Original Research Article

Research on the synergistic effect of government subsidy and government procurement on enterprise digital transformation

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Abstract: As a key driver of high-quality economic development, corporate digital transformation requires comprehensive government support. Using panel data from A-share listed companies (2015-2023), this study examines the synergistic effects of government subsidies and procurement on digital transformation and their underlying mechanisms. The findings demonstrate a positive co-effect between government subsidies and procurement in promoting digital transformation. Policy recommendations include: establishing a coordinated policy framework to address the limitations of single policies, maximizing the guiding role of government subsidies and procurement in digital transformation, and designing differentiated combined policies for government subsidies and procurement.

Keywords: government subsidies; government procurement; enterprise digital transformation

1. Introduction

In China, enterprises serve as the fundamental units of the national economy, playing a pivotal role in the market economy and being the primary participants in economic activities. Advancing their digital transformation not only facilitates the upgrading of traditional competitive industries but also fosters new growth drivers for emerging sectors, increases fiscal revenue, and ultimately achieves high-quality economic development. Therefore, digital transformation is of paramount importance for enterprises. However, China's corporate digital transformation remains in its nascent stage, facing dual challenges from both internal and external fronts. The government must address critical issues such as insufficient core technologies, talent shortages, and excessive transformation costs through institutional interventions[1]. Research on enterprise digital transformation has thus become an urgent priority.

As fiscal policy instruments, government subsidies and procurement can play a crucial role in corporate digital transformation. Government subsidies represent supply-side support, directly providing funds to enterprises for digital equipment procurement and recruitment of key technical personnel. These subsidies exhibit differentiated characteristics, with amounts adjusted according to various criteria to accommodate different stages of digital transformation. Government procurement, on the other hand, serves as demand-side support through tendering processes to select products for digital transformation, stimulating corporate innovation while providing practical value for product refinement. Based on the "policy combination" theory, the synergy between supply-side and demand-side tools proves more effective than standalone policies. Therefore, this study explores the synergistic effects of government subsidies and procurement on corporate digital transformation, offering both practical and theoretical significance.

2. Theoretical analysis and research hypothesis

Current literature predominantly defines corporate digital transformation as an approach that integrates traditional industries with scientific and technological advancements, driving comprehensive and multi-level

restructuring of production factors, organizational frameworks, and business models to enhance corporate competitiveness and economic efficiency[2-3]. It emphasizes that digital transformation should not focus solely on material production aspects but must encompass broader cultural and meaning systems within an enterprise's context, specifically encompassing shifts in the realm of thought[4]. Accordingly, it proposes that corporate digital transformation should achieve an organic integration of three key objectives: improving corporate performance, enhancing product quality, and creating employment opportunities, requiring coordinated efforts from government guidance, corporate implementation, and public acceptance. The following section outlines fundamental assumptions and mechanism hypotheses regarding the synergistic effects of government subsidies and procurement on corporate digital transformation.

2.1. Synergistic effects of government subsidies and government procurement on enterprise digital transformation

Enterprises require substantial resources for digital transformation, and government subsidies can effectively reduce costs, particularly targeted subsidies that cover all aspects of digital transformation. For instance, digital subsidies can catalyze corporate R&D innovation and accelerate technology implementation; employment subsidies can be used for employee skill training to address talent shortages; government support for upstream enterprises can drive digital upgrades in downstream sectors. Government procurement serves dual functions of policy intent and market selection, directly providing orders to relevant enterprises and reducing market uncertainty. Standards set by the government for procured products can also compel enterprises to adopt digital transformation[5]. However, the use of single policy tools may produce negative effects. Enterprises might engage in cutthroat competition for subsidies, failing to genuinely enhance digital transformation capabilities. Some local governments may prioritize purchasing locally innovated products or engage in gray-area practices during procurement, creating standards tailored for specific enterprises. Long-term reliance on government subsidies and procurement may foster corporate inertia. The combined use of government subsidies and procurement can mitigate the negative impacts of single policy tools on digital transformation.

2.2. In summary, the following basic hypothesis is proposed

H1: Government subsidies and government procurement exhibit significant synergistic effects on enterprise digital transformation.

3. Model setting, variable selection and data description

3.1. Model specification, specification of model

To study the synergistic effect of government subsidies and government procurement on enterprise digital transformation, we set up two-way fixed effect models (1) and (2) to test.

$$Digitalit=\beta_0+\beta_1 Subsidies_{it}+\beta_2 Procure_{it}+\beta_3 Controls_{it}+\mu_i+\theta_t+\varepsilon_{it} \quad (1)$$

$$Digitalit=\beta_0+\beta_1 Subsidies_{it}+\beta_2 Procure_{it}+\beta_3 Subsidies_{it}\times Procure_{it}+\beta_4 Controls_{it}+\mu_i+\theta_t+\varepsilon_{it} \quad (2)$$

In this framework, Digital Transformation of enterprises serves as the dependent variable, while Government Subsidies and Government Procurement act as core explanatory variables. The Controls represent a set of control variables, with μ and θ denoting individual and time fixed effects respectively.ε denotes the cluster-specific random error term at the micro-level firm level, and β_0 is the constant term. Coefficients β_1, β_2, and β_3 represent the effects of explanatory variables and interaction terms, while β_4 indicates the coefficients of control variables. Model (1) jointly tests Government Subsidies and Government Procurement to demonstrate their average effects on enterprise Digital Transformation, whereas Model (2) examines the synergistic effect between these two factors. A significantly positive sign in the interaction term (Subsidies×Procure) of Model (2) indicates that

Government Subsidies and Government Procurement exhibit a synergistic effect in promoting enterprise Digital Transformation.

3.2. Variable selection

Dependent Variable: Corporate Digital Transformation. As there is currently no definitive data to quantify corporate digital transformation, the widely adopted text analysis method was employed. Through Python web scraping of listed companies' annual reports, the data was downloaded, converted into text format, and analyzed for keyword extraction and frequency statistics. This generated a representative metric for corporate digital transformation, where higher values indicate greater digital transformation progress.

Core explanatory variable:(1)Government subsidies. The amount of government subsidies in the notes to the financial statements of enterprises is identified, and this variable is defined as the natural logarithm of the government subsidy amount.(2)Government Procurement. By using Python web scraping to obtain tens of thousands of government procurement contract data from 2015 to 2023, and matching these data with China A-share listed companies, the total annual government procurement amount obtained by enterprises is derived, and the natural logarithm of government procurement is used to define this variable.

Control variables include: Listing Age (ListAge), FirmAge (FirmAge), Debt-to-Equity Ratio (Lev), Return on Equity (Roe), Fixed Asset Ratio (Fixed), Growth (Growth, defined as revenue growth rate), Board Size (Board), Tobin's Q (TobinQ), Asset Structure (Tang), Cash Holdings (Cash), and Return on Total Assets (Roa).

4. Regression result of basic model

Table 1 presents the regression results of government subsidies and government procurement on corporate digital transformation. In columns (1) and (2) of the regression models, the core explanatory variables are government subsidies and government procurement, along with their interaction terms, without incorporating additional firm-level control variables. Column (1) reveals that the coefficients for government subsidies and government procurement are 0.080 and 0.026 respectively, both showing statistically significant positive effects, indicating positive average effects on corporate digital transformation. Column (2) incorporates the interaction term, with the coefficient of the interaction term reaching 0.010, which remains significant at the 1% level. Columns (3) and (4) include firm-level control variables, demonstrating consistent results with columns (1) and (2). This confirms the synergistic effects of government subsidies and government procurement on corporate digital transformation, supporting Hypothesis H1.

Table 1. Regression result of basic model.

Variable	(1)	(2)	(3)	(4)
	Digital			
Subsidies	0.080*** (0.012)	0.068*** (0.011)	0.071*** (0.012)	0.057*** (0.010)
Procure	0.026*** (0.005)	-0.137** (0.061)	0.026*** (0.005)	-0.169*** (0.060)
Subsidies×Procure		0.010*** (0.004)		0.011*** (0.004)
control variable	No	No	Yes	Yes
individual fixed effect	Yes	Yes	Yes	Yes
time fixed effect	Yes	Yes	Yes	Yes
sample size	28466	28466	28466	28466
adjusted R2	0.870	0.870	0.872	0.873

When the interaction term of core explanatory variables was introduced into the model, both the coefficients of government subsidies and government procurement showed reduced values, with some even reversing signs. This phenomenon likely stems from the interaction term diluting the average impact of these two factors on corporate digital transformation. Government subsidies are characterized by their broad applicability, diverse

forms, and substantial funding scale, whereas government procurement excludes many enterprises through competitive bidding mechanisms. Consequently, government subsidies tend to be higher in magnitude, while government procurement is relatively lower in value.

5. Conclusion and policy recommendations

This paper focuses on the micro-level of enterprises, and studies the synergistic effect of government subsidies and government procurement on the digital transformation of enterprises. The main conclusions are as follows: The government subsidies and government procurement have a significant synergistic effect on the digital transformation of enterprises.

The key policy implications of this study are as follows:

(1) Establishing a coordinated policy framework to address the limitations of single-policies. Governments should develop a policy system that synergistically combines supply-side tools (government subsidies) with demand-side tools (government procurement), thereby avoiding the diminishing marginal utility caused by isolated policy instruments. The optimal ratio between government subsidies and procurement should be determined, while policy implementation must adhere to the principle of "market dominance with government guidance" to prevent market distortions and ensure effective policy outcomes.

(2) Maximize the catalytic effect of government subsidies and procurement policies in driving digital transformation. To ease financing constraints, innovative subsidy models should be developed with transparent application, review, and disbursement mechanisms. Scientific procurement plans should be formulated to expand procurement scope, creating more market opportunities for enterprises and boosting their revenue and cash flow. To incentivize product innovation, increased subsidy amounts and dedicated innovation funds should be established to support key technology R&D and prototype development. Furthermore, priority procurement categories for innovative products should be clearly defined.

(3) Design differentiated government subsidy and government procurement collaborative policy packages. Based on the characteristics of enterprises and their regions, formulate tailored policy combinations to allocate government subsidies and procurement resources more favorably toward non-state-owned enterprises, large-scale enterprises, and those located in central regions or pilot policy cities.

References

[1] Shi Yupeng, Wang Yang, Zhang Wentao. Digital Transformation of Chinese Enterprises: Current Status, Challenges and Prospects [J]. Economist, 2021(12):90-97.

[2] White Paper on Enterprise Digital Transformation [R]. China Electronics Standardization Institute.

[3] Pei Xuan, Liu Yu, Wang Wenhua. Digital Transformation of Enterprises: Driving Factors, Economic Effects, and Strategy Selection [J]. Reform, 2023(05):124-137.

[4] Luo Zhangbao, Cheng Dejun. A Review of Research on the Connotation and Path of Enterprise Digital Transformation from an Institutional Perspective [J]. Journal of Management, 2024,21(11):1727-1738.

[5] Fang Ziyi, Du Pengfei. How government procurement affects the digitalization of Chinese enterprises — Empirical evidence from China‘s manufacturing enterprises [J]. Economic Issues Exploration, 2023(08):86-102.