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Analyze the impact of the transition from business tax to VAT on the tax burden of transport enterprises in various regions of China

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ABSTRACT

In recent years, the transportation industry has enjoyed the benefits brought about by changes in the national tax policy. The purpose of this paper is to analyze the impact of the change from Business Tax to Value-Added Tax (BT-to-VAT) on the tax burden of transport enterprises in various regions of China. Based on the cross-regional characteristics of the transportation industry, China is divided into four regions: eastern, central, western and northeast. Research hypothesis – the tax reduction effect of the BT-to-VAT tax burden is not only related to the characteristics of the enterprise itself, but also related to the regional environment and market integration factors of China. Using the Difference in differences (DID) method, the data covers 22 listed companies from 2009 to 2020. The paper analyzes the internal characteristics of the enterprise itself, the influence of the external environment and the degree of industrial integration on the enterprise, and the reasons for the difference. Empirical research shows that BT-to-VAT reduces the tax burden of enterprises, the eastern region has the least impact on the ratio of corporate income tax expenses to operating income, while the central and western regions have relatively greater impacts. The scale of the enterprise and the level of economic development have a positive effect on the financial efficiency of the enterprise, while the non-current assets ratio and the degree of market integration have a negative effect on the tax burden. This research is beneficial to provide reference for enterprises in different regions to improve their management and to formulate macro policies by relevant national departments.

KEYWORDS

transport industry, Business Tax, VAT, tax burden, difference in differences method

JEL H20, L98

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Анализ влияния перехода от налога на предпринимательскую деятельность к НДС на налоговую нагрузку транспортных предприятий в различных регионах Китая

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АННОТАЦИЯ

В последние годы транспортная отрасль пользовалась преимуществами, связанными с изменениями в государственной налоговой политике. Целью данной статьи является анализ влияния перехода от налога на предпринимательство к налогу на добавленную стоимость на налоговую нагрузку транспортных предприятий в различных регионах Китая. По межрегиональным характери-

стикам транспортной отрасли Китай делится на четыре региона: восточный, центральный, западный и северо-восточный. Гипотеза исследования – налоговый эффект снижения налоговой нагрузки при переходе от налога на предпринимательство к налогу на добавленную стоимость связан не только с особенностями самого предприятия, но и с региональной средой и факторами интеграции рынка Китая. С помощью метода «разность в разностях» (DID) мы собрали информацию о 22-х зарегистрированных на бирже с 2009 по 2020 гг. компаниях. В работе анализируются внутренние характеристики самих предприятий, влияние внешней среды и степени промышленной интеграции на предприятия, а также причины их различий. Эмпирические исследования показывают, что переход от налога на предпринимательство к НДС снижает налоговую нагрузку на предприятия. При этом в восточном регионе у предприятий прослеживается наименьшее влияние изменений по расходам по корпоративному подоходному налогу в процентах от операционной деятельности, в то время как предприятия центрального и западного регионов Китая находятся под большим влиянием анализируемого перехода. Масштаб и уровень экономического развития предприятия положительно сказываются на его финансовой эффективности, тогда как величина внеоборотных активов и степень рыночной интеграции отрицательно сказываются на налоговой нагрузке. Результаты исследования могут быть востребованы национальными и региональными ведомствами для разработки макрополитики.

КЛЮЧЕВЫЕ СЛОВА
транспортная отрасль, налог на предпринимательскую деятельность, НДС, налоговая нагрузка, метод «разность в разностях»

1. Introduction

Tax policies have an important impact on the operation and development of various market players. Since business tax is included in the product price, it was used as the main tax collection method in the past, resulting in repeated taxation by taxpayers and aggravating the tax burden [1]. In order to reduce the tax burden and stimulate the vitality of the market, accelerate the integration with the international mainstream tax system, and adapt to the international economic development situation. In 2011, the State Administration of Taxation of China promulgated the "Pilot Plan for the change from Business Tax to Value-Added Tax". The state has begun to continuously reduce the tax burden on taxpayers and release tax reduction dividends.

On January 1, 2012, Shanghai took the lead in implementing the BT-to-VAT policy for the transportation industry and some modern service industries. In May 2016, BT-to-VAT was fully launched in China. In 2018, the "Notice on Adjusting the Value-Added Tax Rate" issued by the Ministry of Finance and the State Administration of Taxation clearly pointed out that on the basis of BT-to-VAT, from May 1, 2018, the original VAT rates were reduced from 17% and 11% to 16% and 10%.

In March 2019, in order to promote the substantial reduction of value-added tax, the Ministry of Finance, the State Administration of Taxation and the General Administration of Customs jointly issued the "Announcement on Industry-Related Policies for Deepening the Value-Added Tax Reform", stating that, the previously applicable VAT rates of 16 and 10% were further reduced to 13 and 9%.These tax incentives not only bring direct benefits to enterprises, but also stimulate the development of the national economy.

As the pioneer of the BT-to-VAT pilot, the effect of the reform of the transportation industry is not only a test of the direction and rationality of the policy, but also directly related to whether the tax reform can be carried out smoothly. The transportation industry plays an important role in the development of the national economy and is the link connecting other upstream and downstream industries [2]. At the same time, it is closely related to regional economic development and plays a role in promoting or restricting regional

economic development. Sylvie Démurger confirmed that the development scale and speed of the transportation industry and the regional economy have a relationship of mutual promotion and interaction [3]. Due to reasons such as history, location, and degree of openness, China's regional economic development has long been in an unbalanced situation of fast development in the east and slow development in the west, and so is the transportation industry [4]. Therefore, it is necessary to analyze the impact of tax policy changes on the transportation industry from an inter-regional level.

The purpose of this paper is to analyze the impact of the change from Business Tax to Value-Added Tax (BT-to-VAT) on the tax burden of transport enterprises in various regions of China.

The reasons for the differences are analyzed from the aspects of the company's own situation, regional economic development, regional market integration and national policies, in order to provide a reference for the country to formulate transportation industry policies.

Research hypothesis – the tax reduction effect of the BT-to-VAT tax burden is not only related to the characteristics of the enterprise itself, but also related to the regional environment and market integration factors of China.

This paper comprehensively analyzes the impact of BT-to-VAT on the financial benefits of transportation enterprises under the influence of regional economy, transportation infrastructure and regional market integration, which can enrich theoretical research. At the same time, it has reference value to formulate relevant policies for listed companies in the transportation industry and macro-control of the country.

2. Literature Review

For a long time, scholars from various countries have conducted research on whether to introduce VAT and how to improve the VAT system.

Kay & King [5] elaborated the meaning and characteristics of VAT from the perspective of the basic theory of taxation and pointed out that taxing profits is far inferior to taxing gross business profits, and that VAT will become an inevitable choice for all countries.

Carbonnier [6] believes that VAT has two sides: the advantage is that it plays a positive role in restraining tax evasion, and it also promotes the establishment of a relatively complete financial management system for enterprises, and at the same time makes the tax burden fairer. The downside is that the administrative cost of imposing VAT is too high.

Bogari [7] collected 287 samples in the private and public sectors and used descriptive and analytical methods to analyze the economic and social impact of VAT adoption in Saudi Arabia. The findings show that the implementation of VAT increases the country's financial resources. There is a strong and significant correlation between VAT application and economic variables such as investment, consumption, inflation, purchasing power, and trade balance.

While increasing tax revenue, VAT also promotes the development of various industries. Mayburov et al. [8] used comparative analysis and analogy methods to analyze its neutrality from the constituent elements of VAT and confirmed that the differentiated export VAT rebate rate is beneficial to supervise the export structure and improve the tax compliance of export companies.

Benzarti & Tazhitdinova [9] estimate their impact on trade flows by using all VAT changes in EU member states from 1988 to 2016. It is found that trade flows are less elastic relative to VAT, even with large changes in VAT. The results suggest that VAT is unlikely to distort trade flows.

Liu et al. [10] used discontinuous regression to study the relationship between BT-to-VAT and Total Factor Energy Efficiency in the logistics industry. The research shows that the reform has significantly promoted the development of Total Factor Energy Efficiency in the logistics industry, thus drive the progress of green technology.

VAT also has a strong role in promoting the transportation industry. Mayburov & Ma [11] confirmed that VAT is con-

ducive to promoting energy conservation, emission reduction and low-carbon green development. Tax policies promote environmentally friendly behavior by manufacturers and owners of automobiles and related products.

Barros et al. [12] believe that a lower VAT rate on public transport fares and a higher tax rate on vehicle ownership can lead to an increase in public transport's market share. Taxing car utilization through VAT on fuel does appear to be significant.

Barbone et al. [13] conducted an economic assessment of the impact of the current EU VAT regime on passenger transport and the possible impact of alternative regimes. It reveals an enormous potential of the application of VAT in the passenger transport sector with regard to generating revenue, and the small impact of applying simpler VAT rates.

Zhang & Lu [14] confirmed that BT to VAT reduces the double taxation of enterprises and accelerates the development of the industry by analyzing the tax burden on the air transport industry after the VAT reform.

The advantages of VAT are prominent, so a large number of scholars have conducted a lot of research on the BT-to-VAT policy. Smart & Bird [15] research shows that, in fact when replacing a traditional sales tax with a VAT consumer price including taxes actually fell, by –0.3% ± 0.49%.

Keen & Mintz [16] proved that the imposition of VAT on products and services can avoid the drawbacks of double taxation in the previous business tax system and played an important role in promoting social tax fairness.

A Schenk made a detailed comparison of VAT and BT, and believed that VAT not only improved economic efficiency, but also improved tax equity [17].

Hoseini & Briand [18] examines the impact of BT-to-VAT on productivity and tax legitimacy in India. The study found that BT-to-VAT improved productivity and tax compliance in India. The study also found that the implementation of the VAT credit and rebate system expanded the formal sector of upstream industries with strong positive linkages.

Many Chinese experts have continued to pay attention and research on BT-to-VAT, providing experience for China's tax reform. Li & Wang [19] researched that companies' reported sales and reporting costs increased significantly after BT to VAT, and the impact of business-to-business transactions was much greater than that of business-to-consumer transactions [19].

Wei [20] assessed the first two years of the BT-to-VAT reform from a tax policy perspective. It is confirmed that reforms may reduce commodity prices by reducing the cost of production, partially mitigating the impact of price increases on consumer services. The government's reforms appear to be aimed at reducing the tax burden.

Peng et al. [21] studied the impact of China's VAT pilot on the total factor productivity of manufacturing enterprises and proved that it has a greater impact on non-state-owned enterprises and labor-intensive enterprises.

Zou et al. [22] confirmed that the corporate leverage ratio dropped significantly after the VAT reform, but it was mainly driven by short-term liabilities.

Lan et al. [23] studied the impact of tax cuts on corporate R&D intensity. The results show that the tax reform has prompted enterprises to increase R&D investment. Specifically, the stronger the tax transfer ability, the more significant this change will promote the R&D intensity of enterprises.

Yang & Zhang [24] using the difference method, confirms that firms enjoying tax benefits become more capital-intensive, but their employment and labor shares decline significantly.

Peng et al. [25] investigated the impact of VAT reform in the service sector on enterprise upgrading during China's transition period. By using 2009–2017 Chinese listed company data and differentiated methods, it is proved that the reform has accelerated the process of enterprise upgrading.

Yu & Qi [26] used the DD model to examine the impact of BT-to-VAT on

productivity in China. The reforms are found to have a significant positive effect on firms' total factor productivity, while bringing in tax relief and additional cash flow.

Fang et al. [27] studied the asymmetric impact of BT-to-VAT on the total tax burden of Chinese enterprises, which has a broad reform dividend effect on small-scale taxpayers. The plan has an asymmetric rather than a broad reform dividend effect on the general taxpayer.

Wang et al. [28] explore the causal relationship between tax deductions and fiscal constraints. Research shows that VAT reform has significantly improved firms' external financing capacity by reducing borrowing costs and promoting commercial credit.

Deng et al. [29] examine the causal relationship between taxation and capital structure by exploiting two institutional features. Prove that businesses are slow to respond to tax cuts but increase long-term leverage when taxes increase.

To sum up, most experts and scholars agree that VAT is imperative. Its implementation can make the tax system completer and more effective. Compared with BT, it can reduce the tax burden on taxpayers. However, there are few studies that specifically focus on the transportation industry. And it does not combine the differences between regions to analyze the impact of BT-to-VAT on the tax burden of the transportation industry in each region and does not consider the particularity of cross-regions and the relationship between inter-regional transportation. Therefore, it is particularly important for the continuous tax reform policy and transportation policy to analyze the impact of BT-to-VAT on the tax burden of the transportation industry in various regions by drawing on domestic and foreign research results.

3. Research Methodology

China is divided into four regions. According to the information from the National Bureau of Statistics, the country is divided into four regions (Table 1).

This paper analyzes the impact of BT-to-VAT on the tax burden of transportation enterprises in different regions from the perspective of mesoeconomics and uses the DID model to analyze the policy effect [30].

Taking the transportation industry as the treatment group, the life service industry as the control group. Set the grouping dummy variable as "treated", its value is 1 for the treatment group and 0 for the control group; the time dummy variable is "time", its value is 0 before BT-to-VAT and 1 after BT-to-VAT. So the DID model is:

$$Y = \beta_0 + \beta_1 treated \cdot Time + \\ + \beta_2 treated + \beta_3 Time + \varepsilon. \quad (1)$$

Among them, Y is the explained variable, and "$treated \times Time$" is the interaction item. When the enterprise "i" of the treatment group is affected by the policy in the year "t", the dummy variable "$treated \times Time$" takes the value of 1, otherwise it is 0.

According to the research purpose of this paper, Debt Asset Ratio is selected as the explained variable, GDP per capita growth rate, Location entropy coefficient as the explanatory variable, enterprise size

Table 1

Regional division of China

East	Beijing, Shanghai, Tianjin, Guangdong Province, Zhejiang Province, Hebei Province, Jiangsu Province, Shandong Province, Fujian Province, Hainan Province
Central	Hubei Province, Jiangxi Province, Shanxi Province, Hunan Province, Anhui Province, Henan Province
West	Chongqing, Shanxi Province, Sichuan Province, Guizhou Province, Qinghai Province, Yunnan Province, Gansu Province, Guangxi Zhuang Autonomous Region, Inner Mongolia Autonomous Region, Ningxia Hui Autonomous Region, Tibet Autonomous Region, Xinjiang Uygur Autonomous Region
Northeast	Liaoning Province, Heilongjiang Province, Jilin Province

and age, Corporate income tax expense as a percentage of operating, Non-current assets ratio as the control variable (Table 2).

Since this paper mainly analyzes the impact of BT-to-VAT on the tax burden of enterprises in different regions from the perspective of regional market integration, on the basis of the DID model, considering market integration a factor, the model is constructed as follows:

$$DAR = \beta_0 + \beta_1 LQ \cdot treated \cdot Time + \\ + \beta_2 LQ + \beta_3 treated \cdot Time + \\ + \beta_4 treated + \beta_5 time + \varepsilon. \quad (2)$$

According to the exogenous requirements analyzed by the DID model and the condition that the treatment group and the control group have the same or similar conditions, BT-to-VAT is implemented in different regions in batches in different time periods, and this paper studies the listed companies in the transportation industry (with road Transportation as an example), so the research in this paper satisfies the randomness assumption. In addition, transportation and life services are both service industries, and their development is consistent. Therefore, this paper is suitable to use the DID model for analysis.

Considering the availability of data, the sample companies selected in this paper are all listed companies. According to the industry classification guidelines of listed companies of the China Banking Regulatory Commission, the 2009–2020 data of companies that have been in the road transportation industry and listed on the Shanghai and Shenzhen main board A-shares since they were classified according to this standard were selected as the treatment group. Considering that BT-to-VAT was launched in 2012, the companies that changed to other industries in 2012 and later and were processed and delisted by ST were excluded. Finally, a sample of 22 road transport listed companies was obtained, including 9 in the east, 7 in the middle, 4 in the west, and 2 in the northeast.

The companies whose classification criteria have always been companies in the life service industry and listed on the A-shares of the Shanghai and Shenzhen Main Boards were selected as the control group. The life service industry began to implement the BT-to-VAT policy in May 2016. Therefore, after excluding the listed companies in 2016 and later, the data of 8 listed companies in this industry from 2009 to 2016 were selected as the control group.

Table 2

Variable description

Variable properties	Variable name	Representation	Variable description
Explained variable	Debt Asset Ratio	DAR	(Total Liabilities / Total Assets) × 100%
Explanatory variables	GDP growth rate per capita	AGDP	After deducting inflation, the growth level of per capita GDP at the end of the year relative to the beginning of the year
Explanatory variables	Location entropy coefficient	LQ	(Transportation employment in a region / total employment in the region) / (National Transportation Industry Employment / National Total Employment)
Control variable	Enterprise size	SIZE	ln (total assets)
Control variable	Enterprise age	AGE	Sample Year – Enterprise Registration Year
Control variable	Corporate income tax expense as a percentage of operating income	TPR	Corporate income tax expense / operating income × 100%
Control variable	Non-current assets ratio	NCR	Non-current assets/total assets × 100%

Due to the different implementation time of BT-to-VAT in each region or industry, the value of each region will be different. The values of the dummy variables for each region of the transportation enterprises are as follows: the eastern region has gradually expanded from Shanghai to Beijing, Jiangsu, Guangdong, Fujian, Zhejiang, and Tianjin, all of which were implemented BT-to-VAT in 2012. The number of enterprises reached more than 86% of the total number in the eastern region, and most of them were in the second half of 2012. Therefore, the eastern region will set its start time as 2013, so that the dummy variable of 2013 and later years is 1, and the value before 2013 is 0. The central region, the northeast region and the western region were implemented in August 2013, so the start time is set as 2014, the dummy variable value of 2014 and later years is 1, and the value before 2014 is 0 (Table 3).

Table 3

DID Model Descriptive Statistics

	Before	After	Summary
Control	32	32	64
Treatment	101	75	176
Summary	133	107	240

The table shows the different groups, as well as the sample distribution before and after the experiment. There are a total of 176 experimental samples in this case, 101 are before the experiment and 75 are after the experiment.

The required data come from the statistical yearbooks and statistical bulletins of various provinces and cities. The panel data of each sample company from 2009 to 2020 comes from CSMAR and the annual report of each company.

4. Research Results

According to the variable setting and the sorted sample conditions, the impact of BT-to-VAT on the operational capacity of transportation enterprises is analyzed, and DID model is established. Descriptive statistics of variables were obtained after analyzing and operating the panel data (Table 4).

Analyzing the Non-current assets ratio in each region, the results show that the change is not obvious, and it is in a stable state. The eastern region has not changed significantly, while the non-current assets ratio of the northeast region is higher than other regions, but it shows a downward trend. The western region has a small increase in 2013, but the central region has a downward trend, so it can be considered that the western region increased its investment in illiquid assets in 2013, increasing its deductible costs in the future, while the deductible costs in the central and northeastern regions decreased.

Therefore, from the changes in the tax burden and non-current assets ratio in each region, it can be found that the BT-to-VAT policy reduces the corporate tax burden, but due to deductible costs or tax policies and other reasons, the reduction is not It is clear.

The DID regression was performed using SPSS software, and the following results were obtained (Table 5).

The results of the DID model are shown in Table 5, including the effect size levels of the control group and the treatment group before and after the experiment. The DID effect value, "diff-in-diff" is –0.08 and it is significant ($p = 0.039 < 0.05$), which means that the DID effect is significant.

Construct the interaction item for OLS regression test (Table 6). The regression coefficient value of the interaction item "treat · time" in the table is –0.08, which is the Diff-in-Diff effect value in the "DID Model Results Summary" table, and the results are consistent.

It can be known from the DID results that the Corporate income tax expense as a percentage of operating is negative, and the Debt Asset Ratio of the transportation industry in each region has a negative impact on the financial performance of the company. It shows that under the BT-to-VAT policy, the higher the Debt Asset Ratio, the lower the financial benefit and the greater the risk. If a company is financing, it is best to use equity financing to reduce the risk of excessive debt.

Table 4

Descriptive statistics

Central						
Items	**Mean**	**Median**	**Std. Deviation**	**Min**	**Max**	**N**
LQ	0.92	0.91	0.08	0.76	1.12	77
AGDP	0.11	0.10	0.06	–0.04	0.27	77
NCR	0.73	0.81	0.19	0.29	0.96	77
DAR	0.49	0.49	0.17	0.21	0.80	77
AGE	17.71	18.00	4.65	7.00	27.00	77
TPR	0.08	0.07	0.05	0.01	0.17	77
SIZE	23.11	23.26	1.11	21.00	24.74	77
Northeast						
Items	**Mean**	**Median**	**Std. Deviation**	**Min**	**Max**	**N**
LQ	1.24	1.24	0.15	1.04	1.55	22
AGDP	0.08	0.06	0.10	–0.22	0.22	22
NCR	0.71	0.70	0.15	0.39	0.95	22
DAR	0.31	0.26	0.19	0.09	0.83	22
AGE	5	5	3	0	10	22
TPR	0.10	0.10	0.03	0.04	0.17	22
SIZE	22.25	22.33	0.32	21.64	22.68	22
East						
Items	**Mean**	**Median**	**Std. Deviation**	**Min**	**Max**	**N**
LQ	1.00	0.87	0.40	0.08	1.91	99
AGDP	0.08	0.09	0.06	–0.16	0.20	99
NCR	0.74	0.82	0.18	0.40	0.98	99
DAR	0.45	0.45	0.11	0.24	0.72	99
AGE	19.78	20	4.85	7	28	99
TPR	0.08	0.09	0.05	-0.02	0.19	99
SIZE	23.46	23.50	0.81	21.28	25.25	99
West						
Items	**Mean**	**Median**	**Std. Deviation**	**Min**	**Max**	**N**
LQ	1.05	1.03	0.17	0.80	1.40	44
AGDP	0.11	0.10	0.07	0.00	0.26	44
NCR	0.75	0.78	0.10	0.48	0.90	44
DAR	0.56	0.57	0.13	0.29	0.77	44
AGE	19.75	20	4	13	28	44
TPR	0.05	0.04	0.05	0.01	0.35	44
SIZE	22.75	22.86	1.07	20.45	24.42	44

Table 5

Summary of DID Model Results

Time		**DAR**	**S. Err.**	**t**	**p**
Before	Control	–0.320			
	Treated	–0.182			
	Diff (T – C)	0.138	0.029	4.804	0.000**
After	Control	–0.234			
	Treated	–0.176			
	Diff (T – C)	0.058	0.029	1.992	0.048*
Diff-in-Diff		–0.08	0.038	–2.071	0.039*

R^2: 0.453, Adjusted R^2: 0.432

* $p < 0.05$ ** $p < 0.01$

Table 6

OLS regression analysis results (n = 240)

	Coeff.	S. Err.	*t*	*p*	95% CI	R^2	Adjusted R^2	F
VARIABLES	–0.32	0.093	–3.455	0.001	–0.503 ~ –0.138			
LQ	–0.075	0.02	–3.69	0	–0.116 ~ –0.035			
AGDP	0.227	0.183	1.24	0.216	–0.134 ~ 0.587			
AGE	–0	0.002	–0.044	0.965	–0.004 ~ 0.003			
SIZE	0.03	0.005	6.514	0	0.021 ~ 0.039	0.453	0.432	F (9,230) = = 21.168, p = 0.000
TPR	–2.034	0.217	–9.387	0	–2.461 ~ –1.607			
NCR	0.216	0.063	3.423	0.001	0.092 ~ 0.340			
Treated	0.138	0.029	4.804	0	0.081 ~ 0.195			
Time	0.086	0.033	2.577	0.011	0.020 ~ 0.152			
Treated × Time	–0.08	0.038	–2.071	0.039	–0.155 ~ –0.004			

Explained variable: DAR

* $p < 0.05$ ** $p < 0.01$

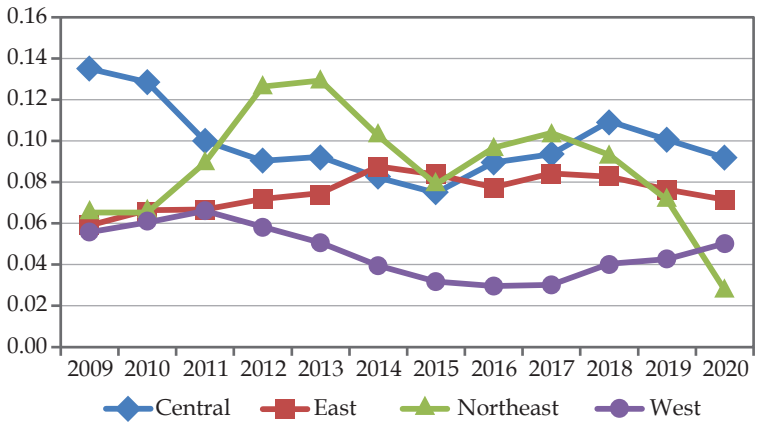

Figure 1. **Corporate income tax expense as a percentage of operating**

It can be seen from the results that the overall tax burden after BT-to-VAT has a downward trend, but after 2015, the ratio of income tax expenses to operating income has an upward trend. It shows that the BT-to-VAT policy has reduced the corporate tax burden, and after 2015, the tax burden may increase due to the increase in corporate operating income. In terms of the degree of volatility, the fluctuations in each region are very large. From the perspective of the tax burden of each region, the northeast region has a heavier tax burden than other regions, and the average corporate income tax burden is the highest in each region, while the western region has a lighter tax burden and the lowest average tax burden.

This also leads to the fact that the financial benefit of the northeast region is the lowest among all regions, while the financial benefit of the western region is the highest. This may be because the deductible costs in the western region are more than in other regions, but less in the northeast region. The western region enjoys the preferential tax policies for the development of the western region, which reduces the overall tax burden of enterprises.

To sum up, from the perspective of various regions, after 10 years of trial implementation of the BT-to-VAT policy, the tax reduction effect of transportation enterprises is obvious, that is, the BT-to-VAT policy is conducive to reducing the

tax burden of enterprises. Both the degree of regional market integration and the Non-current assets ratio have a significant negative impact on the tax burden of transportation enterprises, which is conducive to reducing the tax burden of enterprises. Only when the proportion of deductible costs in the company's costs to operating income reaches a corresponding threshold, the company's overall tax burden will show a downward trend.

Therefore, although the operating income of enterprises may increase, the overall tax burden of enterprises has a downward trend. And from the perspective of regional market integration, BT-to-VAT is beneficial to regional market integration, which further reduces the tax burden of enterprises. From an inter-regional perspective, BT-to-VAT has a larger tax burden on the western and central regions and a smaller impact on the eastern region. As the eastern region is relatively developed and has relatively complete road infrastructure, the degree of regional market integration is relatively high. Therefore, the improvement rate of BT-to-VAT in the market integration of the eastern region is lower than that of other regions, and the tax reduction rate is also lower.

In addition to being greatly affected by the BT-to-VAT policy in the western region, the state also has relatively large tax incentives for the western region. For example, the Western Development Policy gives preferential treatment to income tax expenses. The investment intensity of Non-current assets in the central region is the smallest among several regions, so it is greatly affected by the BT-to-VAT policy, but its average value is relatively large.

5. Conclusion

One of the main purposes of China's tax reform is to reduce the tax burden of enterprises. In all regions, BT-to-VAT has reduced it. Under the effect of market integration, the tax reduction effect of BT-to-VAT is greater, so the degree of market integration has an impact on the tax reduction effect. The greater the proportion of investment in non-current assets, the more conducive to reducing the tax burden of enterprises.

From the comparison of various regions, the impact of BT-to-VAT on the tax burden of the western region is significantly greater than that of the eastern region. This may be due to the fact that in addition to being affected by BT-to-VAT in the western region, the state has relatively large tax incentives for the western region, while the eastern region has advantages in economic development due to good basic conditions, and the rate of improvement in market integration is relatively low. Therefore, the tax cut effect on the eastern region is also lower.

Based on the above analysis, the research hypothesis was confirmed, and it is found that the tax reduction effect of the BT-to-VAT tax policy is not only related to the characteristics of the enterprise itself, but also related to the regional environment and market integration factors, which should further improve the financial efficiency and reduce the tax burden.

As far as the government is concerned, it is appropriate to increase tax incentives, especially in the northeast and central regions. Although changes in tax policies in recent years have brought about a reduction in corporate tax burdens, the financial benefits are not ideal, indicating that the benefits brought by tax policies have not been fully reflected in business operations. Therefore, tax incentives should be further increased to reduce the impact of tax policy changes on enterprises. Since the tax burden of the central and northeastern regions is significantly higher than that of the western and eastern regions, more preferential taxation should be given to these two regions to facilitate the balanced development among the regions.

BT-to-VAT has carried out input tax deduction, but because different industries have different resource allocation tendencies, the resulting tax impact is also different. Transportation is a capital-intensive industry, and the purchase of means of transportation requires high capital and has a long service life. For large and medium-sized transportation enterprises, which are general taxpayers, they have entered a relatively mature and stable stage, and are unlikely to frequent-

ly purchase new transportation vehicles in the short term. Therefore, the input tax credit for the acquisition of non-current assets is not continuous in most years. For the transportation industry, the input tax deduction is insufficient, and BT-to-VAT has not actually reduced the tax burden of enterprises, so greater policy support is needed. In view of this actual situation, it is recommended to consider implementing a certain percentage of deduction for existing non-current assets. The monthly depreciation amount of non-current assets can be used as the base to determine a proportional coefficient.

At the same time, increasing the construction of infrastructure in areas with relatively backward road infrastructure is conducive to improving the financial benefits of transportation enterprises. The development of the transportation industry is inseparable from infrastructure. In order to develop the transportation industry, it is necessary to increase investment in road infrastructure. The key to strengthening inter-regional connections is to make them more closely connected, improve market integration, and provide favorable conditions for the development of the transportation industry in underdeveloped areas.

As far as the enterprise is concerned, enterprises in the central, western and northeastern regions should focus on cooperation with similar companies to enhance the degree of market integration, while the eastern region should pay more attention to the improvement of their own strength. In regional with low economic level, their infrastructure is relatively poor, and the external conditions of enterprises are also not good. Strengthening the cooperation between enterprises can improve the ability to resist risks and achieve common development. In regional with relatively good economy, the infrastructure is relatively good, the external conditions of enterprises are relatively good, and the degree of integration of enterprises is also high. Therefore, in order to achieve further development, it is necessary to enhance the strength of enterprises themselves.

In the context of the full implementation of BT-to-VAT in China, this paper compares the change curves of tax burdens in the four major regions from 2009 to 2020, and builds a DID model to analyze the impact of BT-to-VAT on the Debt Asset Ratio in each region. Overall, the BT-to-VAT policy has achieved a structural tax reduction effect.

The BT-to-VAT policy is a major measure in China's tax system reform. The state implements it not only to reduce the tax burden of enterprises, but also to optimize the industrial structure and promote the connection between industries. Although the BT-to-VAT policy has been fully promoted at present, the promotion time is not long, so the long-term effect it brings and the related effect with other industries can be deeply analyzed in future research.

References

1. Bird R., Gendron P. The Political Economy of VAT. In: *The VAT in Developing and Transitional Countries*. Cambridge: Cambridge University Press; 2007, pp. 193–212. https://doi.org/10.1017/CBO9780511619366.012

2. Emadi A. Transportation 2.0. *IEEE Power and Energy Magazine*. 2011;9(4):18–29. https://doi.org/10.1109/MPE.2011.941320

3. Démurger S. Infrastructure Development and Economic Growth: An Explanation for Regional Disparities in China? *Journal of Comparative Economics*. 2001;29(1):95–117. https://doi.org/10.1006/jcec.2000.1693

4. Chen Z., Haynes K.E. Transportation Infrastructure and Economic Growth in China: A Meta-analysis. In: Shibusawa H., Sakurai K., Mizunoya T., Uchida S. (eds) *Socioeconomic Environmental Policies and Evaluations in Regional Science. New Frontiers in Regional Science: Asian Perspectives*. Springer, Singapore; 2016. Vol. 24, pp. 339–357. https://doi.org/10.1007/978-981-10-0099-7_18

5. Kay J., King M. *The British Tax System*. 5th ed. New York: Oxford University Press; 1990. 262 p.

6. Carbonnier C. Who pays sales taxes? Evidence from French VAT reforms, 1987–1999. *Journal of Public Economics*. 2007;91(5-6):1219–1229. https://doi.org/10.1016/j.jpubeco.2006.12.004

7. Bogari A. The Economic and Social Impact of the Adoption of Value-Added Tax in Saudi Arabia. *International Journal of Economics Business and Accounting Research (IJEBAR).* 2020;4(02):62–74. https://doi.org/10.29040/ijebar.v4i02.991

8. Karpova O.M., Mayburov I.A., Fan Y. Prospects and problems of realization of the vat neutrality principle in Russia and china. *Journal of Tax Reform*. 2020;2(6):124–141. https://doi.org/10.15826/jtr.2020.6.2.078

9. Benzarti Y., Tazhitdinova A. Do Value-Added Taxes Affect International Trade Flows? Evidence from 30 Years of Tax Reforms. *American Economic Journal: Economic Policy.* 2021;13(4):469–489. https://doi.org/10.1257/pol.20190492

10. Liu Z., Jiang Y., Bolayog D. Does "replacing business tax with value-added tax" promote the energy efficiency of the logistics industry in China? *Environmental Science and Pollution Research*. 2019;26:33169–33180. https://doi.org/10.1007/s11356-019-06367-5

11. Ma J., Mayburov I. Analysis of the transport tax system in the People's Republic of China. *R-Economy*. 2020;6(4):271–279. https://doi.org/10.15826/recon.2020.6.4.024

12. Barros V., Cruz C.O., Júdice T., Sarmento J.M. Is taxation being effectively used to promote public transport in Europe? *Transport Policy.* 2021;114:215–224. https://doi.org/10.1016/j.tranpol.2021.10.003

13. Barbone L., Breemersch T., Carruthers R., Zenz H. VAT-induced Distortions in the Passenger Transport System in the European Union: Assessment and Options for Reform. *Transportation Research Procedia*. 2016;14:333–342. https://doi.org/10.1016/j.trpro.2016.05.085

14. Zhang J.-Z, Lu Q.-S. The Impact on the Air Transportation Industry Tax Burden after Value Added Tax Reform. *International Journal of Scientific Research in Science and Technology*. 2020:201-214. https://doi.org/10.12783/DTSSEHS/ICESD2017/11727

15. Smart M., Bird R.M. The Economic Incidence of Replacing a Retail Sales Tax with a Value-Added Tax: Evidence from Canadian Experience. *Canadian Public Policy*. 2009;35(1):85–97. https://doi.org/10.1353/cpp.0.0007

16. Keen M., Mintz J. The optimal threshold for a value-added tax. *Journal of Public Economics*. 2004;88(3-4):559–576. https://doi.org/10.1016/S0047-2727(02)00165-2

17. Schenk A.,Thuronyi V., Cui W. *Value Added Tax a Comparative Approach.* 2nd ed. U.K: Cambridge University Press; 2015. 543 p.

18. Hoseini M., Briand O. Production efficiency and self-enforcement in value-added tax: Evidence from state-level reform in India. *Journal of Development Economics.* 2020;144:102462. https://doi.org/10.1016/j.jdeveco.2020.102462

19 Li J., Wang X. Does VAT have higher tax compliance than a turnover tax? Evidence from China. *International Tax and Public Finance*. 2020;27:280–311. https://doi.org/10.1007/s10797-019-09567-4

20. Cui W. China's Business-Tax-To-Vat Reform: An Interim Assessment. *British Tax Review*. 2014;5:617–641. Available at: https://ssrn.com/abstract=2476503

21. Peng F., Peng L., Wang Z. How do VAT reforms in the service sectors impact TFP in the manufacturing sector: Firm-level evidence from China. *Economic Modelling.* 2021;99:105483. https://doi.org/10.1016/j.econmod.2021.03.002

22. Zou J., Shen G., Gong Y. The effect of value-added tax on leverage: Evidence from China's value-added tax reform. *China Economic Review.* 2019;54:135–146. https://doi.org/10.1016/j.chieco.2018.10.013

23. Lan F., Wang W., Cao Q. Tax cuts and enterprises' R&D intensity: Evidence from a natural experiment in China. *Economic Modelling*. 2020;89:304–314. https://doi.org/10.1016/j.econmod.2019.10.031

24. Yang Y., Zhang H. The value-added tax reform and labor market outcomes: Firm-level evidence from China. *China Economic Review*. 2021;69:101678. https://doi.org/10.1016/j.chieco.2021.101678

25. Peng F., Wang L., Shi X., Wu H. Does value-added tax reform in services accelerate enterprise upgrading? Micro evidence from China. *Applied Economics.* 2022;54(9):1093–1109. https://doi.org/10.1080/00036846.2021.1975029

26. Yu J., Qi Y. BT-to-VAT reform and firm productivity: Evidence from a quasi-experiment in China. *China Economic Review.* 2022;71:101740. https://doi.org/10.1016/j.chieco.2021.101740

27. Fang H., Bao Y., Zhang J. Asymmetric reform bonus: The impact of VAT pilot expansion on China's corporate total tax burden. *China Economic Review.* 2017;46:S17–S34. https://doi.org/10.1016/j.chieco.2017.02.003

28. Wang J., Shen G., Tang D. Does tax deduction relax financing constraints? Evidence from China's value-added tax reform. *China Economic Review.* 2021;67:101619. https://doi.org/10.1016/j.chieco.2021.101619

29. Deng K., Zhu Y., Smith T., McCrystal A. Tax and leverage: Evidence from China. *China Economic Review*. 2020;62:101479. https://doi.org/10.1016/j.chieco.2020.101479

30. Ma J., Mayburov I. Using DID Model to Analyse the Impact of Vehicle Purchase Tax on the Sales of Alternative Fuel Vehicle. *IOP Conference Series: Earth and Environmental Science*. 2021;849(1):012006. https://doi.org/10.1088/1755-1315/849/1/012006

31. Li N., Teoh J., Krever R. VAT Reform in China Reaches a Critical Turning Point. *Tax Notes International*. 2016;82(4):387–398. Available at: https://ssrn.com/abstract=2769490

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