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Research on the Impact of Tax Reform of "Replacing Business Tax with Value-Added Tax" on Green Development

-- Panel Data Analysis based on Cities in the Yangtze River Economic Belt

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Abstract

"Replacing the business tax with a value-added tax" is an important tax reform measure implemented in China in recent years, which has a far-reaching impact on all aspects of the economy and society. The tax policy affects the economic activity through the substitution effect and the income effect, and then promotes the change of the ecological environment. In order to explore the impact of tax reform of "replacing business tax with value-added tax" on green development, this paper empirically tested the impact of "replacing business tax with value-added tax" on green development in 108 cities of the Yangtze river economic belt. Through theoretical analysis and empirical test, the following conclusions are drawn: first, since the implementation of the tax reform of "replacing business tax with value-added tax", the overall environmental pollution level of the Yangtze river economic belt has been significantly reduced, and production energy consumption and exhaust gas and waste water discharge have been reduced; Second, in the regression of samples, the focus of pollution prevention and control in the Yangtze River economic belt is to focus on resource-based cities and cities along the river, the tax system reform of "replacing business tax with value-added tax" has a significant positive effect on reducing production energy consumption and exhaust gas emissions, but has no significant impact on wastewater emissions, this shows that the water pollution prevention and control of the Yangtze River economic belt is still need to overcome the difficult deep waters. Based on this, relevant policy suggestions are put forward to promote the coordinated development of surrounding cities and enhance the overall economic influence of the Yangtze River economic belt.

Keywords

tax reform, green development, dual difference model.

1. Introduction

The Yangtze River economic belt is a concept of coordinated regional economic development formed by the natural division of the Yangtze River basin, covering 11 provinces and cities in the east, central and west of China. When general secretary Xi Jinping inspected both sides of the Yangtze River in 2016, he made it clear that we should focus on major protection and refrain from major development, which laid the foundation for green, coordinated and integrated development of the Yangtze River economic belt. In recent years, the sustainable development of the Yangtze River economic belt has made good achievements, but there are still regional and structural problems that cannot be cured. The Yangtze River economic belt spans thousands of kilometers, and the economic development level and environmental pollution prevention priorities vary among different river basins. The Yangtze River delta in the lower reaches of the Yangtze River has the largest urban cluster in China, with a high level of economic

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development and dense population. In the middle reaches of the Yangtze River, the iron and steel industry (Wuhan iron & steel co., LTD., Panzhihua iron & steel co., LTD.), non-ferrous metals (Tungsten mine in Jiangxi province) and other heavy industries are developed, and the agricultural industry is developed.[1] In the upper reaches of the Yangtze River, the level of economic development is relatively low, and the ecological environment such as the wetland in the source of the three rivers is relatively fragile. Cutting down trees is easy to cause soil erosion, and the construction of a large number of small and micro hydropower facilities has damaged the ecological balance of the upper reaches.

"Replacing business tax with value-added tax" (hereinafter referred to as "replacing business tax with value-added tax") is a large-scale and far-reaching tax reform implemented in China in recent years, which has produced many impacts on the economy and society. Based on the existing research results and policy practice, this paper holds that "replacing the business tax with a value-added tax" can promote regional green development by alleviating the "bottom-for-bottom competition" in inter-regional taxation, promoting the transformation and upgrading of industrial structure, improving the level of regional innovation and enhancing the internal driving force of local reform. To verify the above ideas, based on the natural experiment of China's reform of "replacing business tax with value-added tax" since 2012, combined with the panel data of cities in the Yangtze River economic belt, this paper will use the double-difference method to test the policy effect of "replacing business tax with value-added tax" on green development.

2. Theoretical Mechanism and Hypothesis

"Replacing the business tax with a value-added tax" is an important tax reform measure implemented in China in recent years, which has a far-reaching impact on all aspects of the economy and society. Through the substitution effect and the income effect, the tax policy affects the economic activity, and then promotes the change of the ecological environment. This paper will explain the environmental protection effect of the tax policy from three aspects.

Firstly, replacing the business tax with a value-added tax promoted the optimization and upgrading of the industrial structure. "Replacing the business tax with a value-added tax", by eliminating double taxation in goods and services and improving the chain of VAT deduction, can promote in-depth industrial division and cooperation, and on this basis, promote the optimization of industrial structure (Fan Ziying, Peng Fei; 2017).[2] Sun Zheng[3](2017) used panel vector autoregressive model to conduct empirical analysis, and the results showed that the turnover tax reform with "replacing business tax with VAT" as the main lead increased the proportion of the tertiary industry, reduced the proportion of the secondary industry, and promoted the upgrading of the industrial structure. Compared with the secondary industry dominated by heavy industry, the tertiary industry is mainly the service industry with relatively light environmental pollution. Developed countries also gradually reduce environmental pollution through industrial upgrading (Ruhr district, Germany). Therefore, the increase of the proportion of the tertiary industry is conducive to improving the ecological environment.

Secondly, replacing the business tax with a value-added tax has enhanced the effect of innovation. Value-added tax has a large number of tax incentives for high-tech enterprises, high-tech enterprises can promote the kinetic energy conversion, and thus reduce energy consumption to promote green development. Gong Qiang et al. (2016) [4] compared and analyzed the innovation cost of enterprises under the mode of collecting business tax and value-added tax by constructing the cournot competition model, and found that value-added tax is more conducive to stimulating enterprise innovation. Innovation-driven development is an important channel to improve the level of production and achieve green development.

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Thirdly, the "replacement of business tax with value-added tax" has maintained the driving force for local governments to deepen reform. By increasing the proportion of VAT tax refund, the financial resources of local governments are guaranteed, the support of local governments in environmental protection is won, the endogenous reform impetus of the government is enhanced, and the support of local governments for deepening the reform is enhanced. Lu Hongyou et al. (2016) [5] found that the 50-50 sharing of VAT between the central and local governments after "replacing the business tax with a value-added tax" had little impact on local fiscal revenue. "Replacing the business tax with a value-added tax" does not substantially reduce local tax revenue, which helps maintain the momentum of local government reform and promote green development.

3. Variables, Data and Models

3.1. Variable Selection

(1) explained variable. The explained variable is green development level. There are a variety of indicators for measuring green development level. Based on relevant practices (Shi Daqian, 2018), [6] this paper selects energy consumption per unit GDP (PPC), per capita waste water emission (wasw) and per capita exhaust gas emission (exgas) as the measurement indicators of the explained variables. The energy consumption per unit of GDP can reflect the energy consumption level of regional economic development. The level of energy consumption per unit of GDP can be used to roughly distinguish regional economic development from extensive or intensive development, while the per capita waste water discharge and per capita exhaust gas discharge can reflect the level of pollution prevention and control in the region. The three comprehensive comparison can reflect the level of green development in a more comprehensive way.

(2) Core explanatory variables. The core explanatory variable is the effect of the policy of "replacing the business tax with a value-added tax". According to the common practice of existing literature, the explanatory variables were set as treat and time, and the combination was did=treat*time. In this paper, the effect of "replacing business tax with value-added tax" on the tax reform is evaluated by using the double-difference method. The double-difference method takes the regions affected by the policy of "replacing business tax with value-added tax" as the treatment group when setting the measurement model. The city under the jurisdiction of a province that implemented the policy of "replacing business tax with value-added tax" was set as the policy treatment group. If the city implemented the "replacing business tax with value-added tax", the dummy variable was assigned to be 1, or 0. In time, in view of the camp "change" is using the pilot implementation step by step, according to the state administration of taxation policies, the documents show in Shanghai in 2012, the first implementation of "change", at the end of 2012 in Jiangsu, Zhejiang and Anhui provinces also started to add "camp", by 2016, all provinces along the Yangtze River economic belt to add "camp", to the camp to increase for the year of 2012 and 2016, and later in the year as the event (time), assign a value to 1, instead of 0. Combining the policy treatment group and the event year group, the tax reform effect (did) is the interaction item between the policy treatment dummy variable (treat) and the time dummy variable (time). Control variables: per capita GDP, urbanization level, infrastructure level and population density. The absolute index in the above mentioned index is logarithmically treated.

3.2. Data Selection and Statistical Description

This paper uses panel data of cities in the Yangtze River economic belt from 2011 to 2017. In view of the fact that Shanghai and Chongqing are municipalities directly under the central government and have great heterogeneity with other cities, while some ethnic autonomous

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prefectures in Yunnan and Guizhou have high policy autonomy and low data availability, the data of 108 cities in total were eliminated. The data in this paper are mainly from the statistical yearbook of Chinese cities. Some of the data are collected and calculated by hand. The data are authoritative and reliable. The statistical description of the variables is shown in table 1.

Table 1. statistical description of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
id	756	54.5	31.19622	1	108
year	756	2014	2.001324	2011	2017
PPC	756	0.6184624	0.3894166	0	2.23935
wasw	756	29.80839	92.86948	0	1156.86
exgas	756	128.7856	151.2366	0	1455.36
treat	756	1	0	1	1
time	756	0.4920635	0.500268	0	1
PGDP	756	41814.55	31605.2	490.89	162388
urban	756	0.4989383	0.1350975	0.10827	0.82
infra	756	32.11483	14.35095	8.31889	81.9253
dop	756	482.5029	237.5228	133	1077.37

3.3. Model Setting

This paper adopts the dual difference econometric model to evaluate the policy effect of the tax reform of "replacing business tax with value-added tax", based on existing literature (Liu Ruiming, 2015; Fan Ziying, 2016) general method, the econometric model is set as follows:

$$\ln ppc(wasw/exgas)_{i,t} = \alpha + \beta did_{i,t} + \gamma controls_{i,t} + u_i + \lambda_t + \varepsilon_{it} \quad (1)$$

Where, is the independent variable, is the control variable, and is the dependent variable. In order to weaken the evaluation interference of heterogeneous factors on the effect of tax policy, this paper adds time and individual fixed effects into the model setting to approximate the real effect of policy effect as much as possible.$did_{i,t}$ $controls_{i,t}$ $(wasw/exags)_{i,t}$

4. Empirical Analysis

In order to explore the impact of the tax reform of "replacing business tax with value-added tax" on the whole Yangtze River economic belt and different types of cities along the river, the baseline regression analysis and sub-sample regression analysis were carried out respectively.

4.1. Baseline Regression Results and Analysis

The whole sample data was used for the benchmark regression analysis, and the regression results in table 2 were obtained.

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Table 2. baseline regression results

	PPC	wsaw	exgas	PPC	wsaw	exgas
did	0.1874 * * * (0.020)	0.3614 * * * (0.059)	0.8801 * * * (0.044)	0.0280 * * (0.014)	0.1081 * * (0.050)	0.3006 * * * (0.082)
Controls,	NO	NO	NO	YES	YES	YES
Time effect	NO	NO	NO	YES	YES	YES
Individual effect	NO	NO	NO	YES	YES	YES
cons	0.608 * * * (0.010)	2.8016 * * * (0.029)	4.7785 * * * (0.022)	2.8782 * * * (1.554)	22.0835 * * * (8.597)	20.7798 * * * (5.391)
N	754	735	754	754	735	754
F	89.7358	38.0561	391.4986	23.68	8.2237	81.3235
r2_a	0.1929	0.0842	0.2948	0.309	0.1324	0.3995
N_g	108	108	108	108	108	108

According to table 2, after controlling for control variables, time and individual effects, the tax reform of "replacing the business tax with a value-added tax" still significantly reduced the power consumption per unit of GDP, per capita waste water discharge and per capita exhaust gas discharge of the Yangtze River economic belt. In the absence of control variables, the tax reform of "replacing business tax with value-added tax" has significant effects on electricity consumption per unit of GDP, waste water discharge per capita and exhaust gas emission per capita in the Yangtze River economic belt. In order to reduce the effects of relevant variables and the individual effect, this paper then control of the Yangtze River economic belt may have some factors that affect the environmental protection, at the same time to control the urban individual and time effect, the regression results still shows "camp to increase tax reform" of the Yangtze River economic belt unit power consumption and waste water discharge and per capita emissions per capita GDP, but the impact level significantly lower than not exert control variables.

Specifically, with the implementation of the tax reform of "replacing the business tax with a value-added tax", the GDP electricity consumption of the Yangtze River economic belt decreased by 0.028 units year by year, the per capita waste water discharge decreased by 0.1081 units, and the per capita waste gas emission decreased by 0.3006 units. According to all the above empirical results, it can be seen that the tax reform of "replacing the business tax with a value-added tax" promotes the overall ecological environment protection in the Yangtze River economic belt, and reduces the production energy consumption and the emission of waste gas and waste water.

4.2. Sample Regression Results and Analysis of City Types

The Yangtze River economic belt covers 11 provinces and autonomous regions, and the economic and environmental issues in the broad basin are complex and interwoven. It is not convincing to observe the overall effect of "replacing business tax with value-added tax" on the overall environmental protection of the basin only. Therefore, the following will set up sub-sample regression to observe the policy effect of "replacing business tax with value-added tax" on environmental protection. The sub-sample regression is set according to the following three aspects: first, urban characteristics. Resource-based cities rely on to the second industry is far more than ordinary city, resources cities in environmental protection, economic transformation and upgrading, and the development of high quality is the key and difficult problem, has always taken seriously, the realization of the rights of the resources city economy transformation and upgrading and development of high quality to the success of the Yangtze

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River economic belt of ecological protection. The second is the distance along the River. Cities within the Yangtze River economic belt along the Yangtze River can be divided into the cities along the Yangtze River and the city, the city along the Yangtze River and the Yangtze River is directly adjacent to, the ecological environment protection, pollution emissions and are directly related to the Yangtze River, the city along the Yangtze River is not only the direct intervention of the Yangtze River ecological environment is the last line of defense, along the city's environmental governance directly affect the success or failure of the Yangtze River environmental protection. The third is the basin. The economic environment characteristics of the upper, lower and middle reaches of the Yangtze River economic belt are different. According to feature 1, cities along the river are divided into resource-based cities and non-resource-based cities, and cities along the river and non-riverside cities are divided into cities along the river and non-riverside cities according to feature 2 and feature 3.

Table 3. sample regression results

	Resource-based city			The cities along the Yangtze River		
	PPC	wsaw	exgas	PPC	wsaw	exgas
did	0.0651 * (0.036)	0.2160 (0.182)	0.5727 (0.206)	0.0502 * (0.027)	0.0921 (0.137)	0.2919 * * * (0.151)
Controls,	YES	YES	YES	YES	YES	YES
Time effect	YES	YES	YES	YES	YES	YES
Individual effect	YES	YES	YES	YES	YES	YES
cons	3.0154 * * * (1.342)	9.6842 * * * (10.117)	23.8334 * * (8.599)	4.3237 * * * (1.402)	14.5396 * * * (7.149)	31.3118 * * (7.923)
N	189	185	187	189	183	189
F	9.5889	4.2554	18.8793	51.0006	3.1615	23.8244
r2_a	0.324	0.1396	0.356	0.2962	0.5437	0.3191
N_g	27	27	27	27	27	27

The results of sub-sample regression of resource-based cities showed that after controlling for control variables, individual effects and time effects, the GDP power consumption decreased by 0.216 units year by year, the per capita waste water discharge decreased by 0.0651 units, and the per capita waste gas emission decreased by 0.5727 units. The effect of the policy of replacing the business tax with a value-added tax (VAT) still significantly reduced energy consumption per unit of GDP and emissions per capita, but had no significant impact on wastewater discharge per capita. The results show that in the process of environmental improvement of resource-based cities in the Yangtze River economic belt, the tax reform of "replacing business tax with value-added tax" effectively promotes the reduction of energy consumption and exhaust gas emissions per unit, and the prevention and control of air pollution and production efficiency are greatly improved, but the prevention and control of water pollution lacks of actual progress.

The regression results of sub-samples of cities along the river show that after controlling for control variables, individual effects and time effects, the GDP power consumption decreases by

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0.0921 units year by year, the per capita waste water discharge decreases by 0.0502 units, and the per capita waste gas emission decreases by 0.2919 units. The sub-sample regression results of cities along the river further verified the sub-sample regression results of resource-based cities. The policy effect of the tax reform of "replacing the business tax with a value-added tax" significantly reduced the energy consumption per unit of GDP and the emission of waste gas per capita, but had no significant effect on the emission of waste water per capita.

Comprehensive resource-based cities sample regression result shows that the cities along the Yangtze River and the Yangtze River economic belt in pollution prevention work, production efficiency has made obvious progress and prevention and control of atmospheric pollution, but is closely related to the Yangtze River water environment of water pollution prevention and control, but there was no major breakthroughs were made in this and the trends of atmospheric pollution control, improve the efficiency, illustrate the current Yangtze River economic belt water pollution governance situation is more serious, the problem is more outstanding.

5. Conclusion and Policy Recommendations

It is the responsibility of the government to promote the harmonious development of economy and environment. The tax reform of "replacing business tax with value-added tax", as the largest tax reform in recent years, has exerted far-reaching influence on all aspects of the economy and society. As the area where the tax reform of "replacing business tax with value-added tax" was initially implemented and popularized, the economic development and environmental protection issues of the Yangtze River economic belt are complex and intertwined. In this paper, through theoretical analysis and the econometric model analysis to get the following conclusions: (1) "camp to increase tax reform since introduced did significantly reduce the overall environmental pollution level of the Yangtze River economic belt, reduces the production energy consumption and the waste gas, waste water discharge. (2) in the sample in the regression, the Yangtze River economic belt along the river pollution prevention must focus on resource-based city and urban," camp to increase tax reform to reduce production energy consumption and emissions has significant positive effect, but no significant influence on wastewater emissions, this shows that the water pollution prevention and control of the Yangtze River economic belt is still need to overcome the difficult deep waters.

Based on the above conclusions, this paper puts forward four Suggestions from the perspective of fiscal and tax policies in combination with the current situation of economic development and environmental protection in the Yangtze River economic belt:

(1) Controlling the river first. At present, the ecological and environmental problems are complex and varied, and the prevention and control of water pollution are prominent in the Yangtze River economic belt. Therefore, the prevention and control of water pollution in the Yangtze River economic belt must be taken as a key issue, and the following three treatment measures should be put forward. First, the financial departments at all levels below the provincial level should closely combine with the functional positioning of the region, concentrate financial resources to ensure the key task of ecological protection of the Yangtze River economic belt, and build an effective water, soil and water quality control system. Second regions must adjust measures to local conditions defined responsibility, special earmarks, prudent approval the upper Yangtze River construction of small hydropower and other facilities, introducing negative listing system control of pollution caused by the transfer of the Yangtze River downstream industry move up, steel, non-ferrous metals industry in the middle reach of Yangtze River in populated areas, in the department of natural resources designated banned open area outside again set a conservation area. Third, we should give certain policy funds to support the rectification of emissions from backward production facilities around the

coastline, the red line for ecological protection and other environmentally sensitive areas, or their removal and closure.

(2) Building a long-term mechanism of pollution prevention and control. The upper reaches of the Yangtze River are most affected by the effects of fiscal and tax policies, which indicates that it is of long-term significance to construct an ecological protection system from the upper reaches of the Yangtze River. The central government should classify 108 coastal cities as a whole and divide them into upstream, middle and downstream regions according to their geographical locations. Then, a certain amount of special funds for pollution prevention and control should be allocated each year according to different regions. Then, relevant departments of governments at all levels should supervise the use of the funds and the treatment effect.

(3) The central government should focus on key areas and establish a long-term plan. For forest resource cultivation, management and protection of natural forest, wetland protection, ecological migration, energy conservation, environmental protection, etc. sustained and stable financial support key tilt to the implementation of the upper Yangtze River major ecological restoration engineering as the development of the Yangtze River economic belt project priority, at the same time increase the Yangtze River economic belt protection forest system construction, soil and water loss and the support of rocky desertification in karst region, governance and other projects.

(4) The tax policy continues to relay. The tax reform of "replacing business tax with value-added tax" has a positive impact on pollution prevention and control and economic transformation and upgrading of the Yangtze River economic belt. Since 2018, with the introduction of the environmental protection tax and the advance of the reform of the resource tax, the role of tax policies in ecological protection has become more and more obvious. But also should see at the same time, the local government in tax rates set environmental protection tax enjoyed greater autonomy, so the rate is generally low, part of the province directly to the low tax rate, it is against the environmental protection tax to promote the ecological environment should be protected, the state administration of taxation shall regulate this behavior, the setting of the minimum increase in the environmental protection tax rate. At the same time, the carbon emission tax system can be introduced to bring carbon emissions into the platform of regional public resource trading center, so as to promote the high-quality development of regional economy through market trading.

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