Digital Government Development and Fiscal Policy Efficiency

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Abstract. Using panel data from 30 Chinese provinces spanning 2015 to 2022, this study examines the effect of digital government development on the efficiency of local fiscal expenditure. The findings reveal a significant and positive relationship between the degree of digital government construction and fiscal-expenditure efficiency at the provincial level. This effect is particularly pronounced in regions with stronger administrative capacity, lower fiscal and growth pressures, where digital tools appear to deliver greater empowerment benefits and it is mainly achieved by enhancing financial transparency and strengthening the mechanism of public supervision. These results highlight the potential for accelerated government digital transformation to enhance fiscal governance and improve fiscal policy effectiveness.

Keywords: digital government, fiscal expenditure efficiency, government pressure

1 Introduction

The rapid growth of the digital economy has led governments worldwide to digitize their operations in an effort to enhance administrative capacity and maximize the value derived from each public yuan or dollar. China is no exception. Digital government, defined as the structured application of data and digital tools to reshape public decision-making and service provision, has progressed well beyond traditional e-government. It now acts as a managerial instrument for the state, pooling real-time data, standardising workflows, and enforcing performance benchmarks across agencies[1]. By embedding information technology into data-driven workflows, digital government improves administrative efficiency, facilitates greater openness and transparency, and supports the development of accessible digital platforms, thereby moving governance toward higher-level intelligent administration[2].

Despite this strategic policy emphasis, empirical research remains limited regarding whether—and through which channels—digital-government initiatives improve local fiscal-expenditure efficiency. Recent systematic reviews highlight this gap. Haug, Dan

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and Mergel (2024)[3], synthesizing 164 studies, report that fewer than 10 percent address fiscal outcomes, identifying budget efficiency as "an under-researched frontier." Afzal and Manni's (2025)[4] meta-analysis on e-government and corruption further underscores that existing literature "largely overlooks budgetary efficiency metrics." Building on these insights, our study quantifies the fiscal-efficiency dividend from digital government using province–year panel data and identifies institutional conditions that amplify this effect. Existing international evidence suggests that more advanced digital government capabilities are associated with accelerated GDP growth[5] and a more robust digital economy[6]. Within the Chinese context, provincial deployments of digital government platforms have been associated with enhanced economic resilience[7], along with firm-level improvements in digital transformation, innovation, and productivity[8][9][10]. These findings collectively imply that digital tools boost allocative efficiency in the private sector, motivating our inquiry into whether such efficiency gains also extend to public-sector spending.

In the context of international research, scholars have widely examined the role of digital government in enhancing fiscal transparency, budgetary performance, and public accountability. Bannister and Connolly (2012)[11], through cross-country comparisons, argue that the greatest value of digital governance lies in improving government transparency and citizen oversight, both of which significantly contribute to the regulation of fiscal expenditures. Similarly, Bertot, Jaeger, and Grimes (2010)[12] emphasize the mechanisms through which information and communication technologies (ICTs) can promote anti-corruption and fiscal governance, suggesting that digital government reduces fiscal waste by fostering open data and public participation. At a broader level, the United Nations *E-Government Surveys* (2020, 2022) provide comparative evidence across countries, the overarching trend indicates that digitalization contributes to greater fiscal sustainability and more efficient resource allocation.

Beyond documenting international evidence, it is important to further unpack the mechanisms through which digital government influences fiscal expenditure efficiency. Two channels are particularly salient. First, digital transformation significantly enhances fiscal transparency by lowering the marginal costs of information disclosure and enabling real-time publication of budgetary data, project expenditures, and performance evaluations. This improved visibility not only empowers citizens with greater access to fiscal information but also generates external constraints on local governments, compelling them to prioritize expenditure effectiveness and align spending decisions more closely with local needs[13][14] . Second, digital government strengthens public oversight by embedding participatory governance into fiscal processes. Tools such as mobile applications, online consultation platforms, and social media reporting mechanisms expand opportunities for citizens to monitor fiscal activities, provide feedback, and demand accountability. Existing studies have shown that enhanced public scrutiny exerts positive effects on fiscal behavior and budgetary outcomes[15]. By institutionalizing these feedback loops, external supervision gradually becomes internalized within government decision-making and performance evaluation systems, thereby reinforcing fiscal discipline. Together, these mechanisms highlight how digital government does not simply represent a technological upgrade, but rather creates new institutional environments that enhance the efficiency of public resource allocation.

At the same time, the public finance literature demonstrates that expenditure efficiency is shaped by external conditions such as population size, fiscal pressure, and transparency in budget processes [16][17][18]. It is also influenced by internal institutional incentives, including horizontal interjurisdictional competition and fiscal decentralization[19][20]. Digital transformation has the potential to influence both dimensions simultaneously: by lowering information costs, it strengthens public oversight, and by automating administrative processes, it reduces inefficiencies within and between levels of government.

This study makes several contributions to the existing literature. First, while prior international and domestic research has primarily focused on digital government's effects on transparency, accountability, or corruption control, our study explicitly examines its impact on fiscal expenditure efficiency, an underexplored dimension of public finance. Second, by identifying two key mechanisms—fiscal transparency and public oversight—we advance the theoretical understanding of how digital transformation reshapes institutional environments and improves the allocative efficiency of public resources.

2 Research Design

2.1 Sample and Data

This study utilizes a balanced panel dataset covering 30 Chinese provinces from 2015 to 2022. The time frame and sample selection are based on the availability and completeness of relevant data. Sources include the China Internet Development Statistical Report, the China e-Government Development Survey Report, the Peking University Digital Inclusive Finance Index, the National Bureau of Statistics, and provincial statistical yearbooks. Where data were missing, values were supplemented using linear interpolation and extrapolation to maintain panel balance.

2.2 Model Specification

To examine the effect of digital government development on the efficiency of fiscal expenditure, we estimate the following panel model, incorporating both year and province fixed effects:

$$eff_{i,t} = \alpha + \beta dg_{i,t} + \gamma \sum Control_{i,t} + u_i + v_t + \varepsilon_{i,t}$$

2.3 Variables

A comprehensive Digital Government Evaluation System is developed for this study, comprising four key dimensions:

(i) digital infrastructure,(ii) information-sharing capacity,(iii) online public-service delivery, and(iv) digital inclusive finance. These are captured using 17 sub-indicators (see Appendix 1). A composite Digital Government Index is constructed using the entropy-weighting method.

Fiscal-expenditure efficiency is assessed through both input and output dimensions. Inputs are evaluated in terms of absolute scale and relative intensity, while outputs reflect public service outcomes in infrastructure, transport, education, science, culture, health, and residents' welfare. Efficiency scores are computed using the Super-SBM model, with indicator details provided in Appendix 2.

Control variables include fiscal decentralization, urbanization, industrial structure, market development, and economic development level. Each variable is defined in Table 1.

Table 1. Variable definitions.

Variable	Definition
Dependent variable	
eff	Dependent variable measuring local fiscal-expenditure efficiency, estimated using the Super-SBM model (see Appendix 2).
Independent variable	
dg	Independent variable representing digital government development, computed via entropy-weighted aggregation of 17 sub-indicators across four dimensions: Digital Technology Fundamentals, Information-Sharing Capacity, Online Government-Service Capacity, and the Digital Inclusive Finance Index (see Appendix 1).
Other variables	
fisd	Fiscal decentralization, measured by the ratio of provincial-level fiscal expenditure to central-level fiscal expenditure.
urban	Urbanization level, calculated as the ratio of the urban population to the total population.
es	Economic structure, measured by the share of the secondary sector in provincial GDP.
market	Marketization level, based on the regional marketisation index by Fan et al. (2019).
gdpgrowth	Economic development level, proxied by the logarithm of per capita GDP.

3 Results

3.1 Baseline Results

Table 2 presents the baseline regression estimates evaluating the impact of digital government development on fiscal-expenditure efficiency. Columns (1) and (2) demonstrate that the coefficient on digital government is positive and statistically significant at the 1% level in both specifications. In column (1), without controls, the coefficient is 0.627; in column (2), after including all control variables, the coefficient increases to 0.757. These results offer preliminary support for the hypothesis that digital government enhances fiscal-efficiency outcomes.

Table 2. Baseline regression results and Robustness check.

Variable	(1)	(2)	(3)dg	(4)eff
dg	0.627***(2.737)	0.757***(2.811)		1.49***(3.16)
Num*dg			0.645**(2.46)	
Control	Excluded	Included	Included	Included
Year & province FE	Yes	Yes	Yes	Yes
N	240	240	240	240
Adj. R2	0.599	0.675	0.544	0.662

Note: *, *** and *** indicate $p < 0.10$, $p < 0.05$, $p < 0.01$, respectively. t-statistics are in parentheses.

3.2 Robustness Check

3.2.1. Instrumental Variable (IV) Method.

To address potential endogeneity concerns, an instrumental variable is constructed by interacting each province's per-million stock of postal and telecommunications infrastructure in 1984 with its current digital government index. The historical telecom infrastructure reflects early-stage information and communication capabilities, yet, by design, it does not exert a direct effect on current fiscal-expenditure efficiency.

Table 2 presents the results from the two-stage least squares (2SLS) estimation. Column (3) shows that the instrument is significantly associated with digital government development at the 5% level, confirming instrument relevance. Column (4) reports that digital government continues to have a statistically significant and positive effect on fiscal-expenditure efficiency at the 1% level, indicating that the main findings are robust under IV estimation.

3.3 Heterogeneity Analyses

3.3.1. Government Governance Efficiency.

The national rollout of digital government initiatives has revealed a pronounced digital divide. Provinces that began adopting digital governance earlier tend to be more capable of implementing fiscal digital reforms, which in turn contributes to higher expenditure efficiency[21].

Following the method proposed by Yan (2025)[22], governance efficiency is measured as the ratio of a province's total population to the number of employees in public administration, social security, and social organizations. Provinces in the top 40th percentile of this ratio are designated as high-efficiency, while those in the bottom 60th percentile are categorized as low-efficiency.

The regression results reported in Table 3 indicate that the positive impact of digital government development on fiscal-expenditure efficiency outcomes is considerably

more pronounced in provinces classified as high-efficiency. This suggests that digital government is more effective in regions where administrative governance is already relatively capable.

3.3.2. Government Pressure.

Within China's institutional framework, marked by political centralization and economic decentralization, the efficiency of local fiscal expenditure is closely shaped by promotion incentives and developmental pressure. Previous studies suggest that greater fiscal stress and more ambitious growth targets are typically associated with reduced spending efficiency [21]. Under such conditions, local officials may prioritize infrastructure and other high-visibility projects at the expense of public welfare programs, thereby undermining overall fiscal performance [19].

To assess these effects, two proxies are used. Fiscal stress is defined as the per capita gap between provincial expenditure and revenue. Growth pressure is proxied by the ratio of a province's official GDP growth target to its average actual growth rate over the previous three years. For each indicator, the sample is divided at the median to construct high- and low-pressure subsamples.

Columns (1) to (6) in Table 3 report the corresponding two-stage least squares estimates. The findings indicate that the fiscal-efficiency gains from digital government development are significantly larger in provinces experiencing lower fiscal and growth pressure. One plausible interpretation is that fiscally less-constrained local governments are better positioned to allocate public resources toward long-term objectives, such as social development and livelihood support, which in turn enhances expenditure efficiency.

Table 3. Heterogeneity analysis and Mechanism testing.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Government governance efficiency		Growth pressure		Fiscal pressure		Fiscal transparency	External public scrutiny
	High	Low	High	Low	High	Low		
dg	1.12***	0.52	0.334	0.62***	0.11	0.69***	4.18**	1.74***
	(2.89)	(1.16)	(1.05)	(0.26)	(0.79)	(0.26)	(2.57)	(3.44)
Control	Included	Included	Included	Included	Included	Included	Included	Included
Year & province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	100	137	65	167	92	145	240	240
Adj.R2	0.791	0.737	0.825	0.711	0.812	0.711	0.742	0.972

3.4 Mechanism Testing

Firstly, there are fiscal transparency mechanisms, To verify this, a mechanism test was conducted using the Research Report on Fiscal Transparency in China, published by

the Public Policy Research Centre at Shanghai University of Finance and Economics. Secondly there is the issue of an external public monitoring mechanism, To test this, the Baidu search index for the term 'fiscal expenditure' was collected for each province. Columns (7) to (8) in Table 3 show that fiscal transparency is significantly positive at the 5% statistical level and the public external supervision mechanism is significantly positive at the 1% statistical level. The results indicate that the construction of a digital government effectively promotes the openness and transparency of fiscal information and facilitates the efficient use of fiscal funds, Furthermore, digital government construction can alleviate the fiscal expenditure management dilemma characterised by insufficient public participation and weak external supervision to a certain extent.

4 Conclusion

This study provides province-level empirical evidence that China's digital-government initiatives substantially enhance fiscal-expenditure efficiency. The results indicate that digital transformation serves not merely as an administrative convenience but as a productivity-enhancing managerial tool within the public sector. However, the efficiency dividend is not uniformly distributed. It is significantly stronger in regions with robust collaborative governance capacity, lower fiscal stress, and moderate growth pressures. These findings suggest concrete policy implications: prioritizing investments in inter-agency data integration, strengthening digital capabilities in underperforming provinces to address regional disparities, and strategically coupling digital-government development with institutional reforms to alleviate fiscal pressures. Collectively, this reframed perspective on digital governance—as an internal managerial asset rather than an external growth enabler—offers clear pathways for targeted policy interventions at the intersection of public-sector digitalisation and fiscal reform.

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Appendix 1.Digital Government Development Measurement Indicator System

First-level indicator	Second-level indicator	Weight	Expected effect
Digital Technology Infrastructure	Internet access port density	0.0673	+
	Cell phone penetration rate	0.0648	+
	Number of Internet access ports	0.0673	+

Information-Sharing Capacity	Number of Internet broadband access subscribers	0.0655	+
	Length of long-distance fiber optic cable per unit area	0.0591	+
	Density of cell phone base stations	0.0612	+
	Government Web Transparency Index	0.0652	+
	Number of government microblog accounts	0.0589	+
	Number of official government headlines	0.0603	+
	Service Coverage Index	0.0635	+
Online Public-Service Delivery	Service Modality Completeness Index	0.0682	+
	Accuracy Index for Clerical Guidelines	0.0698	+
	Online Processing Maturity Index	0.0664	+
Digital Inclusive Finance Index	Digital Finance Breadth of Coverage Index	0.0721	+
	Depth of use index for digital finance	0.0732	+
	Degree of digital finance digitization	0.0715	+

Appendix 2.Indicator system for Local Fiscal-expenditure Efficiency

Type	First-level indicators	Second-level indicators
Inputs	Absolute size	General public budget expenditure (local level)
	Relative strength	Fiscal expenditure as a share of GDP
	Livelihood Indicators	Per capita disposable income of urban residents
		Per capita disposable income of rural residents
		Gross horsepower of agricultural machinery
Outputs	Infrastructure development	Effective irrigated land area
		Per capita road area
		Green space per capita in public parks
		Urban gas pipeline coverage rate
		Urban water supply coverage rate
		Comprehensive water supply capacity
	Transportation development	Passenger-kilometer volume
		Railroad mileage
		Domestic Patent Applications Granted
	Education, science, culture,	Public education funding
		Higher education enrollment per 100,000 residents

	and health	Number of medical and health institutions
		Number of hospital beds
		Public library holdings per capita

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References

1. Bao, J., Fan, Z., Jia, K., 2020. Research on the governance form of digital government: Conceptual analysis and hierarchical framework. E-Government 2020 (11), 2–13.
2. Song, Y.Q., Jia, X.G., 2023. Influencing factors and improvement path of digital government construction performance under the socio-technology framework: A qualitative comparative analysis of 31 provinces. Science & Management 2, 1–19.
3. Haug, N., Dan, S., Mergel, I., 2024. Digitally-induced change in the public sector: A systematic review and research agenda. Public Management Review 26 (7), 1963–1987.
4. Munshi, M., Manni, U.H., 2025. Can digital transformation reduce government corruption? A meta-analysis. Quantitative Economics and Management Studies 6 (1), 1–8.
5. Majeed, M.T., Shah, A., 2018. An empirical analysis of economic performance of Asian economies: The role of electronic government. Review of Economics and Development Studies 4 (1), 91–102.
6. Ali, M.A., Hoque, M.R., Alam, K., 2018. An empirical investigation of the relationship between e-government development and the digital economy: The case of Asian countries. Journal of Knowledge Management 22 (5), 1176–1200.
7. Zhang, L.L., Song, L., 2024. Digital governance and urban economic resilience. Economic Perspectives 2024 (10), 109–127.
8. Li, J.P., Shi, J., Gu, N.H., 2024. Spillover effects of digital government construction on enterprise digital transformation: Evidence from big data on government procurement contracts. South China Journal of Economics 2024 (2), 1–25.
9. Wang, X.X., Huang, H.G., Xia, Y.F., 2021. E-governance construction and enterprise innovation. Finance & Economics 2021 (11), 118–132.
10. Hu, J.Y., Yu, L., Liu, Y.W., 2024. Does the construction of digital government improve enterprise performance? Based on the open perspective of data elements. Dongyue Tribune 45 (6), 109–122.
11. Bannister F, Connolly R. Defining e-governance[J]. E-Service Journal: A Journal of Electronic Services in the Public and Private Sectors, 2012, 8(2): 3-25.
12. Bertot J C, Jaeger P T, Grimes J M. Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies[J]. Government information quarterly, 2010, 27(3): 264-271.
13. Li Y, Wang X. Study on the Effect of Local Fiscal Transparency on Fiscal Expenditure Efficiency in China under the Perspective of National Governance [J]. Journal of Central University of Finance & Economics,2016,(11):3-10.

14. Lv B Y. The Construction of Modern Public Financial System: A Framework of Public Order [J].Journal of Management World,2021,37(10):100-111.
15. Park J, Butler J S, Petrovsky N. Understanding public participation as a mechanism affecting government fiscal outcomes: Theory and evidence from participatory budgeting[J]. Journal of Public Administration Research and Theory, 2023, 33(2): 375-389.
16. Tang, Q.M., Wang, B., 2012. Efficiency and influencing factors of local government fiscal expenditure in China. Journal of Financial Research 2012 (2), 48–60.
17. Xu, C., Pang, Y.M., Liu, D., 2020. Local fiscal pressure and government expenditure efficiency: Income-tax sharing reform as a quasi-natural experiment. Economic Research Journal 55 (6), 138–154.
18. Li, Y., Wang, X., 2016. Local fiscal transparency and fiscal-expenditure efficiency in China under the perspective of national governance. Journal of Central University of Finance & Economics 2016 (11), 3–10.
19. Liu, J.H., Wang, G.Y., 2017. Impact of local government fiscal competition on the efficiency of fiscal expenditure: Empirical evidence from the Yangtze River Delta urban agglomeration. Public Finance Research 2017 (8), 56–68+111.
20. Cui, Z.K., Zhang, Y., 2017. Effect of fiscal decentralization and transfer payment on the efficiency of local welfare expenditure. Public Finance Research 2017 (5), 24–37.
21. Sun, Y.D., Xi, Y., 2021. Factors affecting the fiscal-expenditure efficiency of local government: Finance, promotion and development pressures. Economic Theory and Business Management 41 (6), 37–49.
22. Yan, J., 2025. Assessing the link between digital government development and urban industrial-chain resilience: Evidence from public data openness. Environmental Impact Assessment Review 112, 107796.