

Can Network Infrastructure Construction Alleviate Corporate Financing Constraints?

-- A Quasi-Natural Experiment Based on "Broadband China"

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Abstract: The construction of network infrastructure is conducive to promoting enterprises to ease financing constraints, which is of great practical significance for optimizing the allocation efficiency of enterprise factors and promoting high-quality economic development. Based on the perspective of information asymmetry, taking the "Broadband China" pilot as a natural experiment, using the data of Chinese listed companies from 2009 to 2020, and using the multi-period double difference method to empirically test the impact of network infrastructure construction on the constraint level of enterprise financing and verify its internal mechanism. The study found that the construction of network infrastructure helps to alleviate the financing constraint level of enterprises. Heterogeneity analysis shows that the policy significantly alleviates the financing constraints of large-scale enterprises, but the impact on small and medium-sized enterprises is not significant. The conclusions of this paper not only broaden the perspective of "new infrastructure" research, but also provide reliable empirical evidence and policy implications for the impact of network infrastructure construction on micro-enterprise behavior.

Keywords: Network infrastructure construction, Financing constraints.

1. Introduction

In 2020, the State Council issued the "Guiding Opinions on Accelerating the Construction of a Modern Industrial System", which pointed out that it is necessary to promote the deep integration of China's new information construction and manufacturing industry, which is another major strategic deployment formulated for the final year of the "13th Five-Year Plan". The 14th Five-Year Plan also clearly proposes to comprehensively develop new infrastructure and promote the development of fifth-generation mobile networks, industrial networks, and big data centers. Therefore, continuing to promote the construction of information network infrastructure and building a network power and a digital power strategy have become an important choice to promote China's long-term goals of socialist modernization in the "13th Five-Year Plan" and "14th Five-Year Plan".

Enterprises are often subject to financing constraints in the process of transformation and upgrading. In 2014, the General Office of the State Council issued the "Guiding Opinions on Multiple Measures and Efforts to Alleviate the High Financing Costs of Enterprises" in an attempt to alleviate the problem of expensive and difficult financing for enterprises, and in 2021, it once again issued the "Several Measures to Enhance the Competitiveness of Small and Medium-sized Enterprises" to strengthen direct financing support for enterprises. The reason is that the credit risk caused by the information asymmetry between the two sides of the financing is an important reason for the difficulty of financing enterprises, and it is also the core problem restricting the development of enterprises. Many scholars have confirmed that reducing the information asymmetry between the two parties to the financing can greatly reduce the financing burden of enterprises (Opler et al. [1], 1999; Faulkender & Wang[2], 2006). Network infrastructure construction can improve the information asymmetry situation by broadening the communication platform and improving the dissemination

of information, so as to alleviate the financing constraints of enterprises to a certain extent. In China's economy into a stage of high-quality development, new infrastructure will surely become an important starting point for promoting the transformation and upgrading of China's real economy in the future. The implementation of network infrastructure will bring unprecedented development opportunities to corporate financing.

Before 2013, China's network infrastructure was slow, slow, and costly. E-commerce retail sales account for only one-tenth of the total social, regional and rural broadband retail sales, and the development is extremely uneven (Cao Jiguang, Zhang Jian[3], 2011). To this end, this paper takes the "Broadband China" pilot as a natural experiment, uses the multi-phase dual difference method to empirically study the impact of network infrastructure construction on enterprise financing constraints, and further reveals the role and effect of 5G-based new infrastructure construction on the information exchange between financing parties and effectively alleviating financing constraints.

2. Literature Review and Theoretical Mechanism

Information asymmetry and a high risk of debt default are key factors in the financing constraints of enterprises (Fuente & Marin[4], 1995). Specifically, financial institutions are only willing to provide loan guarantees for enterprises when they cannot fully grasp the financial and credit status of the lending enterprises, but many companies have difficulty obtaining bank loans because they have fewer assets available for guarantee (Liang Qi, Lin Aijie [5], 2020). In recent years, the development of information technology has had a revolutionary impact on the information environment of the capital market (Miller & Skinner[6], 2015), the "Broadband China" policy as a major boost to improve the level of information technology, its implementation on the one hand

can greatly promote the development of network infrastructure, provide enterprises with more convenient and fast financing platforms, the interaction of network platforms can improve investors' information utilization capabilities, market information efficiency level (Ding Hui et al. [7], 2018; Tan Songtao et al. [8], 2016), thus effectively reducing the degree of information asymmetry between investment and financing parties, and thus freeing enterprises from financing difficulties (Gao Jingzhong, Yang Chao [9], 2021); On the other hand, as the "central node" and "transmission link" of the modern space Internet, the construction of information Internet infrastructure has huge capacity and the superiority of ultra-high-speed data transmission, which effectively promotes the rational allocation of knowledge, information, technology, big data and other element resources in the space Internet, which may directly affect market information release, information market intermediary, investor behavior, etc. (Blankespoor et al. [10], 2013; He Xianjie et al. [11], 2016). Such a faster and cheaper network platform greatly reduces the cost of information transmission between information, thereby improving the effectiveness of information dissemination (Jess et al [12], 1996), which in turn increases the trust of both parties to the capital demand and alleviates the problem of information dissemination asymmetry. Thus, as an effective information intermediary, the Internet can reduce the information asymmetry between the two parties to the transaction (Miller [13], 2006). From this we propose hypothesis 1:

Hypothesis H1: Network infrastructure construction can effectively alleviate corporate financing constraints by reducing the degree of information asymmetry between the financing parties.

The possible marginal contributions of this paper are as follows: First, in terms of research content, this paper innovatively studies the impact of new infrastructure on corporate financing constraints, providing a new research perspective for the utility of information network infrastructure construction and the mitigation of corporate financing constraints. Secondly, in the sense of research, in order to deeply implement the development strategies of major countries such as Internet rich countries, further promote the construction of the electronic information industry, and further stimulate the vitality of enterprises, an important theoretical and empirical basis is put forward. Research Design

2.1. Model Selection

Since this paper analyzes the mitigation effect of the financing constraint of the "Broadband China" pilot policy, the empirical method used in this paper is the double difference method of evaluating the policy effect. By the end of 2021, the Chinese government had approved a total of 120 "broadband China" pilot cities in 2014, 2015 and 2016, of which the approval of the test cities was arbitrary, thus creating a favorable condition for the use of the double difference method. In view of this, this paper selects listed companies from 2009 to 2020 as research objects to empirically test whether the "Broadband China" pilot policy can alleviate corporate financing constraints. If the city where the listed company is located belongs to one of the 120 pilot cities, it is designated as an "experimental group" and vice versa as a "control group". Because the "Broadband China" test was determined in the three years of 2014, 2015 and 2016, the policy implementation year is not in the same year, so the

multi-period double difference method was selected. Drawing on the practice of Yuan Hang and Zhu Chengliang [14] (2018), a two-way fixed effect model of multi-period double difference is constructed, and the specific model is set as follows:

$$FC_{i,t} = \alpha_0 + \alpha_1 did_{i,t} + \alpha_2 X_{i,t} + \eta_t + \mu_i + \varepsilon_{i,t} \quad (1)$$

where $FC_{i,t}$ is the level of constraints on enterprise financing; $did_{i,t}$ is a dummy variable for enterprises in the pilot cities. $X_{i,t}$ are variables that govern corporate financing constraints, including business size, earnings per share, profitability, financial leverage, current ratio, bank debt, and the nature of property rights. η_t is a time fixed effect, μ_i is an individual fixed effect, and $\varepsilon_{i,t}$ is a random perturbation term. α_1 focuses on the treatment effects of policies.

2.2. Measures of Major Variables

1. Degree of financing constraints: Measures of corporate financing constraints include the KZ index (Lamont et al. [15], 2001), WW Index (Whited & Wu [16], 2006), eHadlock and Pierce [17] (2010) divide the types of corporate financing constraints according to the KZ method according to corporate financial reports, and construct the SA index using two variables of enterprise size and enterprise age that do not change much over time and have strong exogenousness, which is conducive to describing the characteristics of financing constraints from a long-term perspective. Lu Shengfeng, Chen Sixia [18] (2017) He Ying et al. [19] (2019) also verified the applicability of the index. In summary, this paper takes the degree of financing constraint of the SA index and takes the natural logarithm in the empirical evidence.

2. Explanatory variables: The "Broadband China" dummy variable was set as follows: "Broadband China" pilot city enterprises were assigned a value of 1 in the current year and later, and the rest were assigned a value of 0.

3. Control variables: Based on the existing literature (Luo Qi et al. [20], 2007;), the control variables we have selected are as follows: (1) Enterprise size (Size): measured by the natural logarithm of total assets at the end of the period; (2) Profitability (Roa): Net profit/total assets; (3) Financial leverage (Lev): total assets/total liabilities; (4) Current ratio (Rat): current assets/current liabilities; (5) Bank debt (Deb): (short-term borrowings + long-term borrowings)/total liabilities; (6) Nature of property rights (Soe): If the value of non-state-owned enterprises is 0, the value of state-owned enterprises is 1.

3. Analysis of Results

3.1. Benchmark Regression Test

In this paper, the two-way fixed double differential method is used to evaluate the impact of the "Broadband China" pilot strategy on the financing constraints of enterprises in the pilot cities, and the regression results are shown in the following table. The coefficient of did before and after adding control variables is significantly negative, which shows that the "Broadband China" pilot policy can significantly alleviate the financing constraints of enterprises. Specifically, after increasing the control variable, the absolute value of the coefficient of did increased from 0.0017 to 0.0021, and all of them were significantly negative; in order to verify the robustness of the results, this paper further controlled the annual, industry and regional fixed effects, and from the

results of column (3), it can be seen that the regression coefficient of did is -0.0019 and significant at the 1% level, which indicates that the results have consistent robustness. In terms of control variables, financial leverage and current ratio have a significant inhibitory effect on corporate financing constraints; The scale, profitability, bank debt and property

rights of enterprises will significantly increase the degree of constraint on corporate financing, and the results of control variables are basically in line with theoretical expectations. Hypothesis 1 proves that network infrastructure can significantly ease corporate financing constraints.

Table 1. Benchmark regression results

	FC		
	(1)	(2)	(3)
did	-0.0017* (-1.75)	-0.0021** (-2.21)	-0.0019*** (-4.59)
Control variables	Yes	Yes	Yes
Time effect	Yes	Yes	Yes
Individual effects	Yes	Yes	No
Industry effects	No	No	Yes
Regional effects	No	No	Yes
N	29998	29998	29998
R ²	0.7869	0.8100	0.8219

Note: The values in parentheses are t-values, and ***, **, and * are significant at the levels of 1%, 5%, and 10%, respectively. The same applies below.

3.2. Robustness Test

3.2.1. Parallel Trend Test

The basic premise of policy evaluation using the did model is that the parallel trend hypothesis holds. To avoid multicollinearity, this article uses pre1 in the year before the policy implementation as a benchmark and removes pre1 in regression. The regression results are shown in Figure 1. Figure 1 shows the change trend of the financing constraint level of enterprises before and after the implementation of the

pilot policy, and it can be seen that before the implementation of the policy, the coefficient confidence interval of did contains 0, indicating that the coefficient joint test is not significant; After the implementation of the policy, the confidence intervals for the coefficients of did did not contain 0, indicating that the coefficients were jointly tested significantly. The above results show that the experimental group and the control group in this paper meet the preconditions of parallel trend.

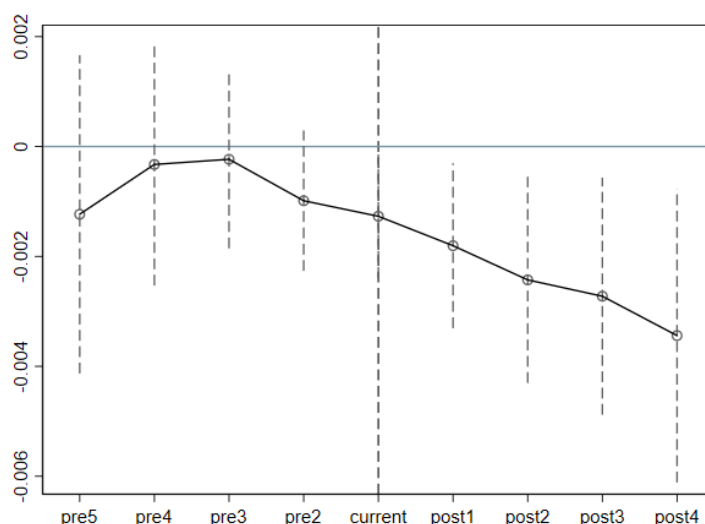


Figure 1. Parallel trend test plot

3.3. Scale Heterogeneity Analysis

We divided all sample companies from large to small according to the size of the enterprise into three groups, defined as large-scale, medium-sized and small-scale enterprises, and the results are shown in Table 3. It can be found that the construction of network infrastructure significantly alleviates the financing constraints of large-scale enterprises at the level of 5%, and its impact coefficient is -0.0022; there is no significant impact on the financing constraints of small and medium-sized enterprises. This may

be due to the degree of investment restriction and uncertainty that small-scale enterprises are subject to, which is more serious than that of large and medium-sized enterprises. The reason is that limited to resource constraints, most small and medium-sized enterprises can only carry out simple information applications due to talent, capital, etc., and it is difficult to quickly improve the level of information disclosure through network infrastructure construction in the short term, reducing the degree of information asymmetry between the two sides of financing; Large and medium-sized enterprises have strong funds, information transparency is

relatively higher, it is easier to gain competitive advantage in the wave of digital transformation, which may enhance the positive role of information resources in the process of

enterprise financing, thereby enhancing the impact of network infrastructure construction on corporate financing constraints.

Table 3. Scale heterogeneity Analysis

	Small	Middle	Large
did	-0.0007 (-1.56)	-0.0001 (-0.42)	-0.0022** (-2.46)
Control variables	Yes	Yes	Yes
Time effect	Yes	Yes	Yes
Individual effects	Yes	Yes	Yes
N	9962	10015	10021
R ²	0.9797	0.9918	0.8666

4. Policy Recommendations

1. Improve the effectiveness and accuracy of broadband incentive policies according to local conditions and situations. In the process of promoting the construction of network infrastructure, the government should implement differentiated arrangements for different enterprises according to the scale of enterprises, the nature of property rights, and the life cycle. First, reduce the threshold for the digital construction of small and medium-sized enterprises to improve the financing capacity and resource allocation efficiency of such enterprises; secondly It is necessary to guide non-state-owned enterprises to participate in the construction of network infrastructure and give appropriate subsidies, and accelerate the formulation of specific ways and measures for the management of market access by industry and field of non-state-owned enterprises; Finally, since network infrastructure has no significant impact on the transformation and upgrading of enterprises in the growth and recession period, the government should give full play to its guiding role for enterprises in the growth and recession periods, focusing on how to solve the degree of asymmetry between enterprises and external information, rather than blindly investing in network infrastructure construction.

2. Further improve the construction of local financial infrastructure and innovate investment and financing platforms. On the one hand, actively promote the establishment of a social enterprise creditworthiness system, further expand the collection and application of enterprise credit information, and further strengthen the stimulating and restricting functions of enterprise creditworthiness; On the other hand, we will further expand the access to the unified registration platform for movable property investment, further improve the mandatory, all-round and accurate information records, and create a convenient investment platform for social enterprises.

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