

Corporate Irregularity and Commercial Bank Digitization

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Abstract. we will study whether the digital transformation of commercial banks can reduce corporate violations from the SEC's reporting of corporate listed companies' violation announcements. This paper empirically analyzes the impact of digital transformation of commercial banks on corporate violations by taking the digital transformation index of commercial banks from 2010 to 2021 as the research object. Through empirical analysis, we find that the digital transformation of commercial banks can significantly reduce corporate violations, and the higher the digitalization index of commercial banks, the more it can inhibit corporate violations.

Keywords: Digitalization; Commercial Banks; Asymmetric Information, and Artificial Intelligence.

1. Introduction

In recent years, China's capital market has developed rapidly, the securities regulatory system has been gradually improved, and the crackdown on corporate violations has been strengthened, but corporate violations still occur from time to time in the capital market, and in 2021 alone, the SEC handled 609 corporate violation cases, of which 163 were major cases involving financial counterfeiting, market manipulation, and pernicious insider trading [1]. For example, Guangzhou Longqi information disclosure violation case. Guangzhou Longqi Industrial Company Limited, there were false records in the 2018 and 2019 annual reports, failure to disclose related transactions in accordance with the regulations, etc., and its two years of combined inflated operating revenues amounted to nearly 12.9 billion yuan, with a combined inflated profit of 411 million yuan. Practice has proved that corporate violations can have a negative impact on the market environment and the companies themselves [2].

On the one hand, commercial banks have strengthened the monitoring and prevention of corporate violations through digital transformation by improving information transparency and regulatory efficiency [3]. Specifically, the use of big data analytics, artificial intelligence and other technologies enables real-time monitoring of corporate financial activities, timely detection of abnormal behaviors, and effective prevention and reduction of violations. In addition, the information on violation penalties released through digital platforms enhances the openness and accessibility of the information, which has a binding effect on enterprises through the reputation mechanism, prompting them to take the initiative to correct their violations and improving the deterrent effect of regulation [4]. On the other hand, however, in the transition process, data security and privacy loopholes, technological lags, and the emergence of regulatory blind spots provide opportunities for new types of non-compliance, while over-reliance on technology may lead to the neglect of human oversight, increasing the risk of regulatory failure [5]. At the same time, the issue of digital divide makes MSMEs face greater compliance challenges, and the increase in compliance costs may also pose a burden on business operations.

2. Theoretical Models and Research Hypotheses

This paper constructs a two-period model of bank lending and business operations, which is used to understand the lending and operations-related decisions between commercial banks and firms. In the first period, the enterprise signs a loan contract with the commercial bank, and the enterprise that obtains the loan operates. In the second period, the firm operates in a standardized manner and earns good or bad operating profits and higher private returns, and pays back the loan if the investment

succeeds, or goes bankrupt if the investment fails. It is assumed that both the commercial bank and the enterprise are risk-neutral and have limited liability.

The distribution of firms is continuous, with the same choice of technology but different initial capital A obeys the uniform distribution, $A \in (0,1)$. The assets of each firm are $I = A + L \equiv 1$, L for loans. (2) The firms are faced with the choice of operating legally or operating illegally, with success rates of p_G and p_B respectively, and $\Delta p = p_G - p_B > 0$. Assume that the returns required by capital are the same for both modes of operation (assuming perfect competition for capital) and that $r > 1$ is satisfied. A firm choosing to operate in a non-compliant manner receives a private return B , and the private return is a source of moral hazard. The return to the compliant firm is higher compared to the expected return to the non-compliant operation, $p_G r > p_B r + B$, i.e. $\Delta p r - B > 0$. (3) The opportunity cost of business investment includes the necessary return on initial capital $r_A A$ and loan repayment $r_L L$, r_A is the necessary rate of return on initial capital, r_L is the interest rate of the loan. In order to simplify the model, it is assumed that the required rate of return is equal to the expected rate of return of a quality project, i.e. $r_A = p_G r$. The commercial bank will monitor the loans granted, and the cost of monitoring is M . The private returns of the monitored firms B fall to $b > 0$. This leads to the following profit function for a firm choosing a different program.

$$\begin{cases} \pi_{f,c} = p_G(Ir - Lr_L) - Ar_A = p_G L(r - r_L) \\ \pi_{f,B} = p_B(Ir - Lr_L) - Ar_A + b = p_B L(r - r_L) - \Delta p Ar + b \end{cases}$$

Therefore, the incentive-compatible conditions for firms to choose compliance are:

$$r_L \leq (r - b/\Delta p)/(1 - A)$$

When the lending rate is lower than $\tilde{r} = (r - b/\Delta p)/(1 - A)$, firms are more inclined to choose compliance.

3. Empirical Research Design

3.1 Data Sources and Sample Selection

The data of listed companies used in this paper come from CSMAR (China Stock Market & Accounting Research Database) database, which is one of the most authoritative databases in the field of China's financial market and corporate finance, with high data quality, and can better represent the overall financial market and corporate finance in China. The CSMAR database is one of the most authoritative databases in China's financial market and corporate finance. It is widely recognized and used in past studies (Liu (2023)). The data on digital transformation of Chinese commercial banks, on the other hand, is provided by the Digital Transformation Index Measurement Team of Chinese Commercial Banks at Peking University. The dataset covers the time span from 2010 to 2021. By matching and integrating the digital transformation index of municipal commercial banks with the underlying data of listed companies, a complete dataset containing 21,652 independent, observations is finally formed.

3.2 Model Setting and Variable Construction

3.2.1 Empirical Model

The specific empirical model settings of this paper are as follows:

$punishment_{c,t} = \alpha + \beta digital_{c,t-1} + \theta X_{c,t} + \mu_c + \mu_j + \mu_t + \mu_{i,t} punishment_{c,t}$ represents the number of violations under listed company c and year t , and $digital_{c,t-1}$ is set to be the commercial bank digitalization index for year $t-1$ under the city of listed company c . Considering the lagged impact of commercial bank digital transformation on listed companies, this paper treats the commercial bank digitalization index of a certain region as one period lagged. $X_{c,t}$

represents firm- and region-level control variables including the level of economic development, etc. μ_c is an individual fixed effect, controlling for inherent differences between firms; μ_j is a province fixed effect, controlling for inherent differences between provinces; $\mu_{i,t}$ represents an industry one-year fixed effect, controlling for systematic shocks between years and heterogeneous characteristics of the industry in which it operates over time; and μ_t is a year fixed effect.

3.2.2 Variable Construction

The following are the specific ways in which the variables are constructed: Explained variable: $punishment_{c,t}$ represents the number of violations under public company c and year t . The set of penalized events is derived from the Cathay Pacific Economic and Financial Database, which publishes information on penalties for violations against listed companies. In particular, listed companies are included in the database if they have the following violations: violations of financial regulatory nature and violations of nonfinancial regulatory nature.

After finding out the violation of the enterprise, the regulators will give different levels of punishment depending on the seriousness of the situation. Based on the criteria, the penalties can be broadly categorized into criticism, warning, reprimand, fine, confiscation of illegal income and others. After detecting a violation, the regulator will impose different levels of penalties depending on the severity of the case. Based on the criteria, the penalties can be broadly categorized into criticism, warning, reprimand, fine, confiscation of illegal income and others. There are about 6,820 punishment announcements involving A-share listed companies in 2000-2021. From the number of various types of penalties in Table 1.

Table 1. Statistical analysis of violations

Penalty Type	Frequency	Meaning
Criticize	794	Criticize listed entities, major controllers etc.
Warning	496	Warning to listed entities, major controllers, etc
Censure	323	Public censure for listed entities, major controllers, etc
Fines	618	Depending on the facts, nature, circumstances and degree of social harm of the offenses committed by the parties or entities concerned
Confiscation of Illegal Income	35	Confiscation of illegal income received by the party or entity as a result of the violation
Other	5327	Other administrative penalties stipulated by laws and administrative regulations, including ordering rectification within a certain period of time, regulating the business conduct of enterprises, and imposing other penalties on the principal person in charge of a listed company

(2) Explanatory variables: $digital_{c,t-1}$ is set to be the commercial bank digitization index for the year $t - 1$ under the city where the listed company c is located. To compute a composite indicator of the degree of commercial bank digitization in each region, we take the following steps: first, for each type of commercial bank within a region, we compute the ratio of the number of banks in the region to the total number of banks of the same type in the country; second, we multiply this ratio by the composite digitization index of the corresponding commercial bank.

Let N_{ij} represent the number of commercial banks of category j in the i city. N_i^{total} represents the total number of commercial banks in the i city. DI_{ij} is the digitization composite index of commercial banks of category j in the i city. Then, the aggregated digitization level of all types of commercial banks in city i DI_i , as a weighted average, can be expressed as follows:

$$DI_i = \sum_j \left(\frac{N_{ij}}{N_i^{total}} \times DI_{ij} \right)$$

(3) Control variables. Considering the differences in regional development, GDP per capita (GDP) in the province where the enterprise is located is also controlled in the regression. Finally, fixed effects for time, province, individual and industry and time interactions are additionally controlled for in the model with clustering standard error correction at the city level. Statistical descriptions of the main variables are shown in Table 2.

Table 2. Variable Definition Table

Variable type	Variable name	Variable symbol
explained variable	Number of corporate violations	Punish
	Logarithmic value of the number of corporate violations	Lpunish
explanatory variable	Regional Digital Transformation Index	Dig_index
Control variables	Enterprise size	Size
	Asset liability ratio	Lev
	Return on assets	ROA
	Enterprise nature	type
	Age of business	Age
	Local outward investment	FDI
	Local employment	Labor

Table 3. Results of descriptive statistics

	Dig_index	Punish	Size	Lev	ROA	Age
mean	88.87	0.22	20.38	47.09	2.92	2.94
std	35.11	1.55	1.85	21.88	6.94	0.34
min	30.48	0	15	5.31	-32.64	1.79
max	156.08	65	25	98.70	20.49	3.58
count	23645	23645	23645	23645	23645	23645

4. Further Analysis

4.1 Mechanism Analysis

The increased digitization of urban commercial banks can significantly improve the business environment in a number of ways. Specifically, the efficient and transparent financial services provided by digital banks enhance the trust of businesses in the banking system, while through improved risk management and credit approval processes, banks are able to respond quickly to market changes and business needs, thereby increasing the availability of credit and the dynamism of economic activity across the business community. Limited by data availability and research scope, this paper only makes possible inferences on the mechanism that commercial bank digitization further improves the reduction of corporate violations by improving the business environment.

4.2 Differential Consequences of Enforcement Intensity

Differences in enforcement intensity also have consequences for the results. Columns 4 and 5 of Table 5 report the extent to which the digitization of commercial banks affects corporate non-compliance in regions with high and low enforcement intensity, respectively. We find that the inhibitory effect of digital transformation on corporate non-compliance is more pronounced in regions with lower enforcement intensity, which may be due to the fact that in regions with low enforcement intensity, firms receive less rule of law pressure, information transparency is reduced, and there are fewer channels to reduce information asymmetry, and the marginal benefit of digital transformation for commercial banks to reduce information asymmetry is relatively larger, and thus exhibits a more

The marginal benefit of digital transformation for commercial banks in reducing information asymmetry is relatively larger, thus showing a more significant inhibitory effect on corporate violations.

Table 4. Mechanism Analysis

	<i>Dependent Variables</i>				
	(1) Trust	(2) Punish	(3) Punish	(4) Punish	(5) Punish
Dig_index	0.077** (0.031)	0.023** (0.010)	-0.003 (0.002)	-0.006** (0.003)	-0.006** (0.003)
Trust		0.028*** (0.009)			
Dig*Tru		-0.000*** (0.000)			
Mis			-0.002** (0.001)		
Unlink			0.078* (0.045)		
Dig*LSize				-0.002*** (0.001)	
Dig*LFA					-0.002*** (0.001)
Labor	1.170 (1.033)	0.121* (0.063)	-0.168** (0.080)	0.162** (0.079)	0.162** (0.079)
RD	-202.571 (210.903)	21.650 (13.266)	-1.080 (6.660)	15.013 (12.131)	15.013 (12.131)
FDI	19.623 (18.331)	-1.195 (2.204)	-1.569 (1.792)	-1.074 (1.829)	-1.074 (1.829)
Size		-0.223*** (0.042)	-0.050*** (0.019)	-0.219*** (0.042)	-0.219*** (0.042)
Leverage		0.196*** (0.053)	0.044 (0.034)	0.178*** (0.053)	0.178*** (0.053)
ROA		-0.014*** (0.005)	-0.005* (0.003)	-0.014*** (0.005)	-0.014*** (0.005)
OCF		0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Age		-0.627* (0.329)	-0.248 (0.245)	-0.667* (0.342)	-0.667* (0.342)
Year FE	Yes	Yes	Yes	Yes	Yes
Id FE		Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes
Ind#Year		Yes	Yes	Yes	Yes
N	21316	21305	17727	21648	21648
r2	0.841	0.208	0.188	0.213	0.213

Standard errors in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5. Conclusion

In this paper, by constructing a two-period model of bank lending and business operations, we put forward the core hypothesis that banks undergoing digital transformation can reduce corporate non-compliance, and use a dataset consisting of 21,652 samples to conduct empirical analyses, which ultimately confirms our hypothesis. Meanwhile, the universality, mechanism of action and differentiation of digital transformation of commercial banks on corporate violations are further discussed through robustness test, mechanism analysis and heterogeneity analysis. It is found that digital transformation of commercial banks can significantly inhibit the occurrence of corporate non-compliance through the channels of reducing the degree of information non-conformity and

improving the business environment, especially in the eastern and western regions and regions with relatively low enforcement intensity.

In conclusion, the digital transformation of commercial banks is not only an inevitable trend in the development of the financial industry itself, but also an important means to enhance the efficiency of financial supervision and promote the healthy development of the economy. With the continuous progress of digital technology, commercial banks will play a more important role in the future of financial regulation and promote the development of the financial market in the direction of greater transparency and efficiency.

Table 5. Heterogeneity Analysis

	East	Area West	Central	High	Enforcement intensity Low
Dig_index	-0.011*** (0.004)	0.011** (0.005)	0.004 (0.004)	-0.001 (0.004)	-0.008** (0.004)
Size	-0.297*** (0.066)	-0.050 (0.067)	-0.127* (0.073)	-0.098*** (0.036)	-0.324*** (0.040)
Lev	0.239*** (0.066)	0.072 (0.131)	0.135* (0.077)	0.078 (0.054)	0.328*** (0.057)
ROA	-0.017** (0.007)	-0.011 (0.007)	-0.016* (0.009)	-0.013*** (0.003)	-0.016*** (0.003)
OCF	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Age	-0.737* (0.437)	-0.950* (0.534)	-0.469 (0.445)	-0.203 (0.337)	-0.880*** (0.323)
Labor	0.216** (0.090)	0.209 (0.257)	0.423 (0.641)	0.131 (0.104)	0.169*** (0.061)
RD	23.767 (15.625)	39.710 (48.170)	-5.039 (34.055)	-8.040 (10.987)	33.965** (14.168)
FDI	0.343 (2.421)	18.043* (10.397)	-3.556 (15.168)	-1.785 (2.431)	2.796 (2.442)
Year FE	Yes	Yes	Yes	Yes	Yes
Id FE		Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes
N	13748	3213	3224	10176	11156
r2	0.202	0.286	0.279	0.283	0.254

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

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