

The Digital Divide between Merging Parties and M&A Completion:Evidence from Listed Companies in China.

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Abstract: There is a keyword problem in the development process of the digital economy, the digital divide, which not only deprives the disadvantaged groups of the right to access information and opportunities but also hinders the whole society from moving forward to informatization and intelligence. Taking the M&A from 2008-2022 as a sample, we adopt an empirical analysis method to examine how the digital divide affects the completion of M&A. The findings indicate that the digital divide inhibits the completion of M&A. Further analysis reveals that this inhibitory effect primarily exists when the acquirer's overall digitization level lags behind that of the acquiree. Specifically, the negative impact is most pronounced when the acquirer falls behind the acquiree in both digital technology and digital application dimensions. Heterogeneity tests show that the digital divide exerts a stronger inhibitory effect in cross-location M&As, when the acquiree has lower information transparency, when the acquirer lacks extensive M&A culture, when the acquiree possesses a rich M&A culture, and when there is a substantial disparity in M&A culture between the two parties. there is no effect of the digital divide on the number of days to M&A completion. Additionally, we find that the digital divide does not significantly affect the number of days to M&A completion. This suggests that while digital asymmetry increases uncertainty and reduces the probability of deal closure, it does not prolong the procedural timeline, as the completion duration is predominantly governed by standardized legal, financial, and regulatory processes rather than digital integration challenges. We incorporate the characteristics of M&A parties into the literature on M&A by studying the digital divide between the two parties, which enriches the existing literature while better guiding companies to use digitalization to facilitate M&A completion.

Keywords: digital divide; M&A; digital technology; digital application

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1. Introduction

China's 2024 government work report states "formulate policies to support the high-quality development of the digital economy, actively promote the industrialization of digital industry and industrial digitization, and promote the deep integration of digital technology and the real economy." This shows the importance China attaches to the development of the digital economy. However, there is a key problem in the development of the digital economy - the digital divide. The digital divide not only deprives disadvantaged groups of the right to access information and opportunities but also hinders the entire society from advancing towards informatization and intelligence.

Enterprises, as an important main body of the micro-economy, are of great significance to the development of the national digital economy, and M&A, as an important means for the externalized development of enterprises in the digital era, is conducive to the acquisition of innovative resources, expansion of the business territory, integration of resources, prevention of risks, enhancement of the competitive strength and enhancement of enterprise value[1]. However, the digital divide between the acquirer and the acquiree may result in the acquirer's inability to effectively understand the acquiree, leading to the failure of the M&A. Therefore an exploration of how the digital divide affects M&A completion will help guide the practice of M&A in the era of digital economy and facilitate enterprises to integrate more smoothly into the wave of the digital economy era.

Existing papers on M&A completion fall into three main areas: the influence of M&A characteristics, the influence of M&A parties' characteristics, and extrinsic influences. M&A characteristics are more likely to be completed in more deal-friendly, cash-based transactions, and more likely to be "derailed" in complex and large deals that are closely scrutinized by regulators[2], while the value of the firm may change significantly between the setting of the terms of the deal and the actual closing of the deal, leading to a higher probability of the M&A not being completed. Changes between the setting of deal terms and the actual closing of the deal, leading to an increased probability of the M&A not being completed[3]. On M&A party characteristics, risk-averse creditors reduce the likelihood of acquisition completion[4]. On extrinsic influences affecting factors, the probability of deal completion significantly increases with the number of favorable acquirers' post-merger announcement proposals but decreases with the number of unfavorable acquirers' post-merger announcement proposals[5], while the failure of deal coordination based on culture clashes, and M&A activities negatively affected by social media discussions lead to the failure of corporate M&A to be completed[6]. Studies on overseas M&A have found a significant positive correlation between the CSR of the principal merger party and the completion rate of overseas M&A[7], but the institutional duality between the home country of the acquirer and the target country of the acquired party reduces the likelihood of the completion of the acquisition[4]. At the same time economic shocks, regulatory shocks, and technological shocks drive a wave of industry M&As. However, whether such shocks trigger a wave of M&As depends on the adequacy of overall capital liquidity[8]. Existing studies have conducted a lot of research on M&A completion but ignored the impact of differences between M&A parties on M&A completion, we integrate the characteristics of M&A parties into the literature on M&A completion by examining the digital divide between M&A parties to better guide firms to utilize digitization to facilitate the completion of M&A while enriching the existing literature.

We test the effect of the digital divide between M&A parties on M&A completion using the difference in the degree of digitization between M&A parties as the digital divide between M&A parties in a sample of M&A parties that are both listed companies from 2008 to 2022. It is found that the digital divide reduces the completion rate of M&A, and the results remain robust after instrumental variable tests, changing the explanatory variable measures, changing the sample period, changing the sample model, and deleting the sample of digitized industries. The effect of the digital divide on the

completion of M&A is stronger in the case of cross-location M&A, lower information transparency of the acquiree, lower level of M&A culture of the acquirer, higher level of M&A culture of the acquiree, and larger differences in M&A culture between the two sides of the M&A; and the digital divide does not affect the length of the completion of the M&A.

Our contributions may be as follows: first, in terms of research content, the study enriches and expands the basic meaning of the digital divide. Drawing on the existing literature on digital divide, we construct a measure of digital divide using both sides of the M&A, which helps to understand the existence of digital divide among firms; second, in terms of research perspectives, we expand related studies in the field of digitalization and M&A. Based on the M&A, we reveal the impact of digital divide on M&A completion, which forms a better complement to the existing studies; third, in terms of findings, our study can provide empirical evidence for other subsequent studies on digital divide. The digital divide is not only between M&A parties but also widely exists among supply chains and in business cooperation. We analyze the impact of the digital divide through M&A, and by assessing the adverse impacts of the digital divide, we can not only provide policy insights for promoting enterprise digitization but also provide useful references for the policy design of digitization and M&A in China.

2. Research hypothesis

In today's digital era, inter-firm M&A activities are not only a restructuring of capital and resources, but also an integration of capabilities and assets. However, the difference in digitization level between M&A parties, the so-called digital divide, may become a hidden obstacle on the way to M&A completion. We analyze the impact of digital divide between M&A parties on M&A completion from the following four points:

First, the information asymmetry theory states that when the amount and quality of information possessed by both parties to a transaction is inconsistent, it may lead to market failure[9]. In the M&A process, if there is a significant difference in the level of digitization between the acquirer and the acquiree, it may lead to inadequate or inaccurate information disclosure. In M&A, the value of digital assets such as software, data, and network infrastructure is difficult to assess accurately. The quantity and quality of digital assets owned by the acquiree, as well as the degree of integration with the business, may not be fully grasped by the acquirer, and at the same time, there may be undisclosed or undiscovered cyberculture vulnerabilities and historical events in the acquiree, and this information asymmetry may bring potential risks to the acquirer[10], thus the existence of the digital divide makes it potentially difficult for the acquirer to accurately assess the value of the acquiree[11], increasing the uncertainty of the M&A and thus reducing the likelihood of the M&A being completed[3].

Second, transaction cost theory emphasizes that costs during the transaction process affect decision-making. The digital divide may lead to increased communication costs, coordination costs, and integration costs during the M&A process[12]. When there is a significant digital divide between the acquirer and the acquiree, the acquirer may need to invest additional resources in understanding and integrating the acquiree's digital systems, or the acquiree's employees may need to be trained to understand and apply each other's digitalization on both sides of the merger. These additional costs may affect

the acquirer's decision-making[13], making the M&A process more complex and difficult, and reducing the likelihood of completion.

Third, organizational culture and change management theories focus on the values, beliefs, and behavioral norms within an organization, as well as adaptation during the change process. Cultural differences play an important role in business, and the more pronounced the cultural differences, the less likely the successful completion of a business M&A[14]. The digital divide between M&A parties may lead to new cultural differences between the M&A parties, especially in terms of digital work styles and decision-making processes. Such cultural differences may cause employee resistance and conflict after the M&A[14], affecting the effectiveness of change management[6][15], and the M&A parties may abandon the M&A after investigating it, thus decreasing the likelihood of the M&A being completed.

Fourth, strategic management theory emphasizes the formulation and execution of corporate strategy. M&A is a part of corporate strategy, which aims to achieve the optimal allocation of resources and the enhancement of core competitiveness by relying on the capital market[16]. The consistency of the digital strategies of both M&A parties is crucial for the overall development and strategy execution of the M&A party after the M&A, and it will affect the M&A effect after the M&A. If there are inconsistencies in the digital strategies of the M&A parties, it may lead to difficulties in strategy execution after the M&A and affect the overall effectiveness of the M&A. The M&A parties may reassess the strategic value of the M&A, which may affect the completion of the M&A.

Therefore, we propose the following Hypotheses:

The digital divide between the merging parties inhibits the completion of M&A.

3. Empirical design

3.1 Data source

Our sample is the sample of M&A companies whose buyers and sellers are listed companies in Shanghai and Shenzhen from 2008 to 2022. We select 2008 as the starting year because China's M&A database (CSMAR) began to systematically record detailed M&A announcement dates, transaction terms, and completion status with high reliability from this year onward, ensuring the consistency and availability of key variables for empirical analysis. To ensure data quality, we carry out a series of treatments on the raw data: (1) deleting samples in which both sides of M&A are in the financial industry; (2) deleting samples with incomplete data; (3) deleting samples in which one side of the M&A or both sides of the M&A are unlisted companies; (4) excluding firms with special treatment status (i.e., ST or *ST) to mitigate the impact of financial distress on M&A outcomes; (5) removing transactions involving backdoor listings or major asset restructurings, as these deals follow distinct regulatory approval procedures and strategic motivations that differ from conventional M&As. Our M&A data and financial data mainly come from the CSAMR database and are supplemented by the CNRDS database, with the key continuous variables being shrink-tailed up and down by 1%, and the measurement software using stata17.0. It should be noted that there may be multiple buyers and sellers in the same M&A, so we combine the multiple buyers and sellers in the same M&A to form the "M&A Party - Year" and the "M&A Seller - Year". We combine multiple buyers and sellers in the same M&A to form a

sample pair of “M&A party - year - M&A seller”.

3.2 Explanation of variables

3.2.1 Explained variable: M&A completion (*Merger_Success*)

Regarding the measurement of M&A completion, most of the existing literature is still vague on the concepts of M&A completion and M&A success. We believe that M&A success should be the completion of M&A to achieve the purpose of M&A, however, there are greater difficulties in measuring the purpose of M&A. Therefore, we mainly adopt M&A completion as our explanatory variable, taking 1 if the M&A is completed and 0 otherwise[5].

3.2.2 Explanatory variable: digital divide (*Digital_Divide*)

Drawing on [17], we measure the digitization level of firms on both sides of the M&A by taking the logarithm of the number of digitized word frequencies disclosed in the annual reports of both sides of the M&A plus one, and we also measure the digital divide of both sides of the M&A by taking the absolute value of the difference in the digitization level of the merger buyer and the seller.

3.2.3 Control variables

The age gap between the two sides of the M&A(*Merger_Age*), the difference between the sample year and the year of establishment to measure the age of the enterprise, the absolute value of the difference between the ages of the two parties; M&A of the two sides of the size of the gap (*Merger_Size*), the absolute value of the difference between the natural logarithm of the total assets of the two companies to measure the difference between the two sides of the M&A of the leverage gap between the two sides of the M&A of the (*Merger_Lev*), measured by the absolute value of the difference between the ratio of total liabilities to total assets of the M&A parties; Merger and Acquisition Nature of Ownership Gap (*Merger_SOE*), if the M&A parties are state-owned enterprises, then take 1, otherwise take 0, and subtract the nature of the ownership of the two sides of the M&A and take the absolute value; M&A Pay (*Merger_Pay*), if the M&A is based on the equity of the target, then take 1, otherwise take 0; M&A parties Growth gap (*Merger_Growth*), measured by the absolute value of the difference between the growth rate of operating income of the two sides of the M&A; M&A of the two sides of the performance gap (*Merger_ROA*), mergers and acquisitions of the two sides of the ROA difference in absolute value; mergers and acquisitions of the two sides of Tobin's Q gap (*Merger_Tobinq*), M&A of the two sides of the Tobin's Q value of the absolute value of the difference between the two sides of the M&A of the two sides of the gap between book-to-market ratio (*Merger_BM*), the absolute value of the difference between the book-to-market ratios of the M&A parties; Gap in equity checks and balances between M&A parties (*Merger_Equity*), the absolute value of the difference between the ratio of the shareholding of the first largest shareholder and the ratio of the shareholding of the top ten shareholders of the M&A parties. The definitions of the variables are shown in Table 1.

Table 1 Description of main variables

Variable type	Variable name	Description of variables
Explained variable	<i>Merger_Success</i>	Take 1 if the M&A is complete, 0 otherwise
Explanatory variable	<i>Digital_Divide</i>	Absolute value of the difference between the digitization level of the concurrent purchaser and the seller
	<i>Merger_Age</i>	Absolute value of the difference between the ages of the merging parties
	<i>Merger_Size</i>	Absolute value of the difference between the natural logarithms of the total assets of the firms on both sides of the M&As
	<i>Merger_Lev</i>	Absolute value of the difference between the ratio of total liabilities to total assets of the merging firms
	<i>Merger_SOE</i>	The nature of ownership on both sides of the merger is subtracted and taken in absolute terms
	<i>Merger_Pay</i>	Take 1 if the M&As is equity-based, 0 otherwise
Control variables	<i>Merger_Growth</i>	Absolute value of the difference between the growth rates of operating revenues of the merging parties
	<i>Merger_ROA</i>	Absolute value of the difference between the ROA of the merging parties
	<i>Merger_Tobinq</i>	Absolute value of the difference between the Tobin's Q values of the merging parties
	<i>Merger_BM</i>	Absolute value of the difference between the book-to-market ratios of the merging parties
	<i>Merger_Equity</i>	Absolute value of the difference between the proportion of shares held by the first largest shareholder and the proportion of shares held by the top ten shareholders of the companies on both sides of the M&As

3.3 Modeling

We use the following model for regression:

$$Merger_Success_{i,t} = \alpha_0 + \alpha_1 Digital_Divide_{i,t} + \sum Controls_{i,t} + Year_t + Eventid_t + \varepsilon_{i,t} \quad (1)$$

Where subscripts *i* and *t* denote M&A and a year respectively, α_0 denotes the intercept term of the model, Controls represent our control variables, and ε represents the random disturbance term of the model, while we control for year (Year) and M&A (Eventid). Since our research object is the M&A, using the Logit model will reduce our sample size, so we use the OLS model for regression, which does not change the sample size while the sign of the coefficients is the same as that of the Logit model.

4. Results

4.1 Descriptive statistics

Table 2 demonstrates the descriptive statistics of this paper, which shows that there are 919 M&A party-year-M&A seller pairs in this paper, and the median (0.000) of M&As completion is less than the mean (0.379) is less than 0.5, which indicates that most of the M&As samples have not been completed, and at the same time the distribution of the data of M&As completion shows a right-skewed distribution; and the median of the numerical divide is less than the mean (0.875) is less than the mean (1.122), indicating that the data distribution of the digital divide presents a right-skewed distribution.

Table 2 Descriptive statistics

Variables	N	SD	Mix	P50	Max	Mean
<i>Merger_Success</i>	805	0.485	0.000	0.000	1.000	0.379
<i>Digital_Divide</i>	805	1.054	0.000	0.875	4.477	1.122
<i>Merger_Age</i>	805	4.378	0.000	5.000	18.000	5.544
<i>Merger_Size</i>	805	1.190	0.000	1.199	5.180	1.477
<i>Merger_Lev</i>	805	0.153	0.000	0.177	0.639	0.206
<i>Merge_SOE</i>	805	0.447	0.000	0.000	1.000	0.275
<i>Merger_Pay</i>	805	0.358	0.000	1.000	1.000	0.850
<i>Merger_Growth</i>	805	0.874	0.000	0.344	5.125	0.629
<i>Merger_ROA</i>	805	0.073	0.000	0.039	0.407	0.064
<i>Merger_Tobinq</i>	805	1.734	0.000	0.660	8.520	1.325
<i>Merger_BM</i>	805	0.196	0.000	0.183	0.832	0.235
<i>Merger_Equity</i>	805	0.165	0.000	0.174	0.656	0.214

In Table 3, the mean difference test between merger buyer completion and non-completion groups in M&A, from which it can be seen that merger buyer digitization, age, size, and book-to-market ratios are lower than non-completion in the completion group, whereas merger buyer performance and Tobin's Q ratios are lower than non-completion in the completion group, which indirectly suggests that merger buyer's performance and Tobin's Q promote M&A completion, whereas digitization, age, size, and book-to-market ratios inhibit the merger and acquisition completion.

Table 3 Test of difference between completed and non-completed means on the concurrent purchase side

Variables	Full sample mean	Non-completion		Completion		Average difference
		N	Mean	N	Mean	
<i>Buyer_Digital</i>	1.550	500	1.624	305	1.429	0.195*
<i>Buyer_Age</i>	18.173	500	18.578	305	17.508	1.070**
<i>Buyer_Size</i>	22.766	500	22.91	305	22.53	0.380***
<i>Buyer_Lev</i>	0.473	500	0.477	305	0.466	0.012
<i>Buyer_SOE</i>	0.452	500	0.456	305	0.446	0.01
<i>Buyer_Growth</i>	0.337	500	0.301	305	0.396	-0.094
<i>Buyer_ROA</i>	0.035	500	0.031	305	0.043	-0.012***
<i>Buyer_Tobinq</i>	2.324	500	2.221	305	2.494	-0.273*
<i>Buyer_BM</i>	0.629	500	0.645	305	0.603	0.042*
<i>Buyer_Equity</i>	0.572	500	0.575	305	0.566	0.009

Note: *Buyer_Digital*, *Buyer_Age*, *Buyer_Size*, *Buyer_Lev*, *Buyer_SOE*, *Buyer_Growth*, *Buyer_ROA*, *Buyer_Tobinq*, *Buyer_BM*, *Buyer_Equity* denote and buyer's digitization, business age, size, leverage, nature of ownership, growth, performance, Tobin's Q,

book-to-market ratio, and degree of equity checks and balances. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels.

In Table 4, the mean difference test between the completion and non-completion groups of M&As sellers in M&As, from which it can be seen that the digitization, age, and nature of ownership of M&As sellers in the completion group are lower than those in the non-completion group, which suggests that digitization and age of M&As sellers inhibit the completion of M&As and that M&As sellers complete M&As at a lower rate when they are non-state-owned firms.

Table 4 Test of difference between completed and non-completed means on the concurrent supply side

Variables	Full sample mean	Non-completion		Completion		Average difference
		N	Mean	N	Mean	
<i>Seller_Digital</i>	1.565	500	1.673	305	1.389	0.284***
<i>Seller_Age</i>	18.875	500	19.172	305	18.387	0.785*
<i>Seller_Size</i>	22.993	500	22.995	305	22.988	0.007
<i>Seller_Lev</i>	0.505	500	0.512	305	0.493	0.018
<i>Seller_SOE</i>	0.481	500	0.508	305	0.436	0.072**
<i>Seller_Pay</i>	0.850	500	0.854	305	0.843	0.011
<i>Seller_Growth</i>	0.320	500	0.327	305	0.307	0.02
<i>Seller_ROA</i>	0.023	500	0.023	305	0.025	-0.002
<i>Seller_Tobinq</i>	2.059	500	2.043	305	2.086	-0.043
<i>Seller_BM</i>	0.666	500	0.673	305	0.655	0.017
<i>Seller_Equity</i>	0.600	500	0.596	305	0.606	-0.01

Note: *Seller_Digital*, *Seller_Age*, *Seller_Size*, *Seller_Lev*, *Seller_SOE*, *Seller_Growth*, *Seller_ROA*, *Seller_Tobinq*, *Seller_BM*, *Seller_Equity* denote the M&A seller's digitization, firm age, size, leverage, ownership nature, growth, performance, Tobin's Q, book-to-market ratio, and degree of equity checks and balances. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels.

4.2 Benchmark regressions

In Table 5, column (1) lists the regression results without fixed effects and control variables, column (2) lists the regression results controlling for M&A parties' industry fixed effects, year, and control variables, and column (3) lists the regression results controlling for year, event, and control variables. The coefficient on *Digital_Divide* is significantly negative at least at the 10% level, suggesting that the digital divide between the two sides of the M&A reduces firms' M&A completion rates, validating our hypothesis.

Table 5 Benchmark regression results

	(1)	(2)	(3)
	<i>Merger_Success</i>	<i>Merger_Success</i>	<i>Merger_Success</i>
<i>Digital_Divide</i>	-0.035** (-2.16)	-0.031* (-1.73)	-0.044** (-2.33)
<i>Merger_Age</i>		0.004 (1.08)	0.011** (2.47)
<i>Merger_Size</i>		-0.002 (-0.10)	-0.008 (-0.45)
<i>Merger_Lev</i>		-0.248** (-2.00)	-0.152 (-1.17)

<i>Merge_SOE</i>		-0.058 (-1.44)	-0.035 (-0.81)
<i>Merger_Pay</i>		-0.007 (-0.12)	0.094 (1.50)
<i>Merger_Growth</i>		0.042* (1.92)	0.022 (0.99)
<i>Merger_ROA</i>		0.167 (0.65)	0.099 (0.37)
<i>Merger_Tobinq</i>		0.008 (0.61)	0.016 (1.12)
<i>Merger_BM</i>		-0.004 (-0.04)	0.008 (0.07)
<i>Merger_Equity</i>		-0.031 (-0.29)	0.096 (0.83)
<i>_cons</i>	0.418*** (16.77)	0.725*** (3.61)	0.120 (0.84)
Year	NO	YES	YES
Buyer_Industry	NO	YES	NO
Seller_Industry	NO	YES	NO
Eventid	NO	NO	YES
N	805	805	805
R2	0.006	0.096	0.318

Note: t-values are in parentheses. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively, in the same table below.

4.3 Robustness check

4.3.1 Instrumental variables

In this paper's baseline model, the direct examination of the impact of the digital divide between the two M&As parties on M&As completion has a certain degree of endogeneity arising from the problems of "reverse causation" and "omitted variables". First, the failure of an M&As may lead to a widening of the digital divide between the two parties, and second, the completion of an M&A may be affected by factors other than the M&As. In this paper, we construct the Bartik IV instrumental variable, which is constructed by multiplying the difference between the current period's digital divide and the previous period's digital divide by the previous period's digital divide[18]. Table 6 reports the results of the instrumental variables, which show that the coefficients of the core explanatory variables are significantly negative, indicating that the causal effect of the digital divide on M&As completion is valid, and the F-value of the weak instrumental variables test is greater than 10, indicating that the instrumental variables are valid.

4.3.2 Replacing the measurement of explanatory variables

To avoid the influence of the difference in the measure of explanatory variables on the research conclusions, this paper replaces the measure of digital transformation in the

digital divide with the frequency of words related to digital transformation divided by the total frequency of words in the annual report and multiplied by 100. As can be seen in Table 6, the regression results of the lagged with the replacement of explanatory variables remain the same as the significance and sign of the coefficients as mentioned above.

4.3.3 Changing the sample period

In 2014, China made a change to the administrative measures for acquisitions of listed companies, to avoid the impact of this change on the completion rate of M&A, this paper restricts the sample to those whose first announcement date of M&A is in 2014 and later to re-examine the test, and the regression results for the changed sample period in Table 6 are the same as those above concerning the significance and sign of the coefficients.

4.3.4 Deleting the sample of digitized industries

Given that the digital divide inherently exists when one of the parties is a firm in a digitized industry, which may have an impact on the regression results of this paper, the sample of firms in which either side of the merger or acquisition is in a digitized industry is deleted and retested. As can be seen from Table 6, the regression results of deleting the digitization industry are consistent with the significance and sign of the coefficients above.

Table 6 Robustness test results

	IV		Replacing the measurement of explanatory variables	Changing the sample period	Deleting the sample of digitized industries
	First stage	Second stage			
	<i>Digital_Divide</i>	<i>Merger_Success</i>	<i>Merger_Success</i>	<i>Merger_Success</i>	<i>Merger_Success</i>
IV	0.107*** (4.36)				
<i>Digital_Divide</i>		-0.203** (-2.06)	-4.967*** (-2.79)	-0.045** (-2.14)	-0.049** (-2.54)
Controls	YES	YES	YES	YES	YES
_cons	0.142 (0.46)	0.145 (1.08)	0.118 (0.83)	0.123 (0.91)	0.113 (0.78)
Year	YES	YES	YES	YES	YES
Eventid	YES	YES	YES	YES	YES
N	805	805	805	632	788
R2	0.351	0.239	0.321	0.285	0.320

5. Further Research

5.1 Differences in the digital divide

In the event of M&A, there are two possibilities for the formation of the digital divide, one is that the digitization of the acquirer is greater than the digitization of the

acquiree, and the other is that the digitization of the acquirer is less than the digitization of the acquiree, and the position of the acquirer is different in the two cases, in the first case, the acquirer company can use its digitization advantage to grasp the situation of the acquiree, and make countermeasures to the measures initiated by the acquiree to oppose the M&A and increase the likelihood of M&A completion; in the second case, the acquirer is not as digitized as the acquiree, and the acquirer may need to invest a lot of resources in understanding and integrating the acquiree's digitized systems and processes, which may lead to a complex and costly integration process and increase the likelihood of M&A failure. To test the impact of the digital divide on M&A completion under different types, we divide the sample into two groups, i.e., two groups where the digitization of the acquirer is greater than the digitization of the acquiree and two groups where the digitization of the acquirer is less than the digitization of the acquiree.

As can be seen from Table 7, the effect of the digital divide on M&A completion is not significant when the digitization of the acquirer is larger than the digitization of the acquiree, and when the digitization of the acquirer is smaller than the digitization of the acquiree, the effect of the digital divide on M&A completion is significantly negative at the 5% level, which confirms that M&A completion is inhibited when the digitization of the acquirer is smaller than that of the acquiree.

Table 7 Differences in the digital divide

	The acquirer is larger than the acquiree	The acquirer is smaller than the acquiree
	<i>Merger_Success</i>	<i>Merger_Success</i>
<i>Digital_Divide</i>	-0.033 (-1.03)	-0.061** (-2.40)
Controls	YES	YES
<i>_cons</i>	-0.077 (-0.15)	0.054 (0.33)
Year	YES	YES
Eventid	YES	YES
N	319	486
R2	0.315	0.374

5.2 Digital technology divide and digital application divide

The digitization of a firm consists of two aspects, one is the digitization of technology and the other is the digitization of technology application. For firms, the difference in the degree of the two types of digitization may also lead to a different digital divide, and consequently, the likelihood of the completion of M&A also differs. To examine the impact of digital technology divide and digital application divide on M&A completion, we use the natural logarithmic difference of the frequency of digital technology-related words in the annual reports of both M&A parties plus one to measure the firm's digital technology divide (*Digital_Divide_Tech*), the natural logarithmic difference of the frequency of digital technology application-related words in the annual reports of both M&A parties plus one to measure the firm's digital application divide (*Digital_Divide_Apply*), the specific test results are shown in Table 8.

The regression results in Table 8PanelA show that the digital technology divide and

M&A completion are significantly negative at the 5% level in the full sample, the digital technology divide and M&A completion are not significant in the group of acquirers whose digital technology is greater than that of the acquired, and the digital technology divide and M&A completion are significantly negative at the 1% level in the group of acquirers whose digital technology is less than that of the acquired, and the regression results in Table 8 Panel B show that the digital application divide and M&A completion in the full sample is significantly negative in the full sample, and the regression results in Table 8 are not significant in the group of acquirers whose digital technology is greater than that of the acquired. The regression results of Panel B show that in the full sample digital application divide and M&A completion are significantly negative at 1% level, in the group of acquirers digital application is larger than the acquired group digital application divide and M&A completion are not significant, in the group of acquirers digital application is smaller than the acquired group digital application divide and M&A completion are significantly negative at 1% level, which indicates that the inhibitory effect on M&A completion of digital technology divide and digital application divide is consistent, i.e., the type of digital divide does not affect the inhibitory effect of digital divide on M&A completion.

Regardless of the type of digital divide, the number of samples in which the acquirer is larger than the acquiree is always 1/2-1/3 of the number of samples in which the acquirer is smaller than the acquiree. In order to further analyze the impact of the combination of different types of digital divides on M&A completion, combined with the number of samples, we classify them into two groups: the group in which the acquirer's digital technology and digital application are lower than that of the acquiree's group, and the other group. In Table 8 Panel C the digital divide is significantly negatively related to M&A completion at the 1% level in the average-low group and is not significant in the other group, indicating that the digital divide inhibits M&A completion only when both digital technology and digital applications lag behind the acquired party.

Table 8 Different types of digital divides and the impact of combinations on M&As completion

PanelA: Digital technology divide			
	Full sample	The acquirer is larger than the acquiree	The acquirer is smaller than the acquiree
	<i>Merger_Success</i>	<i>Merger_Success</i>	<i>Merger_Success</i>
<i>Digital_Divide_Tech</i>	-0.051** (-2.39)	-0.006 (-0.15)	-0.085*** (-3.18)
Controls	YES	YES	YES
_cons	0.119 (0.82)	0.022 (0.04)	0.157 (1.05)
Year	YES	YES	YES
Eventid	YES	YES	YES
N	805	249	556
R2	0.319	0.320	0.372
PanelB: Digital application divide			
	Full sample	The acquirer is larger than the acquiree	The acquirer is smaller than the

			acquiree
	<i>Merger_Success</i>	<i>Merger_Success</i>	<i>Merger_Success</i>
<i>Digital_Divide_Apply</i>	-0.056*** (-2.75)	-0.024 (-0.63)	-0.072*** (-2.81)
Controls	YES	YES	YES
_cons	0.125 (0.87)	0.601*** (3.14)	-0.018 (-0.12)
Year	YES	YES	YES
Eventid	YES	YES	YES
N	805	295	510
R2	0.321	0.363	0.358
PanelC: Digital divide portfolio			
	Both low		Other
	<i>Merger_Success</i>		<i>Merger_Success</i>
<i>Digital_Divide</i>	-0.077*** (-2.86)		-0.015 (-0.50)
Controls	YES		YES
_cons	0.060 (0.37)		-0.113 (-0.23)
Year	YES		YES
Eventid	YES		YES
N	422		383
R2	0.397		0.304

5.3 Cross-sectional test

5.3.1 M&A region

M&As can be categorized into off-site and co-located M&As based on the region where the M&A parties are located. Co-located M&A is usually easier to carry out because both parties have commonalities in culture, language, business practices, and legal environment, which helps reduce friction and costs in the integration process; off-site M&A can help firms to enter new markets quickly, acquire new customer groups, and achieve geographic diversification. In addition, cross-location M&As can bring economies of scale and synergies to improve the competitiveness of firms[10]. Combined with the previous analysis, we believe that cross-location M&As make it more difficult for acquiring firms to obtain information about the acquired party because of the digital divide, which reduces the completion rate of M&As, and the impact of the digital divide on the completion of M&As is reduced by the fact that both firms of a co-located M&A have the same policy guidance and cultural environment in the same region. Therefore, we expect that the digital divide significantly inhibits M&A completion in cross-location M&A and the effect of the digital divide on M&A completion in co-location M&A is not significant. For further observation, we categorize M&As into co-located M&As and off-site M&As based on whether the M&A parties are in the same province. The results of PanelA in Table 9 show that the digital divide in co-located M&As is not significantly

related to M&A completion, indicating that the digital divide in co-located M&As may not have a significant effect on M&A completion due to the similarity of the cultural and political environments between M&A parties, while the digital divide in co-located M&As is significantly negatively related to M&A completion at the 5% level, suggesting that the digital divide in co-located M&A significantly inhibits the completion of co-located M&A.

5.3.2 Information Transparency

Information transparency plays a crucial role in the M&A process. When the information transparency of the acquired party's enterprise is high, the acquirer can obtain the acquired party's detailed financial statements, operational data, market strategies, customer relationships, technology patents, and other key information, to accurately assess the potential risks of the acquired party, such as financial risks, legal proceedings, market risks, etc., to make a more reasonable decision on the M&A and to establish the trust of the two parties, and to reduce the risk in the M&A process. trust, reduce suspicion and uncertainty in the M&A process, and promote the smooth implementation of M&A; when the information transparency of the acquired party's enterprise is low information transparency may lead to information asymmetry, and the acquirer cannot accurately understand the real situation of the acquired party, which increases the risk of M&A failure[5][10]. Therefore, we expect the digital divide to significantly inhibit M&A completion when the information transparency of the acquired party is low, and the effect of the digital divide on M&A completion is insignificant when the information transparency is high. For further observation, we measure the information transparency of the acquired party as the natural logarithm of the number of analysts tracked by the acquired party[5], and analyze it in high and low groups according to the median sample size. The results of PanelB in Table 9 show that the digital divide and M&A completion when the information transparency of the acquired party is high is not significant, suggesting that when information transparency is high it may be because the acquirer can know more about the situation of the acquired party which makes the effect of the digital divide on the completion of the M&A insignificant; the digital divide and the completion of the M&A when the information transparency of the acquired party is low is significant and negative at the 10% level, indicating that the information transparency of the acquired party This indicates that digital M&A with low information transparency of the acquiree significantly inhibits M&A completion.

Table 9 Heterogeneity test - Heterogeneous M&A and information transparency

PanelA: M&A region		
	Co-located M&As <i>Merger_Success</i>	Off-site M&As <i>Merger_Success</i>
<i>Digital_Divide</i>	-0.049 (-1.39)	-0.046** (-1.98)
Controls	YES	YES
_cons	0.347 (1.32)	0.064 (0.35)

Year	YES	YES
Eventid	YES	YES
N	268	537
R2	0.446	0.327
Panel B: Information transparency heterogeneity		
	High	Low
	<i>Merger_Success</i>	<i>Merger_Success</i>
<i>Digital_Divide</i>	-0.037 (-1.52)	-0.061* (-1.96)
Controls	YES	YES
_cons	0.084 (0.40)	0.101 (0.50)
Year	YES	YES
Eventid	YES	YES
N	441	364
R2	0.404	0.341

5.3.3 M&A culture of both M&A parties

M&A culture differences between the M&A parties may lead to the failure of the M&A to be completed, and this effect is mainly reflected in the following two aspects: first, M&A culture differences between the M&A parties lead to employees' resistance to the M&A, fearing for the security of their positions, changes in their work styles, or the erosion of their corporate cultures. Employee resistance and dissatisfaction may affect the smooth running of the M&A or even lead to its failure. Second, M&A cultural differences may lead to misunderstandings and barriers in communication between the two parties, which can affect their understanding of the terms of the M&A and their ability to reach a consensus in the negotiation process. Miscommunication may lead to miscommunication of key information, which in turn affects the decision-making and execution of the M&A. To specifically examine the impact of M&A culture differences between M&A parties on the relationship between the digital divide and M&A completion, we measured the M&A culture of M&A parties by the sum of the number of M&As in all the years before the year of the M&A[19], M&A industry strategic decision-making relies on the pre-accumulation of knowledge, and the more the number of times about a certain M&A, the higher the level of the formed M&A culture will be.

The results of PanelA in Table 10 show that the digital divide is not significantly related to M&A completion in the group with a high M&A culture of M&A, while the digital divide is negatively related to M&A completion at the 1% level in the group with low M&A culture, which indicates that M&A culture of M&A provides positive benefits to M&A and attenuates the effect of digital divide on M&A completion[20].

Table 10PanelB results show that the digital divide is negatively related to M&A completion at the 1% level in the group with high M&A culture of the merger seller and insignificantly related to M&A completion in the group with low M&A culture, suggesting that the M&A seller's M&A culture provides negative benefits to the M&A enhancing the impact of the digital divide on M&A completion. The high M&A culture of M&A sellers may lead to a desire to follow experience in negotiating M&As, creating

path dependence and leading to more stringent M&A terms and conditions for M&A sellers. This may make the negotiation process more complex and difficult, increasing the risk that the M&A will not reach an agreement. At the same time, if the seller perceives its own M&A culture to be superior, it may be skeptical of the buyer's capabilities and intentions, fearing that its own culture and values will be weakened or undermined after the M&A. This reserved attitude may result in the seller not cooperating actively enough in the M&A process, affecting the smooth implementation of the M&A[21].

Table 10PanelC results show that digital divide is negatively associated with M&A completion at the 10% level in the group with higher M&A cultural differences between the merging and acquiring parties and insignificantly associated with M&A completion in the low group, suggesting that the merging and acquiring parties' merging and acquiring cultural differences provide negative benefits for the merging and acquiring enhancing the impact of digital divide on M&A completion. On the one hand, M&A cultural differences between the M&A parties may lead to communication barriers between the M&A parties[15], especially in the communication of digital strategies and goals. If both parties are unable to effectively communicate and understand each other's digital vision and needs, it may lead to key decision-making errors during the M&A process and increase the risk of M&A failure; on the other hand, M&A parties with significant M&A culture differences may face greater challenges in technology integration. For example, one party may be more focused on technology innovation and digital transformation, while the other party may be more focused on traditional business processes. Such differences may lead to conflicts and delays in the technology integration process, affecting the successful completion of the M&A.

Table 10 Cultural heterogeneity of M&A parties

PanelA: M&A culture on the acquirer side		
	High <i>Merger_Success</i>	Low <i>Merger_Success</i>
<i>Digital_Divide</i>	-0.016 (-0.61)	-0.083*** (-3.03)
Controls	YES	YES
_cons	0.573 (1.17)	0.356** (2.13)
Year	YES	YES
Eventid	YES	YES
N	413	392
R2	0.294	0.447
PanelB: M&A culture on the acquiree side		
	High <i>Merger_Success</i>	Low <i>Merger_Success</i>
<i>Digital_Divide</i>	-0.076*** (-2.83)	0.003 (0.09)
Controls	YES	YES
_cons	0.292**	0.164

	(2.02)	(1.06)
Year	YES	YES
Eventid	YES	YES
N	415	390
R2	0.264	0.455
PanelC: Differences in M&A culture between M&A parties		
	High <i>Merger_Success</i>	Low <i>Merger_Success</i>
<i>Digital_Divide</i>	-0.047* (-1.82)	-0.045 (-1.54)
Controls	YES	YES
_cons	0.246 (0.66)	0.328** (2.02)
Year	YES	YES
Eventid	YES	YES
N	423	382
R2	0.256	0.467

5.4 Days to M&A Completion

The number of days to completion of an M&A refers to the length of time it takes from the start of an M&A transaction to its finalization. This time span can vary depending on several factors, including the complexity of the M&A, the size of the companies involved, the regulatory approval process, the depth of due diligence, the difficulty of negotiations, and market conditions. Often a simple M&A transaction may be completed within a few months, while more complex transactions may take a year or more. In some cases, the transaction may even be canceled if significant hurdles are encountered. For us, the greater the difference in the degree of digitization between the acquirer and the acquiree, the longer the asymmetry makes the number of days to completion of the M&A likely to be. To examine the effect of digital divide on the number of days to M&A completion, we restrict the sample to completed samples and also use the natural logarithm of the difference between the number of days between the completion announcement date and the first announcement date as the number of days to M&A completion (*Merger_Day*)[3][10], and the results of the test are shown in Table 11. The relationship between the digital divide and days to M&A completion is not significant, indicating that the digital divide does not have an impact on days to M&A completion. We believe that the legal, financial, and regulatory processes involved in the M&A process are usually standardized and are not directly affected by the digitalization level of enterprises, and the execution time of these processes mainly depends on the legal framework, regulatory efficiency, and the response speed of the two parties, so the information access problem caused by the digital divide only reduces the amount of information obtained by the M&A party and affects the completion of the M&A, but the fixation of the M&A process makes digital divide have no significant effect on the number of days to completion of the M&A. M&A completion days has no significant effect.

Table 11 Days to M&A completion

	<i>Merger_Day</i>
<i>Digital_Divide</i>	0.048 (0.49)
Controls	YES
_cons	5.198*** (6.60)
Year	YES
Eventid	YES
N	305
R2	0.726

6. Conclusions and policy recommendations

6.1 Conclusion

Taking the M&A of listed companies in Shanghai and Shenzhen from 2008 to 2022 as a sample, we constructed the digital divide indicators of M&A parties through textual analysis methods in conjunction with the existing literature to study the impact of digital divide on M&A completion, and we have the following main findings: firstly, we found that the digital divide between M&A parties inhibits the completion of M&A; secondly, we explored the impact of different types of digital divide and the digitalization degree of the M&A party relative to the acquired party on the completion of M&A. digitization of the acquirer on M&A completion. The results show that the digital divide caused by the digitization of the acquirer being smaller than that of the acquiree inhibits M&A completion, while both the digital technology divide and the digital application divide inhibit M&A completion, and both the digital technology and digital application of the acquirer being lower than that of the acquiree lead to the failure of the M&A; thirdly, we explore the effect of heterogeneity in the characteristics of the M&A and the characteristics of the parties to the M&A on the completion of the M&A. The results show that the effect of digital divide on M&A completion is more significant when the acquirer and the acquiree are not in the same province, the acquiree has lower information transparency, the acquirer has an insufficient M&A culture, the acquiree has an adequate M&A culture, and the M&A cultures of the two parties to the M&A are more different from each other; fourth, we examine the effect of digital divide on the number of days to completion of the M&A. Using a sample of completed M&A, we find that the digital divide does not have a significant effect on the number of days to M&A completion.

6.2 Policy recommendations

6.2.1 Enhance digital competence training and resource integration between M&A parties:

Policymakers should encourage and support both M&A parties to enhance and integrate their digital capabilities before and after the M&A. This can be achieved by providing professional training, technical support, and financial subsidies. Especially for

those M&A parties with a low level of digitization, they should be encouraged to adopt advanced digital technologies and tools to reduce the gap between them and the acquired parties in terms of digital application, thus increasing the completion rate of M&A.

6.2.2 Improve information transparency and communication efficiency:

The government and regulators should set stricter information disclosure standards and require listed companies to provide more detailed and transparent information during the M&A process so that both parties can better assess the potential risks and benefits of the M&A. At the same time, a specialized M&A information platform can be established to promote information exchange and communication between M&A parties and reduce the digital divide caused by information asymmetry.

6.2.3 Promote the digital synergy of cross-regional M&A:

Given the impact of the digital divide that exists between different regions on the completion of M&A, policymakers should promote interregional digital synergy. This can be achieved by establishing regional digital economic development programs, promoting the R&D and application of digital technologies, and providing tax incentives for cross-regional M&As. Through these measures, the digital divide in cross-regional M&As can be reduced, and the efficiency and completion rate of M&As can be improved.

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