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Tax Competition, Capital Flow, and the Innovation Efficiency of Industrial Enterprises

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Abstract: Many countries use tax competition tools to stimulate enterprises to improve innovation efficiency. Consequently, in China, does tax competition have an incentive effect on the improvement of enterprise innovation efficiency, and what is the existing mechanism? Considering the characteristics of industrial enterprises engaged in various innovative activities to achieve sustainable competitive advantage and taking the panel data of industrial enterprises in 31 provinces and regions of China from 2011–2018 as the research object, this paper empirically studies the influence of tax competition and its mechanism on the innovation efficiency of industrial enterprises. It is shown that excessive tax competition in China hinders the improvement of the innovation efficiency of industrial enterprises, in which capital flow plays a partially mediating role. Further research shows that after the implementation of an innovation-driven development strategy, the degree of tax competition in China was reduced, which alleviated the adverse impact of excessive tax competition on the innovation efficiency of industrial enterprises, and capital flow also reduced this negative effect. The results reflect the good effect of implementing an innovation-driven development strategy in China, and it also shows that excessive government intervention is not conducive to the effective allocation of market resources. Tax Competition is a double-edged sword; therefore, it is necessary to promote the innovation efficiency of industrial enterprises by combining promising government and an effective market. The conclusions are important for the appropriate shaping of fiscal policy.

Keywords: tax competition; capital flow; China's innovation-driven development strategy; innovation efficiency of industrial enterprises in China

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1. Introduction

Innovation is the first driving force leading sustainable economic development, and it is the key element in national competition. Therefore, innovation must be placed at the core of national development [1]. Many countries such as Belgium, France, Germany, and America, use tax incentives, government subsidies, and other tax competition tools to stimulate enterprises to increase innovation activities and innovation efficiency [2]. For one thing, as one of the most competitive emerging economies, it is worth considering whether China should also adopt tax competition to improve enterprise innovation efficiency and its mechanism. For another, industry is the most important industrial carrier of national technological innovation, and industrial enterprises are the leading force of national scientific and technological progress, which determines the important position of innovation efficiency in the whole country. Industrial enterprises engage in innovation activities to achieve a sustainable competitive advantage [3]. However, innovation is a complex input–output process that requires a huge capital investment; it is not enough to improve innovation efficiency under the condition of limited innovation resources through market power. It is also necessary for the government to attract capital by means of tax competition such as tax preference. The local government adopts the means of tax competition to improve the return rate of capital to attract capital inflows into its jurisdiction and to provide available funds for enterprises to invest in innovation activities, thus affecting the

innovation efficiency of enterprises. Therefore, it is worth studying the concrete effect and the possible mechanisms of tax competition.

Tax competition generally refers to the self-interested behavior of governments to reduce effective tax rates in their jurisdictions by means of implementing tax incentives in order to attract capital and other factors of production from other regions. Scholars have carried out a series of studies on tax competition, confirming that tax competition is widespread among countries [4–6]. Zodrow and Mieszkowski (1986) and Wilson (1986) have established tax competition models, and they have shown that there exists tax competition between regions, which reduces tax rates and government public expenditure [7,8]. Janeba and Osterloh (2013) have used German data to establish a theoretical model of local tax competition to show that large jurisdictions (cities) compete locally with smaller neighboring communities and inter-regionally with distant cities, while small jurisdictions (the interior) only compete with other jurisdictions in neighboring areas [9]. Chirinko and Wilson (2017) used panel data for the period 1965–2006 from the United States to estimate the capital tax reaction function, and they found that the slope of the reaction function was negative, that is, tax competition exists—it is not a bottom-by-bottom competition but a "sitting on the seesaw" [10].

In order to comprehensively improve the innovation efficiency of enterprises and to accelerate industrial transformation and upgrading, local governments have adopted tax competition to support enterprises in improving innovation efficiency. However, whether the implementation of various means of tax competition can really promote the improvement of corporate innovation efficiency has aroused widespread attention and in-depth research in the academic community.

Some studies have found that the influence of tax competition on enterprise innovation efficiency is uncertain. For example, after combing the literature on the relationship between American tax preference policy and enterprise innovation efficiency, Mansfield (1982) found that the outcome was uncertain due to the limitation of measurement conditions and methods at that time [11]. Some scholars hold positive opinions. For example, Czarnitzki et al., (2011) have shown that preferential tax policies can improve the innovation efficiency of manufacturing enterprises using Canadian data [12]. Ehsan (2021) has found that the implementation of tax incentives and other tax competition measures for the R&D activities of small and medium-sized enterprises in the UK encouraged these enterprises to increase investment in innovation activities and to improve innovation efficiency [13].Some scholars such as Catozzella and Vivarelli (2016) hold negative opinions, using data from Italy to study and to find that enterprises get preferential treatment through tax competition from the government but do not increase innovation efficiency correspondingly [14]. Du and Mickiewicz (2016) conclude that the administrative approval of China's tax preference policies is seriously subjective and arbitrary and lacks relevant constraints, leading to the loss of innovation efficiency caused by the rent-seeking of enterprises [15].

To sum up, existing literature generally studies the impact of tax competition on overall enterprise innovation efficiency, but it does not consider the heterogeneity of enterprises, and the results also show that the effect of tax competition on enterprises innovation efficiency may be a promoter or hinderance. Therefore, as industrial enterprises are an important category of enterprises, whether tax competition has the same impact on the innovation efficiency of industrial enterprises as the overall enterprise is uncertain, and it needs further verification. Therefore, two competitive hypotheses are put forward:

H1a. *Tax competition promotes the improvement of industrial enterprises' innovation efficiency.*

H1b. *Tax competition hinders the improvement of industrial enterprises' innovation efficiency.*

The government adopts tax incentives and other tax competition methods for industrial enterprises, which has a signal transmission effect. It can send high-quality signals to the capital market and guide capital to flow to these enterprises. Chowdturya and Maung (2012) show that perfect capital markets reduce regional information asymmetry and the transaction costs of enterprises, and thus make capital flows more efficient and

better improve the innovation efficiency of enterprises [16]. Defects in the capital market aggravate enterprises' situations of external financing constraints through strong information asymmetry between investors and enterprises on the quality of innovation projects. In this case, the lack of funds for enterprises to carry out some innovation projects has harmed innovation efficiency to a certain extent [17].

According to the above literature review, it can be seen that tax competition influences the innovation efficiency of industrial enterprises by guiding capital flows. Therefore, the second research hypothesis of this paper is proposed:

H2. *Capital flow plays a mediating role in the relationship between tax competition and innovation efficiency of industrial enterprises.*

In summary, this paper studies the influence of tax competition and its mechanisms on the innovation efficiency of industrial enterprises using data for 31 provinces and regions of China from 2011–2018. The main conclusion is that excessive tax competition in China hinders the improvement of the innovation efficiency of industrial enterprises in which capital flow plays a partially mediating role. Further research shows that after the implementation of the innovation-driven development strategy, the degree of tax competition in China reduced, which alleviated the adverse impact of excessive tax competition on the innovation efficiency of industrial enterprises, and capital flow also reduced the negative impact.

This paper has the following contributions. First, the existing literature generally directly studies the relationship between tax competition and enterprise innovation, and it does not consider the influence mechanism; for example, Mukherjee et al., (2017) only find that there exists a negative relationship between state corporate tax rates and enterprise innovation, and they do not deeply explore the specific mechanism of this impact [18]. Second, this paper notes that the degree of excessive tax competition decreased after the implementation of the innovation-driven development strategy, thus alleviating the degree of reduction in the innovation efficiency of industrial enterprises; the innovation-driven development strategy is implemented by the Chinese government and it has Chinese characteristics, but the economic effects of this strategy are also instructive to other countries. Third, most of the related studies focus on micro-econometric evidence, while this paper focuses on the macro level.

The rest of this paper is set up as follows: the first part is a literature review, and it puts forward the research hypotheses; the second part is the research design; the third part is the empirical process and the results discussion; and the last part is the conclusion and suggestions for further research.

2. Research Design

2.1. Sample and Data Sources

In this paper, the data of industrial enterprises in 31 provinces (cities and districts) from 2011 to 2018 are selected from the following books: CHINA STATISTICAL YEARBOOK ON SCIENCE AND TECHNOLOGY, CHINA INDUSTRY STATISTICAL YEARBOOK, and China Economic and Social Big Data Research Platform. In order to eliminate the influence of extreme outliers in the original data, the variables in this paper are tailed at the 1% level.

Since 2011, the book CHINA STATISTICAL YEARBOOK ON SCIENCE AND TECHNOLOGY has adjusted the statistical scope of industrial enterprises; the data for 2019 has not yet been released. Therefore, the sample scope of this article is selected from 2011 to 2018.

2.2. Model Design

Tax competition adopted by regions in China to compete for capital and other production factors leads to the cross-regional flow of capital, which will have an impact on the innovation efficiency of industrial enterprises in the region. In this process, capital flow

plays a mediating role. In order to test the influence and the mechanism of tax competition on the innovation efficiency of industrial enterprises, the mediating effect model is established, including Models (1)–(3):

$$INEF_{it} = c_0 + c_1TC_{it} + STATE_{it} + SIZE_{it} + YEAR + u_1 \quad (1)$$

$$CF_{it} = a_0 + a_1TC_{it} + a_2SC_{it} + a_3HC_{it} + a_4MZ_{it} + a_5AIS_{it} + a_6FD_{it} + a_7MA_{it} + YEAR + u_2 \quad (2)$$

$$INEF_{it} = b_0 + b_1TC_{it} + b_2CF_{it} + b_3STATE_{it} + b_4SIZE_{it} + YEAR + u_3 \quad (3)$$

Within Models (1)–(3), i refers to the region, t represents the year, and u_1–u_3 indicate the random error of each model; YEAR means the fixed effect of years, and other symbols are shown in Table 1; the selection and calculation methods of variables of Table 1 are in the Section 2.3.

Table 1. Definitions of variables.

Variable Type	Variable Name	Variable Symbol	Variable Description
Explained variable	Innovation efficiency of industrial enterprises	INEF	Value calculated through Super-efficiency DEA model
Explanatory variable	Tax competition	TC	Ratio of China's overall average tax rate to regional average tax rates
Mediating variable	Capital flow	CF	Ratio of actual utilization of foreign capital to local GDP
Control variables	Status of property rights	STATE	Proportion of operating income of state-owned holding industrial enterprises in total income
	Average scale of enterprises	SIZE	Ratio of operating income of industrial enterprises above designated size in total income
	Regional science and technology level	SC	Ratio of trade in technology markets to local GDP
	Regional human capital level	HC	Logarithm of the ratio of the number of college students per 10,000 people to the total population at the end of the year in the area
	Marketization degree	MZ	Logarithm of employment in local private enterprise
	Advanced level of regional industrial structure	AIS	Ratio of the output value of the tertiary industry to the secondary industry
	Regional financial deepening level	FD	Ratio of deposit and loan balances of regional financial institutions to the local GDP
	Market accessibility	MA	Ratio of regional urban road mileage to urban road area

2.3. Variable Definitions

2.3.1. Explained Variable: Innovation Efficiency of Industrial Enterprises (INEF)

The innovation efficiency of industrial enterprises measures their innovation ability, and it is the innovation output that a unit of innovation input can produce. The internal expenditure of R&D funds and the full-time equivalent of R&D personnel are selected as the innovation inputs (capital input and manpower input) of industrial enterprises, and the number of patent applications and the sales income of new products are selected as the innovation outputs of industrial enterprises.

To eliminate the influence of dimension, each index is divided by the sum of the corresponding indexes in the current period and transformed into the relative level. With the help of DEAP2.1 software, the innovation efficiency of industrial enterprises is calculated by using the super-efficiency DEA Model, which can rank the relative efficiency of all decision units compared with the traditional DEA method [19]. On this basis, the overall leading degree of relative efficiency of decision units can be measured in a certain period of time. Therefore, the efficiency of the decision unit can be more accurately tested, and its position in peer innovation can be accurately grasped [20].

2.3.2. Explanatory Variable: Tax Competition (TC)

According to Fu and Zhang (2007), tax competition is measured by the formula: $TC_{it} = (TAX_t/GDP_t)/(TAX_{it}/GDP_{it})$ [21] where TAX_t means China's overall tax revenue in year t and GDP_t means China's GDP in year t, TAX_t/GDP_t refers to the ratio of China's tax revenue to GDP in year t. Similarly, TAX_{it}/GDP_{it} represents the ratio of tax revenue to GDP in region i of China in year t. The higher the TC value in a certain area, the higher the degree of tax competition in the area.

2.3.3. Mediating Variable: Capital Flow (CF)

The entry of FDI will cause China's domestic capital to flow across regions [22]. Based on this, the ratio of actual use of foreign capital to local GDP is used as a proxy variable for regional capital flows. The larger the value, the larger the scale of capital flows in a certain region.

2.3.4. Control Variables

The mediation effect consists of three models. The dependent variables of Model (1) and Model (3) are the innovation efficiency of industrial enterprises, and the dependent variable of Model (2) is the capital flow. Considering that the factors affecting the two dependent variables are different, this paper sets the relevant control variables, respectively.

The control variables that affect the innovation efficiency of industrial enterprises include the status of property rights (STATE) and the average scale of enterprises (SIZE). Considering the availability of data, the status of property rights (STATE) is measured by the proportion of operating income of state-owned holding industrial enterprises in total income, and the average scale of enterprises (SIZE) is measured by the ratio of operating income of industrial enterprises above the designated size in total income.

The control variables that affect regional capital flows contain the following variables: the regional science and technology level (SC) is measured by the ratio of trade in technology markets to local GDP; regional human capital levels (HC) are expressed as the logarithm of the ratio of the number of college students per 10,000 people to the total population at the end of the year in the area; marketization degree (MZ) is indicated by the logarithm of employment in local private enterprises; advanced level of regional industrial structure (AIS) is calculated by the ratio of the output value of the tertiary industry to the secondary industry; regional financial deepening level (FD) is represented by the ratio of deposit and loan balances of regional financial institutions to the local GDP; and market accessibility (MA) is shown by the ratio of regional urban road mileage to urban road area.

In conclusion, Table 1 summarizes the variables in this article.

3. Empirical Process and Results Discussion

3.1. Descriptive Statistics

Table 2 contains the descriptive statistics of the main variables in this paper. The difference between the maximum and the minimum value of INEF indicates that the innovation efficiency of industrial enterprises varies greatly in different regions of China; the difference between the maximum and the minimum value of TC is very large, the mean value is close to the maximum value, indicating that the degree of tax competition varies greatly in different regions of China, and there may be excessive tax competition in general; the small

average value of CF indicates that China's inter-provincial capital flows are relatively small, reflecting from the side that excessive tax competition has not achieved the goal of attracting capital flows to a certain scale; for the control variables, except for the small difference between the maximum and the minimum value of STATE, the other variables differ greatly, indicating that the operating income of state-owned holding industrial enterprises is relatively evenly distributed in China, and other conditions vary greatly between regions.

Table 2. Descriptive statistics.

Variables	Sample Size	Mean	Standard Deviation	Minimum Value	Maximum Value
INEF	248	0.648	0.212	0.220	1
TC	248	2.321	0.61	0.906	3.763
CF	248	0.023	0.021	0	0.140
SC	248	0.013	0.026	0	0.154
HC	248	5.208	0.272	4.474	5.809
MZ	248	5.714	1.055	3.208	7.838
AIS	248	1.142	0.621	0.554	4.165
FD	248	0.497	0.507	−0.165	2.856
MA	248	0.512	0.070	0.334	0.693
SIZE	248	3.255	1.002	1.297	6.414
STATE	248	0.032	0.019	0	0.087

3.2. Regression Results of Mediating Effect

The mediating effect model can explain how tax competition affects the innovation efficiency of industrial enterprises, i.e., the mechanism.

Tables 3 and 4 are the regression results of the model. Combined with the model in Section 3.2, we can see that the coefficient c1 of Model (1) is −0.1280 and it is significant at a 1% level, indicating that a mediating effect exists; the coefficient a1 of Model (2) is −0.0051, and it is significant at a 5% level, while the coefficient b2 of Model (3) is 0.5970 and not significant. Therefore, the bootstrap method is needed for the next step. The bootstrap test result in Table 4 shows that the bootstrap 95% confidence interval of indirect effects is [−0.0327, −0.0028], and the confidence interval does not include 0, indicating that the indirect effect is significant, that is, capital flow plays a mediating effect in the relationship between tax competition and the innovation efficiency of industrial enterprises. Coefficient b1 of Model (3) is −0.1210, and it is significant at a 1% level, the value of a1 × b2 has the same sign as the value of b1. Therefore, capital flow plays a partial mediating role, which verifies hypothesis two.

Table 3. Regression results.

Serial Number	(1)	(2)	(3)
Variables	**INEF**	**CF**	**INEF**
TC	−0.1280 ***	−0.0050 **	−0.1210 ***
	(−6.61)	(−2.20)	(−5.94)
CF			0.5970
			(1.06)
SIZE	−0.0830 ***		−0.0800 ***
	(−7.08)		(−6.67)
STATE	4.2280 ***		4.1970 ***
	(7.17)		(7.11)
ST		−0.4930 ***	
		(−6.15)	
HC		0.0350 ***	
		(6.83)	
MZ		−0.0043 ***	
		(−3.57)	

Table 3. *Cont.*

Serial Number	(1)	(2)	(3)
Variables	**INEF**	**CF**	**INEF**
AIS		−0.0040	
		(−0.93)	
FD		0.0330 ***	
		(8.39)	
MA		0.0190	
		(1.04)	
Year	Control	Control	Control
N	248	248	248
R^2	0.334	0.378	0.337
F	39.02	18.58	29.56

Note: the Prob > F of the model is 0.0000, and the *t* statistics are shown in parentheses, * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 4. Bootstrap Test results.

Explanatory Variables	Effect	Coefficient	Bootstrap Standard Error	Normal-Based Confidence Interval (95%)	
TC	Indirect effect	−0.0137	0.0079	−0.0327	−0.0028
	Direct effect	−0.0553	0.0224	−0.0977	−0.0124

Specifically, the coefficient of TC in Table 3 (1) is −0.1280, indicating that the innovation efficiency of industrial enterprises decreases by approximately 13% when the degree of tax competition increases by 1%. This result shows that in China there may be excessive tax competition which hinders the improvement of industrial enterprises' innovation efficiency. The conclusion verifies hypothesis H1b.The above results reflect excessive tax competition in China results in lower actual average tax rates and lower local tax revenues, which makes local governments lack sufficient resources to create an infrastructure environment conducive to improving the innovation efficiency of enterprises [23]. On the other hand, China's current tax incentives are numerous and complex, with many restrictive conditions, some of which are still in a state of continuous improvement and instability, leading to higher costs of tax compliance and leaving enterprises with no time or funds to carry out innovation activities, which will inevitably hinder enterprises from improving innovation efficiency. This above conclusion shows that when the degree of tax competition exceeds a certain range or even reaches the degree of vicious competition, it will restrain innovation. Therefore, tax competition is a double-edged sword for the innovation efficiency of enterprises.

The coefficient of TC in column (2) of Table 3 is −0.0050, which shows that in the sample range analyzed in this paper, tax competition hinders capital flow, which runs counter to the goal of tax competition to attract capital inflow. It reflects the current excessive tax competition in China, which has interfered with the rational allocation of resources by the market.

The coefficient of TC in column (3) of Table 3 is −0.1210, indicating that under the mediating effect of capital flow, the degree of tax competition increases by 1% and the innovation efficiency of industrial enterprises decreases by approximately 12%, which is less than the degree of disregarding the mediating effect of capital flow. This result reflects that a rational capital flow promotes the improvement of the innovation efficiency of industrial enterprises. Because innovation activities need a lot of financial support, if enterprises face serious financing constraints this will limit the development of innovation activities, let alone the improvement of innovation efficiency. The improvement of the level of capital flow alleviates the financing constraints of enterprises, increases the financing level of enterprises—which can be used to increase the funds invested in innovation activities—and

it can also attract investors to strengthen corporate governance to promote the innovation efficiency of enterprises.

3.3. Robustness Test

Value-added tax and corporate income tax are two main taxes of industrial enterprises. Therefore, this part uses corporate income tax competition (INCOMETC) and value-added tax competition (VATC) to verify the benchmark model. The results are basically stable, as shown in Tables 5 and 6.

Table 5. Regression results according to different taxes.

	INEF	**CF**	**INEF**	**INEF**	**CF**	**INEF**
INCOMETC	−0.0364 ***	−0.0027 ***	−0.0317 ***			
	(−4.42)	(−2.92)	(−3.59)			
VATC				−0.0320 ***	0.0004	−0.0280 **
				(−2.92)	(0.34)	(−2.55)
CF			0.861			1.446 **
			(1.43)			(2.52)
SIZE	−0.0743 ***		−0.0702 ***	−0.0708 ***		−0.0655 ***
	(−6.11)		(−5.65)	(−5.68)		(−5.25)
STATE	3.397 ***		3.445 ***	3.860 ***		3.833 ***
	(5.41)		(5.49)	(6.13)		(6.15)
ST		−0.480 ***			−0.511 ***	
		(−6.00)			(−6.34)	
HC		0.0321 ***			0.0346 ***	
		(6.17)			(6.61)	
MZ		−0.0051 ***			−0.0041 ***	
		(−4.06)			(−3.34)	
AIS		−0.0037			0.00002	
		(−0.95)			(0.01)	
FD		0.0325 ***			0.0341 ***	
		(8.17)			(8.43)	
MA		0.0224			0.0149	
		(1.25)			(0.83)	
N	248	248	248	248	248	248
R^2	0.271	0.387	0.277	0.238	0.365	0.258
F	28.87	19.38	22.26	24.24	17.55	20.18

Note: the Prob > F of the model is 0.0000, and the *t* statistics are shown in parentheses, * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 6. Bootstrap Test results.

Explanatory Variables	**Effect**	**Coefficient**	**Bootstrap Standard Error**	**Normal-Based Confidence Interval (95%)**	
INCOMETC	Indirect effect	−0.0077	0.0033	−0.0166	−0.0027
	Direct effect	−0.0033	0.0124	−0.0268	0.0195
VATC	Indirect effect	0.0010	0.0019	−0.0028	0.0047
	Direct effect	−0.0177	0.0079	−0.0332	−0.0023

Capital flow plays a partial mediating role in the relationship of negative effect between corporate income tax competition and the innovation efficiency of industrial enterprises, and the adverse effect is weakened by the mediating effect of capital flow. Specifically, regardless of the mediating role of capital flow, for every 1% increase in corporate income tax competition, the innovation efficiency of industrial enterprises will drop by approximately 4%; under the mediating effect of capital flow, for every 1% increase in corporate income tax competition, the innovation efficiency of industrial enterprises drops by approximately 3%.

The 95% bootstrap confidence interval of the indirect effect of value-added tax competition on the innovation efficiency of industrial enterprises is [−0.0028, 0.0047] and the

direct effect is [−0.0332–0.0023]. Therefore, the mediating effect of capital flow in the relationship between value-added tax competition and the innovation efficiency of industrial enterprises is not significant.

Value-added tax is a turnover tax, which is a tax on multiple links in the production and circulation of goods, and it does not directly tax capital, while corporate income tax mainly taxes capital. Therefore, corporate income tax competition is more likely to affect the innovation efficiency of industrial enterprises through capital flow. Value-added tax competition may have an impact on the innovation efficiency of industrial enterprises through other channels, which needs to be further explored.

3.4. Further Analysis

An innovation-driven development strategy is one of the core strategies in China. The eighteenth Party's Congress proposed to adhere to the road of independent innovation with Chinese characteristics and to implement an innovation-driven development strategy. The publication of "Several Opinions on Deepening the Reform of Institutions and Mechanisms and Accelerating the Implementation of Innovation-Driven Development Strategies" made 2015 an accelerated implementation stage [24]. Therefore, the sample is divided into two intervals: 2011–2014 and 2015–2018.

Table 7 provides descriptive statistics, with only important variables in the two intervals. Table 7 shows that compared with 2011–2014, the average and the minimum values of the innovation efficiency of industrial enterprises become larger; and, the average, minimum, and maximum value of tax competition become smaller in 2015–2018, when the innovation-driven development strategy has been implemented. Tables 8 and 9 are empirical results before and after the implementation of the innovation-driven development strategy.

Table 7. Descriptive statistics.

YEAR	2011–2014				2015–2018			
Variables	Mean	Standard Deviation	Minimum Value	Maximum Value	Mean	Standard Deviation	Minimum Value	Maximum Value
INEF	0.564	0.190	0.158	1	0.577	0.166	0.219	1
TC	2.372	0.638	1.034	3.921	2.272	0.584	0.885	3.431

Table 8. Empirical results of innovation-driven development strategy.

Phase	2011–2014			2015–2018		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
	INEF	CF	INEF	INEF	CF	INEF
TC	−0.0692	−0.0229 **	−0.2130 **	−0.1190 ***	−0.0010	−0.1040 ***
	(−0.72)	(−2.14)	(−2.54)	(−4.08)	(−0.45)	(−3.47)
CF			−4.2850 ***			2.2450 *
			(−6.18)			(1.80)
SIZE	−0.1050 **		−0.1080 **	−0.0758 ***		−0.0751 ***
	(−2.09)		(−2.56)	(−4.70)		(−4.70)
STATE	−0.6920		−3.5220	3.4030 ***		3.0830 ***
	(−0.13)		(−0.76)	(4.16)		(3.71)
ST		0.0619			−0.1630 **	
		(0.17)			(−2.43)	
HC		−0.0802 *			0.0229 ***	
		(−1.92)			(4.49)	
MZ		−0.0176 *			−0.0001	
		(−1.66)			(−0.01)	
AIS		−0.0106			0.0025	
		(−0.65)			(0.73)	

Table 8. *Cont.*

Phase	2011–2014			2015–2018		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
	INEF	CF	INEF	INEF	CF	INEF
FD		−0.0241			0.0124 ***	
		(−1.09)			(3.16)	
MA		−0.3490 ***			−0.0032	
		(−6.28)			(−0.20)	
Year	Control	Control	Control	Control	Control	Control
N	124	124	124	124	124	124
R^2	0.868	0.942	0.908	0.276	0.367	0.296

Note: the *t* statistics are shown in parentheses, * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 9. Bootstrap test results.

Explanatory Variables	Effect	Coefficient	Bootstrap Standard Error	Normal-Based Confidence Interval (95%)	
TC	Indirect effect	−0.0202	0.0096	−0.0389	−0.0014
	Direct effect	−0.0475	0.0285	−0.1033	0.0084

As shown in Table 8, in the period 2011–2014 when no innovation-driven development strategy was implemented, the coefficient of TC in column (1) is not significant (according to the new mediating effect test procedure proposed by Wen and Ye (2014), this situation should be analyzed by the suppression effect). The coefficients of TC in column (2) and CF in column (3) have passed the significance test, and the product of the two is positive, which is opposite to the sign of the coefficient of TC in column (3). Therefore, capital flow plays a suppression effect in the relationship between tax competition and the innovation efficiency of industrial enterprises. Suppression effect means that the third variable increases the total effect between independent variable and dependent variable [25]. In this section, the suppression effect of capital flow is manifested in the fact that tax competition hinders the innovation efficiency of industrial enterprises even more, which is reflected in the absolute value of −0.2130 being greater than that of −0.0692. Specifically, for every 1% increase in tax competition, the innovation efficiency of an industrial enterprise decreases by approximately 7%, and the suppression effect of capital flow makes it drop approximately 21%. The fact that the coefficient of CF in column (3) is negative indicates that capital flows impede the innovation efficiency of industrial enterprises for the period 2011–2014. The above results also show the fact that the financing function of the capital market in China is not perfect, and it does not become the main financing channel for the innovation investment of industrial enterprises, which results in a negative relationship between capital flow and the innovation efficiency of industrial enterprises.

Table 8 also shows that in the period 2015–2018 when the innovation-driven development strategy was implemented, coefficients of TC both in column (4) and column (6) are significant, the product of coefficients of TC in column (5) and CF in column (6) is negative and it has the same sign as the coefficient of TC in column (6), and the indirect effect of the bootstrap test in Table 9 is significant. Therefore, capital flow plays a partial mediating role in the relationship between tax competition and the innovation efficiency of industrial enterprises. Specifically, for every 1% increase in tax competition, the innovation efficiency of industrial enterprises drops by approximately 12%, and the partial mediating effect of capital flow eases the decline in the innovation efficiency of industrial enterprises by approximately 10%.

In conclusion, the implementation of an innovation-driven development strategy reduces excessive tax competition, changes capital flow from suppression to a partial mediating effect, and alleviates the negative impact of excessive tax competition on the

innovation efficiency of industrial enterprises. The above results reflect the good effect of implementing an innovation-driven development strategy in China.

4. Conclusions

This paper adopts the panel data of industrial enterprises in 31 regions in China to study the influence of tax competition on the innovation efficiency of industrial enterprises and its mechanism. The study concludes that current excessive tax competition in China has hindered the innovation efficiency of industrial enterprises and that capital flow plays a partial mediating role. Specifically, for every 1% increase in tax competition, the innovation efficiency of industrial enterprises decreases by approximately 13%, under the mediating effect of capital flow, it drops by approximately 12%. Further research shows that capital flow plays a suppression effect in the relationship between tax competition and the innovation efficiency of industrial enterprises between 2011 and 2014, when the innovation-driven development strategy had not been implemented, that is, capital flow expands the total effect between tax competition and the innovation efficiency of industrial enterprises. Specifically, for every 1% increase in tax competition, the innovation efficiency of industrial enterprises decreases by approximately 7%, but the suppression effect of capital flow causes it to drop approximately 21%. In the 2015–2018 period when the innovation-driven development strategy had been implemented, the degree of tax competition in China was reduced, alleviating the adverse impact of excessive tax competition on the innovation efficiency of industrial enterprises. Specifically, for each 1% increase in tax competition, the innovation efficiency of industrial enterprises decreases by approximately 12%, while the partial mediating effect of capital flow alleviates the declining degree of the innovation efficiency of industrial enterprises by approximately 10%.

The above results mean that tax competition should be moderate in the effect of encouraging enterprises to improve innovation efficiency. The above results also show that the implementation of an innovation-driven development strategy reduces excessive tax competition, changes the effect of capital flow from suppression to a partial mediating role, alleviates the adverse impact of excessive tax competition on the innovation efficiency of industrial enterprises, and reflects the good effect of China's innovation-driven development strategy.

In summary, innovation activities of enterprises require a large amount of capital investment, with long cycles, uncertain returns, and a good external innovation environment. Therefore, tax competition not only needs a perfect capital market to alleviate financing constraints, it also needs the government to take measures to guide the rational allocation of resources in the capital market to promote the innovation efficiency of industrial enterprises. According to results of this paper, excessive government intervention is not conducive to the efficient allocation of market resources, so it is necessary to have a combination of promising government and effective markets to jointly promote the improvement of the innovation efficiency of industrial enterprises [26].

In view of the contributions provided by this article, it can be improved and expanded from the following aspects in the future. The first concerns the research period of this paper: since 2011, the book of CHINA STATISTICAL YEARBOOK ON SCIENCE AND TECHNOLOGY has adjusted the statistical scope of industrial enterprises, and the data for 2019 and beyond have not yet been released. Therefore, the sample scope of this article is selected from 2011 to 2018. In the future, we will continue to pay attention to the update of data and conduct further research. The second point is that future research can compare China with other countries to find more meaningful conclusions.

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