

Original Research Article

Research on the horizontal imbalance of value-added tax distribution in the digital economy era

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Abstract: The advent of the digital economy era has facilitated the high-quality development of China's economy, while also posing certain challenges to the value-added tax (VAT) collection and management model under the principle of production location. Based on panel data from 30 provinces and cities in China spanning from 2015 to 2022, this article investigates the impact mechanism of digital economy development on the inter-regional VAT tax gap in China from both theoretical and empirical perspectives.

Keywords: digital economy; horizontal imbalance of VAT distribution

1. Introduction

The "Digital China Development Report (2023)" indicates that "the digital economy maintains robust growth, with the added value of core digital economy industries accounting for about 10% of GDP. Looking ahead to 2024, the development of Digital China will resonate and synergize with China's acceleration of new quality productive forces, becoming a significant engine driving changes in quality, efficiency, and momentum." While injecting new vitality into economic development, the digital economy era also presents challenges to the VAT collection model based on the production location principle. The boundaryless and efficient nature of the digital economy makes transactions more frequent, complex, and difficult to track, while value-added tax is mainly based on the principle of production location, which often leads to inconsistencies in the attribution and contribution of tax revenue sources, thereby exacerbating the tax revenue gap between tax revenue sources and tax burden bearing areas, and promoting the imbalance of horizontal distribution of value-added tax.

2. Theoretical hypotheses and research design

2.1. Theoretical hypotheses

2.1.1. Direct effect of the digital economy

The development of the digital economy directly promotes the imbalance of horizontal distribution of value-added tax. Economically developed regions have strong strength and surplus budget for the construction of the digital economy. The development of the digital economy in turn promotes local economic development. As long as the local consumption (purchase) in underdeveloped regions exceeds its sales to other regions, underdeveloped regions will lose a large amount of tax base and revenue, which is not conducive to local economic development and then to the development of the digital economy, resulting in a clear "Matthew effect".

2.1.2. Indirect effect of the digital economy (enterprise de-branching)

The digital economy indirectly affects the horizontal distribution imbalance of value-added tax through the de branching effect of enterprises. The boundaryless nature of the digital economy allows for geographical and temporal distance conditions for enterprise sales and customer service, eliminating the need for companies to establish branch offices in other regions, resulting in a significant de branching effect for enterprises. In the

digital economy, the production and consumption areas are often different, which leads to the inability of the government in the consumption area to exercise its tax collection and management power, and exacerbates the problem of imbalanced horizontal distribution of value-added tax. Based on the above theoretical analysis, the following hypotheses are proposed:

H1: The horizontal imbalance in VAT distribution intensifies with the development of the digital economy.

H2: The digital economy affects the horizontal distribution pattern of value-added tax through its direct and indirect effects.

2.2. Research design

2.2.1. Model specification

To examine the impact of digital economy development on regional VAT disparities, the following model is constructed:

$$vatd_{it} = \alpha + \beta dige_{it} + \sum \gamma_j X_{ijt} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

Where, X denotes several control variables.

2.2.2. Variable definitions

Dependent Variable: Inter-regional VAT revenue gap (vatd). Following the approach of Yonghui Zhao et al. (2017)^[4], this is measured as the difference between a province's VAT revenue and the annual national average of total provincial VAT revenues.

Core Explanatory Variable: Digital economy development level (dige). Drawing on the research of Feng Guo et al. (2020)^[5], this is measured across three dimensions: digital infrastructure, digital industry development, and digital inclusive finance.

Control Variables: Referring to Jianjun Li et al. (2023)^[6], the following control variables are selected for the baseline regression: Industrial structure (Ind3), Transfer payment structure (tras), Human capital level (humc).

Mechanism Test Variables: Economic development level (lngdp), measured as the natural logarithm of local GDP; Enterprise de-branching indicator (other), following Jianjun Li et al. (2023)^[6], measured as the proportion of enterprise registrations in other cities to national enterprise registrations.

2.2.3. Data description

The empirical analysis sample covers 30 provinces, autonomous regions, and municipalities directly under the central government from 2015 to 2022. Data are primarily sourced from the Wind database; provincial statistical yearbooks; annual Central Government Final Accounts Reports; the CSMAR database.

3. Empirical results and analysis

3.1. Baseline regression analysis

As shown in **Table 1**, results from both models indicate that digital economy development has a significant positive impact on horizontal VAT distribution imbalance, i.e., it exacerbates the imbalance, supporting Hypothesis H1.

Table 1. Baseline regression results.

Variable	(1)OLS	(2)FE
	vatd	
dige	142.3***	43.83**
(Industrial Structure)	(10.55)	(17.21)
Control Variables	Y	Y
Province/Year Fixed Effects	N	Y
Observations	240	240
R2	0.737	0.224

Robustness Tests.

3.2. Robustness tests

3.2.1. Variable standardization

Based on Equation (1), variables are standardized, and the static panel regression is re-run. Results in column (1) of **Table 2** show that the standardized results are essentially consistent with the baseline regression.

3.2.2. Endogeneity issues

The mobile Internet access traffic (intgb) and the number of websites owned by enterprises (webnum) in each province are selected as the instrumental variables of the development level of the digital economy, and the two-stage least square method (2SLS) is adopted for the robustness regression test. The results are shown in the column (2) of **Table 2**. The effect and significance of the core explanatory variables remain stable after endogenous treatment, which proves that the empirical results are robust.

Table 2. Robustness test results.

Variable	(1)FE	(2)2SLS
	z_vatd	vatd
z_dige	0.272***	
(Std. Dig. Econ. Dev. Lev.)	(0.0815)	
dige		47.44**
(Digital Economy Dev. Lev.)		(21.45)
Control Variables	Y	Y
Province/Year Fixed Effects	Y	Y
Observations	240	240
R2	0.224	0.387

3.3. Mechanism test analysis

Firstly, Column (1) shows that digital economy development level has a significant positive impact on local economic development. Column (2) shows that local economic development positively affects horizontal VAT distribution imbalance. Thus, the digital economy exacerbates imbalance through the direct economic development effect. Column (3) indicates that a higher digital economy development level inhibits enterprises from establishing branches in other locations, confirming the de-branching effect. Column (4) shows that enterprise de-branching positively affects horizontal VAT distribution imbalance. Therefore, the digital economy worsens imbalance through the enterprise de-branching effect. Hypothesis H2 is supported.

Table 3. Mechanism test results.

Variable	FE			
	(1)	(2)	(3)	(4)
	lngdp	vatd	other	vatd
dige	0.00986***		-1.045***	
(Digital Economy Dev. Lev.)	(0.00245)		(0.222)	
lngdp		3760.9***		
(Econ. Dev. Level)		(736.4)		
other				12.05*
(Enterprise De-branching)				(6.627)
Control Variables	Y	Y	Y	Y
Province/Year Fixed Effects	Y	Y	Y	Y
Observations	240	240	240	240
R2	0.881	0.294	0.454	0.198

4. Research conclusions and policy recommendations

Theoretical and empirical research finds that horizontal imbalance in VAT distribution intensifies with

digital economy development. The digital economy affects this imbalance through enhancing local economic development (direct effect) and the enterprise de-branching effect (indirect effect). Moreover, the impact of digital economy development on the VAT revenue gap among less developed regions is greater than among developed regions.

Based on these conclusions, the following recommendations are proposed:

Firstly, from the perspective of value-added tax, the practice of distributing value-added tax between regions based on the principle of production location should be changed, and a combination of the principles of production location and consumption location should be adopted for distribution Secondly, from the perspective of digital economy, local governments should accelerate the optimization of digital economy industry upgrading, and use digital economy to drive high-quality development of local economy.

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