



How Does Network Infrastructure Construction Reshape Corporate Cash Holdings?

— A Quasi-Natural Experiment from the Broadband China Strategy

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Abstract. Against the backdrop of next-generation information technologies' rapid development, network infrastructure construction increasingly influences corporate financial behaviors. Taking Chinese A-share listed companies (2009-2024) as samples, this study uses the "Broadband China" strategy as a quasi-natural experiment and a multi-period DID model to explore its impact on corporate cash holdings and mechanisms. Results show the strategy significantly raises cash holdings, validated by robustness tests. Core transmission channels are alleviated financing constraints and enhanced innovation capability. Heterogeneity analysis shows that the policy exerts a more significantly positive impact on enterprises in eastern and central regions, state-owned enterprises, as well as non-technology-intensive, non-capital-intensive and labor-intensive enterprises; yet its impact on small and medium-sized enterprises in underdeveloped areas remains statistically insignificant. This study enriches corporate cash holding theory application and provides empirical evidence for new infrastructure's micro-effects.

Keywords: Network Infrastructure Construction, Corporate Cash Holdings, Broadband China Strategy, Quasi-Natural Experiment

1 Introduction

In recent years, with the accelerated iteration of next-generation information technologies, network infrastructure, a key part of new infrastructure, has become crucial for building a digital power and realizing Chinese-style modernization. The 2013 "Broadband China Strategy and Implementation Plan" designated broadband as national strategic public infrastructure, and pilot cities were rolled out in 2014, 2015, and 2016.

Corporate cash holding is a core corporate finance topic critical to mitigating operational risks and optimizing resource allocation. Affected by internal and external factors, imbalanced cash holdings reduce efficiency. Identifying key drivers, especially network infrastructure in the digital economy, helps firms balance liquidity and profitability. Existing research focuses on traditional factors, neglecting new infrastructure's

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link to cash holding decisions and leaving a theoretical gap. This study adopts a DID model with 2009-2024 data of Chinese A-share listed firms (excluding ST and financial firms), measures cash holdings by cash-to-total-assets ratio, examines the "Broadband China" strategy's impact, and analyzes mediating mechanisms of eased financing constraints and enhanced innovation capability, offering empirical evidence for new infrastructure's effect on corporate financial decisions.

This study contributes theoretically by integrating network infrastructure into the cash holding analytical framework, expanding research boundaries. Practically, it guides enterprises' cash management, offers micro-level evidence for evaluating the strategy's effectiveness, and references policy refinement.

2 Literature Review

As a core underpinning of the digital economy's high-quality development, network infrastructure construction has been extensively studied since the 2013 "Broadband China" strategy launch.

Macroscopically, it boosts urban economic development and innovation (Hu Zhenhua et al., 2024)^[1], facilitates cross-regional capital flows with more inter-provincial corporate investment (Zhang Weiguang et al., 2025)^[2], narrows the urban-rural income gap (Chen Yang et al., 2022)^[3], and stimulates rural consumption, with its macroeconomic and social impacts empirically validated. At the corporate level, early research shows corporate informatization density and regional infrastructure influence Chinese enterprises' export performance (Li Kunwang et al., 2015)^[4]. ICT investment outperforms R&D in driving innovation and productivity (Hall et al., 2012)^[5], while employee broadband access boosts productivity more than product innovation (Bartelsman et al., 2019)^[6].

Literature on corporate cash holdings centers on motives (Keynes' transactional, precautionary, speculative—with the first two prevalent) and influencing factors (macro financing constraints, micro governance). The pecking order theory highlights prioritization of internal financing, with constraints prompting higher cash holdings; internal factors like size, and leverage also matter. Despite abundant research on network infrastructure and corporate finance, studies on how the former impacts corporate cash holdings, especially via financing capacity and innovation capability remain scarce.

3 Theoretical Analysis and Research Hypotheses

As the core underpinning of the digital economy, network infrastructure construction strongly drives enterprises' adoption of next-generation information technologies, with existing studies confirming its impact on corporate digital transformation. Digital transformation creates new investment needs (e.g., digital R&D, online platform development) and intensifies market competition, exposing enterprises to high uncertainty from rapid tech iteration and new business expansion.

Per the precautionary cash holding theory, enterprises proactively increase cash reserves during digital transformation to seize opportunities and mitigate risks, avoiding missed chances from delayed external financing or operational distress due to capital chain strains. Thus, Hypothesis 1: The "Broadband China" strategy can raise corporate cash holding levels.

Studies show the "Broadband China" pilot policy significantly eases corporate financing constraints via media attention and information disclosure effects, narrowing the information gap between financing parties (Yang Xiaomei et al., 2025)^[7]. Though easing may reduce precautionary cash, it enhances allocation flexibility, and policy-driven digital transformation brings diversified opportunities, prompting enterprises to increase cash holdings for market responses and long-term development. Hence, Hypothesis 2: The strategy affects cash holdings through corporate financing constraints.

Additionally, network infrastructure boosts corporate technological innovation by alleviating information asymmetry and facilitating digital transformation (He Dandan, 2024)^[8], increasing R&D intensity. Rigid, sustained R&D spending generates dual cash demands: ensuring project continuity amid uncertainty and seizing innovation commercialization opportunities. Thus, Hypothesis 3: The strategy impacts cash holdings through corporate innovation capability.

4 Data Sources and Research Design

4.1 Model Design

In line with the actual implementation of the Broadband China policy, designates A-share listed companies registered in pilot cities as the treatment group (assigned a value of 1), and those in non-pilot cities as the control group (assigned a value of 0). Since the pilot programs were designated in batches from 2014 to 2016 rather than uniformly implemented in a single year, a multi-period difference-in-differences approach is adopted. Specifically, the year when a firm's located city was approved as a pilot and all subsequent years are assigned a value of 1, while the years prior to approval are assigned 0.

Accordingly, this paper regards the "Broadband China" strategy as a quasi-natural experiment and constructs a two-way fixed effects model based on the multi-period DID approach. The specific model specification is as follows:

$$Cash_hold_{i,t} = \alpha_0 + \alpha_1 DID_{i,t} + \sum \alpha_i Controls_{i,t} + \mu_i + \delta_j + \varepsilon_{i,t}$$

4.2 Variable Construction

In existing studies, there are three main approaches to measure corporate cash holding level: first, the logarithm of the ratio of cash and cash equivalents to operating income; second, the ratio of cash and cash equivalents to total assets; third, the ratio of cash and cash equivalents to total assets minus cash and cash equivalents. Selects the second measurement method as the core dependent variable. Its value is strictly confined to the

range of [0,1], which can directly reflect the corporate cash holding status. Adopt the other two indicators(Cash_hold2 and Cash_hold3 respectively) for robustness tests.

Select the "Broadband China" pilot policy as the core explanatory variable. The pilot city list is sourced from the three batches of pilot directories in 2014-2016. The interaction term DID is constructed as the policy indicator, which equals 1 for the pilot approval year and subsequent years, and 0 otherwise.

Drawing on classic corporate cash holding studies, select key characteristic variables affecting cash holding decisions as control variables. The absolute value of the SA index (calculated solely by firm size and age), which effectively avoids endogeneity issues, is selected to measure corporate financing constraints—with a larger absolute value indicating stronger constraints. The natural logarithm of a firm's R&D investment is chosen to gauge corporate innovation capability, as R&D investment directly generates corporate cash reserve demand and has a more direct correlation with cash holding behavior^[9]. Variable definitions are detailed in Table 1.

Table 1. Definition of Main Variables

Type	Name	Symbol	Definition
Dependent Variable	Cash Holding Level	Cash_hold	Ratio of cash and cash equivalents to total assets
Explanatory Variable	Broadband China Strategy	DID	Treat × Post
	Size	Size	Natural logarithm of total assets in the year end
	Profitability	ROE	Net profit/average net assets at the end of the year
	Leverage Ratio	Lev	Total liabilities/ total assets at the end of the year
Control Variable	Firm Listing Age	Age	Ln (Current year - Year of establishment +1)
	Ownership Concentration	Top1	Number of shares held by largest shareholder / total shares
	Board Size	Dir_scale	Ln (number of board members)
Mediating Variable	Financing Constraints	SA	$ -0.737 \times \text{Size} + 0.043 \times \text{Size}^2 - 0.04 \times \text{Firm Age} $
	Innovation Capability	Innovation	Ln (R&D expenditure current year)

4.3 Sample Selection and Data Sources

The core explanatory variable of this paper is the interaction term DID between Post and Treat. The dependent variables and control variables are compiled from the data of the China Stock Market & Accounting Research Database (CSMAR).

The research sample includes data of Chinese A-share listed companies from 2009 to 2024. Excluding ST enterprises with abnormal financial conditions and high investment risks, and financial firms whose cash holding logic are barely comparable to non-financial ones, this paper selects the remaining A-shares as samples. All continuous variables undergo 1% winsorization at both tails to reduce outlier impacts; enterprises with severe indicator deficiencies are excluded. After screening, 45,861 firm-year observations are obtained, with each variable's descriptive statistics shown in Table 2.

Table 2. Descriptive Statistics

VARIABLES	mean	sd	min	p50	max	N
Cash_hold	0.175	0.138	0.010	0.134	0.677	45,861
Size	22.169	1.335	19.679	21.969	26.326	45,861
ROE	0.050	0.153	-0.912	0.068	0.342	45,861
Lev	0.414	0.209	0.050	0.404	0.898	45,861
Age	2.945	0.344	1.946	2.996	3.611	45,861
Top1	0.342	0.151	0.084	0.319	0.749	45,861
Dir_scale	2.113	0.200	1.609	2.197	2.639	45,861

5 Empirical Results and Analysis

5.1 Baseline Regression Results

Table 3 shows the baseline regression results. Columns (1)-(3) are basic regressions without control variables, incorporating year-fixed, industry-fixed, and two-way fixed effects respectively. Columns (4)-(6) add firm financial characteristic control variables under the two-way fixed effects framework. With all controls and fixed effects included, the DID coefficient is 0.009 (significantly positive at the 1% level), verifying Hypothesis 1: the "Broadband China" Strategy significantly raises corporate cash holdings, with pilot city enterprises seeing an average 0.009-unit increase vs. non-pilot ones.

Table 3. Baseline Regression Results

VARIABLES	(1) Cash hold	(2) Cash hold	(3) Cash hold	(4) Cash hold	(5) Cash hold	(6) Cash hold
DID	0.023*** (7.61)	-0.001 (-0.41)	0.011*** (3.67)	0.021*** (7.61)	0.002 (0.88)	0.009*** (3.53)
Controls	YES	YES	YES	YES	YES	YES
Year	YES	NO	YES	YES	NO	YES
Industry	NO	YES	YES	NO	YES	YES
Observations	45,861	45,847	45,847	45,861	45,847	45,847
Adjusted R-squared	0.028	0.135	0.147	0.231	0.288	0.296

Robust t-statistics in parentheses

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

5.2 Parallel Trend Test

Conduct a parallel trend test on the sample, with the results presented in Figure 1. Given that a multi-period DID model is adopted in the study, the policy implementation time of each city is taken as the benchmark. It can be observed that the trend lines of the

treatment group and the control group remain basically parallel before the policy implementation, indicating that the two groups exhibited consistent changing trends prior to policy, which satisfies the parallel trend assumption.

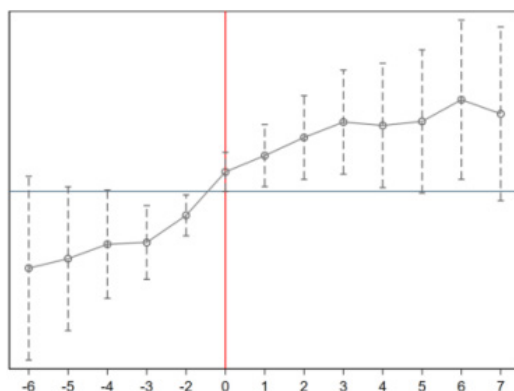


Fig. 1. Parallel Trend Test

5.3 Robustness Test

To further verify the reliability of the baseline regression results, conduct the following three robustness tests.

First, replace the explained variable. As shown in Table 4, two alternative indicators are adopted to redefine corporate cash holdings for re-regression. The coefficients of the core explanatory variable DID are both significantly positive, which confirms the robustness of the main effect. Second, conduct regressions on the three batches of pilot cities separately. The coefficients are all significantly positive, showing the policy's positive effect remains stable amid pilot expansion. Third, exclude specific samples. Samples of provincial capitals and sub-provincial cities are removed, with only ordinary prefecture-level cities retained. The coefficient is significantly positive, indicating core conclusions are not affected by urban administrative levels.

Table 4. Test Results of Dependent Variable Replacement, Batch-wise Regression and Sample Exclusion

	(1) Replace the Explained Variable		(2) Including batch 1,1-2,1-3		(3) Ex-Samples	
	Cash hold2	Cash hold3	Cash hold	Cash hold	Cash hold	
DID	0.063*** (2.95)	0.019*** (3.11)	0.011*** (3.72)	0.009*** (3.27)	0.009*** (3.53)	0.012*** (3.90)
Controls + Year FE + Industry FE	YES	YES	YES	YES	YES	YES
Observations	45,847	45,847	36,871	40,887	45,847	32,466
Adjusted R-squared	0.360	0.256	0.302	0.298	0.296	0.296

5.4 Mechanism Test

Perform a three-step regression analysis: regress corporate cash holdings on the policy; separately regress the mediating variables on the policy; regress corporate cash holdings on both the policy and mediating variables simultaneously.

Table 5 Columns (1)–(3) report the financing constraint mediation test results. Column (1) verifies the total effect. Column (2) shows a significantly negative DID coefficient, proving the policy eases corporate financing constraints. Column (3) includes both DID and the SA index; the SA coefficient is significantly negative and the DID coefficient is lower than Column (1), verifying the mediating effect of financing constraints and supporting Hypothesis 2. Columns (4)–(5) test innovation capability's mediating effect. Column (4) finds a significantly positive DID coefficient, meaning the policy boosts corporate innovation capability. Column (5) adds the innovation variable to the baseline regression: its coefficient is significantly positive and the DID coefficient falls to 0.008. This confirms the mediating effect and supports Hypothesis 3.

Table 5. Test Results of Mediating Effects

VARIABLES	(1) Cash_hold	(2) SA	(3) Cash_hold	(4) Innovation	(5) Cash_hold
DID	0.009*** (3.53)	-0.007* (1.68)	0.008*** (3.20)	0.198*** (6.29)	0.008*** (2.67)
SA			-0.036*** (-9.34)		
Innovation					0.006*** (4.31)
Observations	45,861	44,566	44,566	25,244	25,244
Adjusted R-squared	0.296	0.782	0.301	0.644	0.237

5.5 Heterogeneity Analysis

To explore the heterogeneous impacts, conduct subgroup regressions based on region, firm size, property rights and industry.

Table 6 shows regional and size heterogeneity. Eastern/central enterprises have significantly positive DID coefficients, while western' coefficient is insignificant, due to weak infrastructure, structural gaps and incomplete institutions. Both large and small enterprises benefit, but only small central enterprises see significant cash holding increases. This reflects uneven digital infrastructure coverage/efficiency in underdeveloped areas. Western SMEs lack supporting infrastructure, failing to fully gain policy dividends. More investment in underdeveloped regions and targeted layouts are needed to narrow gaps.

Table 6. Heterogeneity Analysis Results by Region and Firm Size

	(1) Eastern	(2) Central	(3) Western	(4) Large- scale	(5) Small- scale	(6) Central- Large	(7) Central- Small	(8) West- ern-Large	(9) West- ern-Small
VARIABLES	Cash_hold	Cash_hold	Cash_hold	Cash_hold	Cash_hold	Cash_hold	Cash_hold	Cash_hold	Cash_hold
DID	0.013*** (3.87)	0.015** (2.27)	-0.007 (-1.01)	0.009*** (2.78)	0.010** (2.44)	0.008 (1.04)	0.021** (2.12)	-0.008 (-0.98)	-0.012 (-1.06)
Controls +									
Year and In- dustry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	32,590	7,322	5,909	22,909	22,908	3,975	3,323	3,031	2,852
Adj_R ²	0.299	0.318	0.320	0.245	0.290	0.275	0.326	0.361	0.308

Table 7 presents ownership and industry heterogeneity. The policy positively impacts both state-owned and non-state-owned enterprises, with a more pronounced effect on state-owned enterprises for their inherent advantages in policy resources and credit support, enabling better capture of broadband infrastructure opportunities. Following Yin et al. (2018)^[10], enterprises are categorized into technology-intensive, capital-intensive and labor-intensive types. The policy benefits non-technology, non-capital and labor-intensive enterprises more notably. Non-technology-intensive firms see stronger marginal operational gains from weak digital infrastructure. The policy eases non-capital-intensive firms' financing constraints; broadband cuts labor-intensive firms' costs and asymmetry, boosting cash holdings for development.

Table 7. Heterogeneity Analysis Results by Property Rights and Industry

	(1) SOE	(2) Non- SOE	(3) Tech-In- tensive	(4) Non-TI	(5) Capital- Intensive	(6) Non-CI	(7) Labor-In- tensive	(8) Non-LI
VARIABLES	Cash_hold	Cash_hold	Cash_hold	Cash_hold	Cash_hold	Cash_hold	Cash_hold	Cash_hold
DID	0.011** (2.30)	0.008** (2.47)	0.010** (2.18)	0.010*** (2.98)	0.010 (1.63)	0.010*** (3.30)	0.016*** (3.38)	0.007** (2.18)
Controls + Year and Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	15,968	29,862	14,559	31,288	5,604	40,243	12,430	33,417
Adj_R ²	0.303	0.314	0.203	0.336	0.245	0.290	0.233	0.316

6 Conclusions and Recommendations

Based on the quasi-natural experiment of the "Broadband China" Strategy, this paper empirically examines its impact and mechanism on corporate cash holdings, drawing three core conclusions. First, the strategy significantly raises corporate cash holdings. Second, alleviating financing constraints and enhancing innovation capability are the key transmission paths. Third, the strategy's effects show obvious heterogeneity across

dimensions. It favors state-owned, eastern-central, non-technology-intensive, non-capital-intensive and labor-intensive enterprises. It benefits both large and small enterprises, yet its impact on SMEs in underdeveloped areas is statistically insignificant.

Accordingly, three policy implications are proposed. First, advance balanced network infrastructure construction with targeted support for central and western underdeveloped regions. Second, strengthen cross-departmental policy coordination to improve innovation subsidies and digital financial services, effectively cutting corporate financing and operation costs. Third, improve long-term infrastructure mechanisms, encourage multi-party corporate participation, establish dynamic policy evaluation systems, and enhance policy precision and implementation effectiveness.

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