The development of the digital economy has intensified the imbalance of the horizontal distribution of VAT

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Abstract. In recent years, China's digital economy is developing from the "catalyst" of high-quality economic and social development in the past to the direction of "new engine". At the same time, we must also realize the impact of the rapid development of digital economy on the current principle of production taxation and the tax system. Among them, the horizontal distribution of VAT in the digital economy among regions has become the focus of theoretical research and practice departments. Using the panel data of 30 provinces from 2015 to 2021, the impact of the development of digital economy on VAT was studied by constructing a fixed-effect model. The results show that the development of digital economy in a certain region will promote the growth of VAT revenue on the whole, but the gap of digital economy development between regions will further aggravate the situation of VAT revenue between regions. Further analysis found that the impact of the digital economy is more obvious for the central and western regions. Based on the current VAT deviation situation.

Keywords: digital economy; value added tax; tax deviation; production principle; fixed effect

1 INTRODUCTION

As one of the major national strategies in the new era, the implementation of the coordinated regional coordinated development strategy will play an important supporting role in improving the quality and efficiency of China's economic development and building a modern economic system. Eckhard Janeba [2]believes that It is of great significance to study the impact of the development of digital economy on the horizontal distribution of tax revenue among regions for establishing a sound tax distribution policy and promoting the coordinated development among regions. Tax reform in 1994 is mainly divided into the central and local tax distribution problem, reform determines the VAT measures for the administration of registration as the core of the principle of the production tax, the VAT belongs to the price tax, the tax eventually borne by consumers, in this distribution pattern, Taiki Susa[8] believes that the product production to consumption residents burden of tax, thus the problem of tax sources. Based on reference Stéphane Gauthier[7],Based on this, this paper measures the development index and the deviation rate of digital economy of each province, and studies the influence of

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the development of digital economy on the deviation of VAT and VAT by constructing a two-way fixed effect model.

2 THEORETICAL ANALYSIS AND RESEARCH HYPOTHESIS

From the perspective of the impact of the digital economy on value-added tax revenue, the vigorous development of the digital economy will bring about an increase in social output by improving resource allocation efficiency and expanding production scale, which is conducive to the expansion of the tax base and the increase of value-added tax revenue. Therefore, this article proposes the following hypothesis: the development of the digital economy has a positive promoting effect on value-added tax revenue. The development of the digital economy has broken the time limit of transaction space. Under the platform economy, the existing digital economy is based on virtual trading venues, connecting consumers and suppliers, reducing transaction costs, vigorously promoting cross regional transfer of goods and services, and achieving value-added tax transfer in the production, sales, and consumption of goods and services.

3 INDEX MEASUREMENT AND ANALYSIS

3.1 Digital economy development index

With reference to Wu Xiaomian[9] and Xu Qishuang[10] selection of indicators for the digital economy development index, this paper decomposes the digital economy index into three dimensions, namely, the informatization development index, the Internet development index and the digital transaction development index. From the measurement results of the Digital Economy Development Index, it can be seen that there is a significant difference in the development index of the digital economy among provinces.

3.2 VAT deviation

The deviation rate of tax sources measures the imbalance of VAT in the horizontal distribution in various places, refer to Li Jianjun[5] and Gan JiaWu[3].For the calculation of tax deviation, the degree of VAT deviation in a certain region is the difference between the actual VAT revenue tax levied in the region and the applicable tax calculated according to the tax base and the average tax collection rate. Assuming that the levy rate is roughly the same, the deviation between VAT tax and tax sources is as follows:

$$vdr == 1 - D_i / T_i \frac{\theta_i \sum T_i}{T_i \sum \theta_i} \quad (1)$$

From tax outflow and tax inflow region comparison can see, the vast majority of the city is the Midwest provinces, the reason may be the lack of advantage, infrastructure and policy advantages than the eastern region, not through the region production meet

the consumer demand of local residents and buy products and services from other provinces, according to the principle of VAT tax outflow.

4 EMPIRICAL STUDY AND OUTCOME ANALYSIS

4.1 Model design

Build Model 1:

$$\ln VT_{it}=\alpha+\beta+\gamma+++Dei_{it}Control_{it}\delta_i\mu_t\varepsilon_{it} \quad (2)$$

Build Model 2:

$$Vdr_{it}=\alpha+\beta+\gamma+++Dei_{it}Control_{it}\delta_i\mu_t\varepsilon_{it} \quad (3)$$

$\ln VT_{it}$ $Vdr_{it}Dei_{it}$Among them, the logarithm of the VAT income in the t year of i city is the deviation rate of the VAT in the t year of i city, and the digital economy comprehensive development index in the t year of i city. It is the control variable, β is the explanatory variable coefficient, γ is the control variable coefficient, the individual fixed effect, the time fixed effect, and the random disturbance term.$Control_{it}\delta_i\mu_t\varepsilon_{it}$

4.2 Variable interpretation

(1) explained variables: The explained variable in this paper is the VAT revenue of each province (L og. VT) and VAT deviation rate (VDR), the data source of VAT revenue and the statistics of the National Bureau of Statistics, the VAT deviation rate adopts Li Jianjun (see above for specific measurement analysis)

(2) Interpretive variables: This paper selects the Digital Economy Development Index (DEI) as the explanatory variable, and draws on Liu Jun's [6]selection of digital economy indicators, Zhang Bin's [12]digital processing of digital economy, and the data standardization processing method of the Networked Preparation Index (NBI)

(3) Control variables; learn from Cao Jingtao[1],Yang Kang[11],Gu Cheng[4],According to the existing literature and research, the measurement model in this paper mainly includes the following control variables: urban-rural income gap (GAP), tax competition (LTC), industrial structure (Log. INDUS), Consumption scale (Log. CO), openness (Log. OPEN) and economic development level (Log.PGDP)

Variable description can be found in **Table 1**.

Table 1. Results of the descriptive statistical analysis

variable	Sample size	Mean	variance	Minimum	Maximum
Log.VT	210	6.325	.963	3.133	8.317
VDR	210	-.049	.268	-.946	.556
DEI	210	2.504	1.213	1.104	6.623
GAP	210	2.506	.352	1.842	3.445
LTC	210	.082	.028	.045	.188

Log.INDUS	210	4.505	.06	4.314	4.603
Log.OPEN	210	2.51	1.115	-.269	4.584
Log.CO	210	9.052	.933	6.543	10.696
Log.PGDP	210	10.981	.408	10.164	12.142

4.3 Empirical results

In this paper, the P-value was found to be less than 0.05, so the fixed-effect model was used for the regression analysis. The regression results are shown in **Table 2**. Table 2 column (1), (2) is the result of the regression of VAT income digital economy, column (2) for adding control variables after the regression results, according to the development of the digital economy growth of every unit will bring the VAT 0.2122 units of growth, the development of the digital economy has a positive effect on promoting VAT income. Column (3), (4) is listed in the digital economy of VAT deviation regression results, column (4) to join the regression after the control variables, by the column (4), the development of digital economy each growth a unit will bring tax deviation rate 0.225 units of growth, the development of digital economy will expand the VAT deviation between provinces, increase the imbalance of VAT transverse distribution.

Table 2. Benchmark regression results

variable	(1)	(2)	(3)	(4)
	Log.VT	Log.VT	VDR	VDR
DEI	0.2279***	0.2121***	0.1425*	0.2550***
	(0.0668)	(0.0519)	(0.0631)	(0.0585)
GAP	——	0.2271*	——	0.2735*
		(0.1039)		(0.1171)
LTC	——	5.7906***	——	5.7629***
		(0.7786)		(0.8779)
Log.INDUS	——	2.4401***	——	0.3556
		(0.7116)		(0.8024)
Log.OPEN	——	-0.1512***	——	-0.1130***
		(0.0224)		(0.0252)
Log.CO	——	0.3623***	——	0.3142***
		(0.0807)		(0.0909)
Log.PGDP	——	0.6436***	——	-0.4619**
		(0.1552)		(0.1750)
_cons	4.8632***	-17.1549***	-0.4506**	-1.2676
	(0.1661)	(3.3667)	(0.1568)	(3.7960)
Areafixed effect	Yes	Yes	Yes	Yes
Timefixed effect	Yes	Yes	Yes	Yes
Obs	210	210	210	210

Note: * * *, * *, * are significant at the 1%, 5%, and 10% levels, respectively, and the values in parentheses are the standard error values

4.4 Heterogeneity analysis

The results of heterogeneity analysis are shown in Table 3. The following table analyzes the regression results of the impact of the digital economy on value-added tax revenue and its degree of deviation based on geographical location and the proportion of secondary industry output value to GDP. We can see that the development of the digital economy has an impact coefficient of 0.9767 on value-added tax revenue in the central and western regions, and 0.2729 on the eastern regions. In comparison, the digital economy has a greater impact on the central and western regions. The impact of the digital economy on tax divergence is comparable in both regions.

Table 3. Heterogeneity analysis results

Variable	VT Eastern	VT Midwest	VDR Eastern	VDR Midwest	VT Low proportion	VT High proportion	VDR Low proportion	VDR High proportion
DEI	0.2729* (0.1292)	0.9767*** (0.2471)	0.3529* (0.1541)	0.2614 (0.6035)	0.9867** (0.2050)	0.3358 (0.2246)	0.9581*** (0.2185)	0.6990 (0.4118)
GAP	-0.1578 (0.3723)	0.1998 (0.5341)	-0.2069 (0.3558)	0.1675 (0.8681)	0.3483 (0.3519)	-0.3947 (0.5268)	0.4879 (0.3264)	-1.9727 (1.3288)
LTC	0.1047 (0.1315)	0.7984*** (0.0938)	0.1704 (0.1514)	0.9375*** (0.1529)	0.6553** (0.1957)	0.4529*** (0.0776)	0.8359*** (0.1937)	0.6086*** (0.1442)
INDUS	3.0995 (1.5545)	2.3988** (0.8683)	0.5967 (1.1296)	1.1690 (1.4613)	1.2912 (0.8009)	4.0616** (1.5347)	-0.8142 (0.9018)	4.5170 (2.8745)
CO	0.1897 (0.1261)	0.8105*** (0.1763)	0.0020 (0.1265)	0.8316* (0.3213)	0.4101** (0.1538)	0.5288*** (0.1279)	0.0595 (0.1191)	0.9686** (0.3075)
OPEN	0.0761 (0.0982)	-0.1277* (0.0492)	0.2669** (0.0976)	-0.1730*** (0.0495)	-0.0871 (0.0731)	0.0302 (0.0350)	-0.1073* (0.0458)	-0.0739 (0.0619)
PGDP	0.2371 (0.3038)	0.1341 (0.2201)	-0.8323* (0.4004)	-0.8465 (0.4356)	0.3724 (0.3237)	0.5221** (0.1666)	0.5221** (0.1666)	-1.2442** (0.4573)
_cons	-12.5602 (7.5412)	-12.7671*** (3.4320)	6.5583 (7.2381)	-1.6661 (6.6531)	-7.9131 (4.2224)	-21.6105** (6.6810)	0.6318 (4.0585)	-13.6598 (13.5436)
Regional fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Time fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.9977	0.9952	0.9677	0.9226	0.9949	0.9978	0.948	0.9174
Obs	84	126	84	126	105	105	105	105

5 CONCLUSIONS AND SUGGESTIONS

The results show that: (1) on the whole, the development of digital economy will promote the increase of tax revenue in our country, but our country the horizontal distribution of VAT is in an unbalanced state, parts of consumption more local governments did not get the corresponding VAT revenue, the gap between the provinces, will aggravate the tax deviation rate between provinces.(2) Further analysis shows that the development of digital economy has a more significant impact in the central and western regions, both from the perspective of VAT growth and the imbalance of horizontal distribution. Based on the above conclusions, the following suggestions are made:

First, the tax distribution system should be improved. It is suggested to rebuild the inter-regional tax distribution mechanism, quantify the contribution of regional consumption to tax, and adopt a more comprehensive measure method based on various factors, so as to reduce the imbalance of horizontal VAT distribution among regions.

The second is to strengthen tax collection and management, reduce negative tax competition between regions, establish a central unified tax system, avoid vicious tax competition between regions, and promote rational distribution of tax revenue among governments in the digital economy.

Third, accelerate the development of the underdeveloped areas of digital economy, promote the overall coordinated development among regions, and reduce the problem of uneven horizontal distribution of VAT from the source.

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