Frontiers in Economics and Management Volume 7 Issue 4, 2026
ISSN: 2692-7608 DOI: 10.6981/FEM.202604_7(4).0009

Tax Competition and Digital Industry Agglomeration

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Abstract

The digital economy has become a crucial engine driving high-quality development in China. Based on panel data of 296 prefecture-level cities in China from 2009 to 2022, this paper empirically examines the impact, mechanisms, and heterogeneity of inter-regional tax competition on the level of digital industry agglomeration. The findings are as follows: First, tax competition exerts a significant inhibitory effect on digital industry agglomeration, and this conclusion remains robust after a series of robustness tests. Second, mechanism analysis indicates that tax competition does not function directly but indirectly inhibits industrial agglomeration through the mediating pathway of "weakening fiscal investment intensity," revealing the underlying logic that it erodes the fiscal capacity of local governments and undermines the long-term development foundation of industries. Furthermore, heterogeneity analysis shows that the inhibitory effect is more pronounced in coastal regions, areas with a higher level of digital infrastructure, and regions with more preferential tax policies, highlighting the imbalance of policy effects. This paper provides new empirical evidence for understanding government behavior and the coordinated development of regional economies, and offers important theoretical basis and policy implications for optimizing regional policy coordination and transforming industrial policies from "race-to-the-bottom in taxation" to "environment creation."

Keywords

Tax Competition; Digital Industry Agglomeration; Fiscal Investment Intensity; Coordinated Development of Regional Economies.

1. Introduction

The Report to the 20th National Congress of the Communist Party of China emphasizes the important deployment of accelerating the construction of a Digital China. Under the new development pattern, the digital economy has become a crucial engine driving China's high-quality development (Fang and Liu; 2024Luo, 2022)[2][4]. With the development and application of digital technologies, digital elements in the economic system have demonstrated increasingly growing economies of scale and effects, and the capabilities of accumulation and analysis have been enhanced, thereby improving productivity and innovation capacity and presenting the characteristic of digital industry spatial agglomeration (Wang et al., 2022)[15]. Digital industry agglomeration is a new model of economic agglomeration, which converges and integrates a large number of digital economy industries, enterprises, talents, and innovative elements in specific regions through technical means such as digitalization, networking, and intelligent technologies, forming a synergistic ecosystem with strong economic competitiveness (Ren et al., 2021)[10]. The new economic geography model emphasizes the interaction between geographical location and economic activities.

On the one hand, digital industry agglomeration breaks the constraints of time and space. Through the construction of infrastructure and information platforms, it enables the free flow of production factors among different cities, realizes the sharing of resource endowments, and reduces diffusion costs, thereby providing more employment opportunities and promoting

ISSN: 2692-7608 DOI: 10.6981/FEM.202604_7(4).0009

economic growth (Hu et al., 2023; Peng et al., 2023;Yu et al., 2023)[3][9][19]. On the other hand, digital economy agglomeration boasts advantages such as green low-carbon development, energy conservation and consumption reduction, and efficient sharing. It can efficiently aggregate and allocate innovative resources, improve the efficiency of green technological innovation, achieve pollution and carbon reduction, and promote inclusive green growth, thus exerting a significant enabling effect on the improvement of urban green economic efficiency (Liu et al., 2024; Liu et al., 2024; Ma et al., 2024;Ren et al., 2022; Wang et al., 2023;Wu et al., 2023)[5][6][8][11][16][17][18].

As the cornerstone of modern national governance, tax policy design is not only related to fiscal revenue but also profoundly influences the flow of production factors and the pattern of industrial development. The theory of tax competition originated from the "voting with feet" theory proposed by Tiebout (1956), referring to a means by which different regions or countries adjust tax policies to attract investment and promote economic development (Wilson & Gordon, 2003)[13].This type of inter-regional competition centered on reducing the effective tax burden, while attracting mobile tax bases, may also trigger a series of complex economic consequences: on the one hand, it can serve as a positive policy signal to attract enterprises to settle in, forming a "policy haven" for industrial agglomeration; on the other hand, it may lead to low efficiency in market resource allocation, erode local fiscal capacity, and ultimately exert an inhibitory effect on industrial agglomeration that relies on an innovative ecosystem and long-term infrastructure.

Under the fiscal decentralization system, local governments' competition for resources will exacerbate the "race-to-the-bottom" phenomenon. Due to disadvantages in institutions and resource endowments, underdeveloped regions fall into a vicious circle of "low tax burden-weak public services-low attractiveness," while developed regions further strengthen resource agglomeration through their existing advantages, leading to an expanding trend in regional disparities. Therefore, in the current context, extending the research perspective from static "tax policies" to dynamic "tax competition" and accurately identifying its net effect and internal mechanism on digital economy agglomeration not only holds profound theoretical value but also constitutes an urgent requirement for optimizing regional policy coordination and guiding the high-quality development of the digital economy.

Based on the unbalanced panel data of 296 cities in China from 2009 to 2022, this paper finds the following: First, tax competition exerts a significant inhibitory effect on digital industry agglomeration, and this conclusion remains valid after a series of robustness tests. Second, mechanism analysis shows that tax competition does not function directly but indirectly inhibits industrial agglomeration through the mediating pathway of "weakening fiscal investment intensity," revealing the underlying logic that it erodes the fiscal capacity of local governments and undermines the long-term development foundation of industries. Furthermore, heterogeneity analysis indicates that the inhibitory effect is more pronounced in coastal regions, areas with a higher level of digital infrastructure, and regions with more preferential tax policies, highlighting the imbalance of policy effects.

Compared with the existing literature, the marginal contributions of this paper are as follows: First, this paper enriches the research on the influencing factors of digital industry agglomeration formation. Although existing literature has paid more attention to the economic effects of digital agglomeration, the discussion on its formation drivers, especially institutional drivers, remains insufficient(Liu et al., 2024; Liu et al., 2024; Ma et al., 2024;Ren et al., 2022; Wang et al., 2023;Wu et al., 2023)[5][6][8][11][16][17][18]. This paper incorporates tax competition, a key institutional variable, into the "core-periphery" analytical framework of new economic geography, revealing how inter-regional tax competition interactions affect the spatial distribution of digital factors and providing a theoretical supplement for understanding the new laws of industrial layout in the digital era. Second, this paper uncovers the potential

ISSN: 2692-7608 DOI: 10.6981/FEM.202604_7(4).0009

inhibitory effect of tax competition on digital industry agglomeration, offering new empirical evidence for understanding government behavior and the geographical pattern of the digital economy. Third, this paper reveals that the regional competition model overly relying on tax incentives may be counterproductive, providing important theoretical basis and policy implications for optimizing regional policy coordination and transforming industrial policies from "race-to-the-bottom in taxation" to "environment creation."

2. Theoretical Mechanisms and Research Hypotheses

According to the "competitive local government hypothesis" proposed by Tiebout (1956), under the fiscal decentralization system, local governments attract the flow of population and capital through differentiated policies, thereby forming an incentive mechanism that helps improve the efficiency of public services. In the absence of coordination mechanisms and regulatory constraints, tax competition is prone to evolve into a "race-to-the-bottom," which in turn undermines institutional efficiency (Wilson,1999)[14]. From a micro perspective, to attract corporate investment, local governments directly affect enterprises' cost structures and location choices by reducing tax rates, narrowing tax bases, or providing fiscal subsidies. Due to weak foundations, underdeveloped regions are at a disadvantage in competition and struggle to attract high-quality factors. From a macro perspective, tax competition behavior exhibits typical characteristics of a "non-cooperative game," deviating from the Pareto optimal state. This reduces the capacity of public service supply, impairs regional coordination mechanisms, and is not conducive to coordinated regional development. Based on the above analysis, this paper proposes:

H1: Tax competition significantly inhibits digital economy agglomeration.

Tax competition conducted by local governments to attract mobile tax bases essentially directly reduces their current and long-term fiscal revenue, thereby generating a "crowding-out effect" on the government's public investment capacity. For industries such as the digital industry, which are highly dependent on digital infrastructure, technological innovation environments, and public services for high-quality talents, continuous and strong fiscal investment by the government constitutes an indispensable strategic supply for maintaining their agglomeration ecosystem. When excessive tax competition erodes government fiscal capacity, leading to reduced investment in areas such as digital infrastructure, R&D subsidies, and human capital development, it will directly weaken the region's long-term attractiveness to digital enterprises and its industrial support capacity. Therefore, this paper anticipates that tax competition not only exerts a direct impact but also significantly inhibits digital industry agglomeration through the channel of weakening fiscal investment intensity. Based on the above analysis, this paper proposes:

H2: Tax competition significantly inhibits digital economy agglomeration by weakening fiscal investment intensity.

3. Research Design

3.1. Empirical Method

To investigate the inhibitory effect of tax competition on digital industry agglomeration, this paper constructs the following benchmark model:

$$Agg_{it} = \alpha + \beta Tax_{it} + \gamma X_{it} + \nu_t + \delta_i + \varepsilon_{it} \quad (1)$$

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Where i denotes the city and t denotes the year. Standard errors are clustered at the city level. Aggit represents digital industry agglomeration, Taxit denotes tax competition, and Xit is a set of control variables. νt and δi stand for individual fixed effects and time fixed effects, respectively, and εit is the random error term.

3.2. Variable Definition

3.2.1. Dependent Variable

Tax Competition (Tax). Local government tax competition in China mainly focuses on the secondary and tertiary industries, with little involvement in the primary industry characterized by zero or low tax burdens. Therefore, this paper measures the intensity of inter-regional tax competition by the ratio of the sum of tax revenues from value-added tax (VAT), business tax (BT), corporate income tax (CIT), and personal income tax (PIT)-which are closely related to regional factor mobility-to the added value of the secondary and tertiary industries. The specific calculation process is shown in Equation (2):

$$Tax_{it} = 1 - \frac{VAT_{it} + BT_{it} + CIT_{it} + PIT_{it}}{Y_{2it} + Y_{3it}} \tag{2}$$

Where VATit , BTit, CITit , and PITit espectively represent the VAT revenue, business tax revenue, corporate income tax revenue, and personal income tax revenue of city i in year t; Y2it denotes the added value of the secondary industry of city i in year t; and Y3it denotes the added value of the tertiary industry of city i in year t. A higher value of Taxit ndicates a more intense level of local tax competition.

3.2.2. Independent Variable

Digital Industry Agglomeration (Agg).The digital industry includes digital equipment manufacturing, digital information transmission, digital technology services, digital content and media, and related services. This paper uses the location quotient index of employees engaged in the telecommunications, other information transmission services, computer services, and software industries in each city to characterize digital industry agglomeration, as shown in Equation (3):

$$Agg_{it} = \frac{Edry_{it} / Es_{it}}{\sum Edry_{it} / \sum Es_{it}} \tag{3}$$

Where Edryit represents the scale of digital industry employees in city i in year t; Esit represents the total number of employees in city i in year t; Edryit represents the national total scale of digital industry employees in year t; and Esit represents the national total number of employees in year t.

3.2.3. Control Variable

The impact of tax competition on digital industry agglomeration is multifaceted and not determined by a single factor. To improve the reliability of the research results, the following control variables are adopted:Economic development level (growth): Measured by the urban GDP growth rate;Human capital (wage): Measured by the logarithm of the average wage of employees;Financial development level (finance): Measured by the winsorized urban fiscal gap;Industrial structure (struc): Measured by the ratio of the added value of the secondary industry to GDP.

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3.3. Data Source and Sample

This paper selects unbalanced panel data of 296 cities in China from 2009 to 2022 to focus on investigating the impact of tax competition on digital industry agglomeration. Among them, the data for various indicators are mainly sourced from the CSMAR Database, the China Statistical Yearbook, as well as the statistical yearbooks of the National Bureau of Statistics and various provinces (autonomous regions and municipalities directly under the Central Government), resulting in a total of 2,409 observations. The descriptive statistics are presented in Table 1.

Table 1. Summary statistics of main variables

VARIABLES	Obs	Mean	SD	Min	Median	Max
Agg	2409	0.7021	0.637	0.06	0.52	6.70
Tax	2409	0.9745	0.015	0.85	0.98	1.00
growth	2409	0.0985	0.084	-0.37	0.09	0.61
wage	2409	10.8970	0.426	8.89	10.91	12.68
finance	2409	1.4171	1.353	-0.01	1.06	10.80
struc	2409	0.4673	0.102	0.12	0.47	0.82

4. Empirical Results

4.1. Baseline Results

Table 2. Baseline results.

	(1)	(2)
VARIABLES	*Agg*	*Agg*
Tax	-4.219**	-4.095**
	(-2.19)	(-2.12)
growth		-0.075
		(-0.68)
wage		0.089
		(1.32)
finance		-0.009
		(-0.38)
struc		-0.311
		(-1.13)
Constant	4.813**	3.888*
	(2.57)	(1.87)
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	2,409	2,409
R-squared	0.771	0.771

Note: Values in parentheses are t-values; ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The same applies to the table below.

To further explore the impact of tax competition on digital industry agglomeration, this paper conducts regression analysis based on the benchmark model, and the results are presented in

ISSN: 2692-7608 DOI: 10.6981/FEM.202604_7(4).0009

Table 2. Column (1) does not include any control variables, and the coefficient of *Tax* is -4.219, which is significantly negative, initially verifying the inhibitory effect of tax competition on digital industry agglomeration. After adding control variables in Column (2), the coefficient of *Tax* remains significantly negative at the 5% statistical level. This result strongly supports Hypothesis **H1** of this study, namely that inter-regional tax competition exerts a significant inhibitory effect on digital industry agglomeration. From an economic perspective, for each 1-unit increase in *Tax*, *Agg* will decrease by approximately 4.095 percentage points. High tax competition may not effectively promote geographical concentration in the digital industry; instead, it may inhibit digital industry agglomeration by distorting market signals, leading to resource misallocation, or triggering low-level "race-to-the-bottom" competition among various regions.

4.2. Robustness Analysis

First, excluding samples from special years. This paper eliminates the sample data of 2020 to avoid the impact of the special period of the pandemic on the regression results. The results of the re-regression are shown in Column (1) of Table 4. The coefficient of *Tax* is -4.187, which remains significantly negative at the 5% level. Second, considering the lag effect. The dependent variable *Agg* is replaced with the one-period lagged *L_Agg* for re-regression, and the results are presented in Column (2) of Table 3. The negative effect of tax competition remains significant. Third, removing extreme values. To exclude the potential impact of outliers or extreme values in the sample data on the regression results, this paper conducts re-regression after eliminating extreme values, and the results are shown in Column (3) of Table 3. The coefficient of *Tax* is -4.027, which remains significant at the 5% level. In summary, after a series of robustness tests, the impact of *Tax* on *Agg* is significantly negative at the 5% level, thereby further verifying the robustness of the core Hypothesis **H1** of this paper.

Table 3. Robustness analys

	(1)	(1)	(2)
VARIABLES	*Agg*	*L_Agg*	*Agg*
Tax	-4.187**	-3.874**	-4.027**
	(-2.04)	(-2.03)	(-2.21)
Constant	3.841*	3.484	5.114**
	(1.74)	(1.59)	(2.28)
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	2,217	2,408	2,409
R-squared	0.763	0.677	0.737

4.3. Mechanism Analysis

According to the theoretical analysis, tax competition indirectly affects digital industry agglomeration through fiscal investment intensity. To verify Hypothesis **H2** , this paper constructs *invest* as the ratio of government fixed asset investment to general government fiscal expenditure, and uses it as an intermediary variable for mechanism testing. The regression results are presented in Table 4. In Column (2), the coefficient of *Tax* is significantly negative at the 1% level, indicating that intense inter-regional tax competition significantly crowds out the disposable fiscal capacity of local governments. The underlying logic is that tax reduction and exemption policies implemented to attract mobile tax bases directly reduce local governments'

ISSN: 2692-7608 DOI: 10.6981/FEM.202604_7(4).0009

fiscal revenue, thereby weakening their fiscal capacity to conduct fixed asset investment and support industrial development. Furthermore, the coefficient of *invest* in Column (3) is significantly positive, confirming that the improvement of government investment intensity is indeed an important factor promoting digital industry agglomeration. Meanwhile, the absolute value of the *Tax* coefficient decreases but remains statistically significant, thus verifying Hypothesis **H2** of this paper: tax competition inhibits digital industry agglomeration by weakening fiscal investment intensity.

Table 4. The results of mechanism analysis

	(1)	(2)	(3)
VARIABLES	*Agg*	*invest*	*Agg*
Tax	-4.095**	-3.698***	-3.540*
	(-2.12)	(-2.94)	(-2.89)
invest			0.350*
			(2.13)
Constant	3.888*	-32.421***	3.645*
	(1.87)	(-3.10)	(1.72)
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	2,409	2,334	2,334
R-squared	0.771	0.758	0.775

5. Further discussion: Heterogeneity Analysis

First, geographical location. Coastal regions typically possess a highly developed transportation network, an open economic system, and a sound financial market, which provide unique conditions for the free flow of factors. Therefore, digital enterprises in coastal regions are extremely sensitive to changes in tax costs. Any subtle adjustment to tax policies will be quickly captured by enterprises and incorporated into their location decision-making, thereby triggering rapid factor reallocation. To this end, this paper constructs a dummy variable (*c_sea*) for geographical location to conduct grouped regression, where (*c_sea* = 1) for coastal regions and (*c_sea* = 0) otherwise. The results are presented in Columns (1) ~ (2) of Table 5. The coefficient of *Tax* is significantly negative only in coastal regions, while it is insignificant in inland regions. This indicates that in coastal regions with high factor mobility and active market economies, intense tax competition is more likely to distort the market mechanism, thereby exerting a significant inhibitory effect on industrial agglomeration.

Second, digital infrastructure. At the current stage of development, the level of urban infrastructure construction has become a key factor attracting the inflow of capital factors in the advanced digital industry (Du and Wang, 2024; Ma and Lin, 2023; Wang and Shao, 2024)[1][7][17]. Therefore, to explore whether the level of digital infrastructure affects the impact of tax competition on digital industry agglomeration, this paper uses the entropy weight method to calculate the scores of various digital infrastructure indicators, forming an indicator system for the development level of new digital infrastructure. A dummy variable (*DNI*) for digital infrastructure is constructed based on the median of the scores, where (*DNI* = 1) for the group with a high level of digital infrastructure and (*DNI* = 0) otherwise. The regression results are presented in Columns (3) ~ (4) of Table 5. The inhibitory effect of *tax* competition is more

ISSN: 2692-7608 DOI: 10.6981/FEM.202604_7(4).0009

significant in regions with a higher level of digital infrastructure, while it is insignificant in the low-level group. This indicates that in regions with advanced digital infrastructure, the location choice of industrial agglomeration should have focused more on market efficiency and infrastructure advantages. However, excessive tax competition distorts this efficiency-based decision-making process, resulting in the level of digital infrastructure not enhancing the policy effect of tax competition, but instead highlighting its negative inhibitory effect.

Finally, the policy environment. As a policy tool, tax incentives exhibit a significant diminishing marginal return effect. In regions where tax incentives are not yet widespread, taking the lead in offering incentives can generate a strong "policy signal" to attract enterprises to settle in, and the positive marginal utility of the policy is relatively high at this time. However, when tax incentives have become a standard configuration in a region, the marginal return of any single region attempting to gain a competitive advantage by further increasing the intensity of incentives will gradually diminish. Eventually, all regions will fall into a vicious trap of ineffective competition. Therefore, to verify the heterogeneity of the policy environment, this paper constructs a tax incentive indicator: total tax and fee rebates received / (total tax and fee rebates received plus total taxes and fees paid). A dummy variable is assigned a value of 1 for regions with values above the median of the indicator (high tax incentive group), and 0 otherwise (low tax incentive group). The results of the grouped regression are presented in Columns (5) ~ (6) of Table 5. The significant inhibitory effect of tax competition on digital industry agglomeration is only reflected in regions with high tax incentives. This indicates that when tax incentives have become a universal policy, excessive tax competition not only fails to bring new momentum for digital industry agglomeration but may also exacerbate regional internal friction, highlighting the urgency of policy coordination.

Table 5. The results of heterogeneous analysis

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	*Agg*	*Agg*	*Agg*	*Agg*	*Agg*	*Agg*
Tax	-8.083**	-1.280	-7.671***	-0.806	-4.624**	-3.847
	(-2.31)	(-0.75)	(-2.77)	(-0.41)	(-2.07)	(-1.30)
Constant	8.638	0.922	6.862**	1.484	2.886	4.196
	(1.51)	(0.52)	(2.30)	(0.67)	(1.17)	(1.38)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	491	1,918	1,484	925	1,168	1,197
R-squared	0.789	0.774	0.790	0.737	0.820	0.761

6. Conclusion

Based on the above research conclusions, this paper puts forward the following policy recommendations to guide tax policies to better serve the high-quality agglomeration of the digital industry and coordinated regional development:

First, promote the coordination of regional tax policies and shift from "race-to-the-bottom competition" to "collaborative win-win"

The research conclusions show that widespread tax competition, especially in policy-intensive regions, has a more prominent inhibitory effect. This warns us that the strategy of a single region "advancing alone" by relying on tax incentives is no longer effective in the digital age and

ISSN: 2692-7608 DOI: 10.6981/FEM.202604_7(4).0009

may even have negative effects. The central government should take the lead in establishing a coordinated mechanism for regional tax policies, such as setting up a "negative list" or "upper limit standard" for tax incentives to curb the "race-to-the-bottom competition" among local governments. The policy focus should shift from competing for "policy depressions" to jointly building "development highlands", and guide regions to form a healthy pattern of functional complementarity and differentiated development.

Second,optimize the fiscal expenditure structure and strengthen "effective investment" to replace "ineffective preferential policies"

Mechanism tests confirm that tax competition exerts negative impacts by weakening fiscal investment intensity. This implies that compared with tax reductions and concessions, increasing efficient fiscal investment is a more optimal path to promote digital industry agglomeration. Local governments should optimize their expenditure structure, redirecting limited fiscal resources from simple tax reductions to increasing long-term investments in digital infrastructure, scientific and technological innovation, and the introduction and cultivation of high-end talents. Only by improving irreplaceable "hard and soft" environments such as infrastructure levels and human capital quality can core competitiveness be formed to attract and retain digital enterprises.

Third, Implement differentiated and targeted industrial policies to avoid a "one-size-fits-all" approach

Heterogeneity analysis reveals that the negative effects of tax competition are more prominent in regions such as coastal areas and those with advanced digital infrastructure. Therefore, policy formulation must reflect differentiation. For regions with solid industrial foundations and high market maturity (e.g., coastal cities), the order of tax incentives should be strictly regulated, and they should be encouraged to enhance attractiveness through non-tax means such as improving governance capacity, protecting intellectual property rights, and optimizing the innovation ecosystem. For underdeveloped regions such as inland areas, a certain degree of policy flexibility can be granted on the premise of strengthening fiscal discipline and performance assessment, but the core goal should be to consolidate the foundation for industrial development rather than engaging in low-level cost competition.

Finally, Establish and improve a local government performance appraisal system oriented to high-quality developmentBehind tax competition lies the traditional appraisal orientation centered on GDP growth. To fundamentally reverse this situation, it is necessary to reform the incentive and restraint mechanism for local officials. It is suggested to incorporate indicators such as the quality of digital industry development (e.g., innovation capability, industrial chain integrity), business environment satisfaction, and fiscal sustainability into the core appraisal system, guiding local governments to transform from "competitors" pursuing short-term behaviors to long-term "service providers" and "environment builders."

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