involved was around 7.6 billion yuan, which translates to an underreporting of taxable income of around 10.15 million yuan per firm.

Table 3. Regression results of digital economy to corporate tax avoidance

	（1）	（2）	（3）	（4）
variable	BTD	BTD	DDBTD	DDBTD
TRIAL	0.002***	0.002**	0.002***	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
SIZE		0.002***		0.001**
		(0.000)		(0.000)
LEV		-0.027***		-0.022***
		(0.002)		(0.002)
FIXED		-0.009***		-0.006**
		(0.002)		(0.002)
GROWTH		0.000		0.000
		(0.000)		(0.000)
DUAL		-0.001		-0.000
		(0.001)		(0.001)
BM		-0.003***		-0.002***
		(0.000)		(0.000)
SOE		-0.003**		-0.003**
		(0.001)		(0.001)
AGE		0.007***		0.006***
		(0.001)		(0.001)
INST		0.002**		0.001
		(0.001)		(0.001)
LIQUID		-0.009***		-0.009***
		(0.002)		(0.002)
INTANG		-0.039***		-0.030***
		(0.006)		(0.006)
STKRET		0.002***		0.002***
		(0.000)		(0.000)
Constant	-0.001***	-0.031***	-0.001***	-0.014

	(0.000)	(0.010)	(0.000)	(0.010)
Corporate fixation	be	be	be	be
Year-to-year fixed effect	be	be	be	be
Sample size	20,688	20,688	20,688	20,688
Adjust the R side	0.490	0.507	0.522	0.533

Note: ***, **, and * indicate significant at 1%, 5%, and 10% levels, respectively, the same below.

4.2 Heterogeneity Analysis

First, this paper uses the speed of annual report release to measure internal information quality [2]; the higher the internal information quality, the faster it can extract financial data from complex and diverse business information to prepare annual reports. It is calculated by dividing the days between the publication date of the company's annual report for the current year and the closing date of the financial year divided by 365. Second, when external supervision weakens, enterprises are more likely to use related-party transactions to avoid taxes. This paper uses the ratio of the standard deviation of the analyst's EPS forecast error to the company's year-end closing price to measure the strength of external supervision of enterprises [12].

Taking the median of internal information quality and external supervision as the boundary, the samples were divided into two groups for group regression. Table 4 indicates that the impact of the digital economy on corporate tax avoidance is more pronounced in companies with high internal information quality and in companies operating in weak external monitoring environments.

Table 4. Heterogeneity analysis (BTD)

	（1）	（2）	（3）	（4）
	Internal information quality		External oversight forces	
variable	Good	difference	small	big
TRIAL	0.003**	0.000	0.002**	0.001
	*			
	(0.001)	(0.001)	(0.001)	(0.001)
Control variables	be	be	be	be
Corporate fixation	be	be	be	be
Year-to-year fixed effect	be	be	be	be
Sample size	9,887	9,671	14,246	5,343
Adjust the R side	0.539	0.568	0.506	0.639

5 Conclusions

The digital economy is the predominant economic system following the agricultural and industrial economies. It is causing significant transformations in production methods, lifestyles, and governance. Based on the national innovative city pilot project, this paper uses the A-share listed companies in Shanghai and Shenzhen from 2010 to 2020

as the research sample. It uses the difference-in-difference model to find that the digital economy can significantly promote corporate tax avoidance. In addition, the heterogeneity analysis shows that the promotion effect of the digital economy on corporate tax avoidance is more significant in enterprises with good internal information quality and little external supervision. The conclusion of this paper has specific policy implications for the state to improve the tax collection and management system.

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