Analysis of the Impact of the Policy of Replacing Business Tax with VAT on the Economy

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Abstract. To address the impact of unreasonable tax system on China 's economy, China began to implement the policy reform of " replacing business tax with VAT " in 2011 to optimize the tax system. This paper uses the panel data of economic indicators of provinces from 2005 to 2017, the economic benefits of the "replacing business tax with VAT" policy among regions were tested by double difference method. The study found that compared with the provinces that did not implement the "replacing business tax with VAT" in 2012, the provinces that implemented the policy in the same year have shown significant positive benefits for regional GDP and the number of nighttime lighting, mainly through three major mechanisms. According to the research results, this paper also puts forward substantive policy recommendations for the follow-up reform of "replacing business tax with VAT."

Keywords: Replacing business tax with VAT, Economic impact, Differences-in-Differences method, Policy proposal.

1 Introduction

Between 2011 and 2015, China's national economy and social development showed a new dynamic, considering the tertiary industry's explosive growth, with the service industry as its core content, becoming an important factor contributing to the growth of the whole society's GDP. Given the current state of social and economic growth, in order to solve a series of adverse chain reactions caused by the unreasonable tax sys-

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tem, to achieve the purpose of optimizing the fiscal and taxation system, fair tax burden, and promoting industrial upgrading, the State Council and the Party Central Committee have made a crucial decision to switch from Business Tax to value-added tax (Hereinafter referred to as "replacing business tax with VAT"). On January 1, 2012, the "1 + 6 "industry was first introduced in Shanghai thanks to China's "replacing business tax with VAT" strategy. Subsequently, from September 1 to the end of 2012, eight provinces and cities were added to the pilot program's scope, including Beijing and Jiangsu Province. On May 1, 2016, the replacing business tax with VAT pilot was fully rolled out.

After a large amount of data review, most of the presented articles focus on studying the impact of the "replacing business tax with VAT" on certain enterprises or certain industries from a micro or meso perspective, and rarely examine the economic benefits of the policy on regional development from a macro perspective. Therefore, to close the gap in the academic literature for this kind of article, this paper elevates the various elements related to or involved in the "replacing business tax with VAT" to the level of the whole social and economic advancement, focuses on comparing the economic benefits of the regional economy to the provinces both before and after the "replacing business tax with VAT" policy was put into place, and provides the corresponding policy recommendations for the subsequent development of this policy.

This paper takes the background, process and importance of "replacing business tax with VAT" as the starting point, and reviews the current academic analysis of "r" replacing business tax with VAT" policy, including the related research of the "replacing business tax with VAT" policy and the related application of the double-difference method in two parts; Secondly, the whole empirical experiment is described in detail from the three aspects of parallelism trend test, DID results and robustness test; finally, this article is summarized and put forward the substantive recommendations for the policy of "replacing business tax with VAT".

2 Literature Review

2.1 Relevant Studies on the Policy of Replacing Business Tax with VAT

Among China's most significant and impact tax reforms in recent memory, the reform of replacing business tax with VAT has attracted the attention of many scholars. The

main scope of the research covers the practical significance of the policy of replacing business tax with VAT and its impact on the secondary industry.

In terms of exploring the importance of using VAT to replace corporate taxes, Gao Peiyong jumped out of the tax reform thinking and structural adjustment vision, and made a panoramic judgment on the actual and potential significance and benefits of the replacing business tax with VAT from a macroscopic point of view, and used it as a basis for defining its functioning and way forward [1]. Hu Yijian et al. successfully analyzed that VAT's impact on the economy and finances when business taxes are replaced from six more microscopic aspects [2], specifically the internal effects of corporate tax burden, fiscal revenue, economic growth, structural adjustment, industrial transformation and residents ' welfare. At the same time, Tian Zhiwei et al creatively constructed the CGE model of China's tax income to analyze the dynamic changes of the two tax burdens of China's industries before and after the replacing business tax with VAT, revealing that the dynamic impact of the replacing business tax with VAT on the industry's tax burdens has enormous practical implications, found in the long-term part some industries will still experience an increase in the burden of taxes [3].

Given the impact of policies on upstream and downstream industries, Fan Ziying and Peng Fe measured the degree of industrial interconnection between the service industry and upstream industries based on the input-output tables of 135 industries in China [4]. Matching it to the microdata of listed companies while creatively using the triple-difference method (DDD) discovered that the impact of substituting corporate tax with VAT on tax reduction was highly influenced by industrial interconnectivity and the VAT rates in upstream industries, but effectively promoted cross-regional division of labor and collaboration, as well as investment in fixed assets.

As for industry innovation, Li Yongyou and Yan Cen discovered that the tax reduction effect of the service sector substituting VAT for business tax drove the modernization and transformation of the manufacturing sector, which was marked by an increase in productivity, and different enterprises can choose different upgrade paths according to the level of their original technology [5]. On the other hand, Jiang Mingyao makes a sufficient comparison between the service industry and the industry and uses the input-output table to simulate and calculate the influence of the VAT "expanding scope" reform on the theoretical tax burden of industry and service industry under different tax rates [6]. It verified that the high value-added rate of the ser-

vice industry and the Clear gap between industries are the significant reasons why the tax burden of the service industry fluctuates more than that of the industry.

2.2 Relevant Applications of the Differences-in-Differences Method

Through extensive literature research, we have found that the Differences-in-Differences method has unique benefits in the use of research methods. Using the data of Chinese publicly traded firms from 2008 to 2014, Chen Zhao and Wang Yang found two different forms of specialization after the execution of the policy of "business tax to VAT" by using the Differences-in-Differences method [7]. These are the externalization of operations that were previously self-sufficient and the increase in demand for outsourcing of services from other firms. Yuan Congshuai et al. established a Differences-in-Differences method based on the panel data of 239 listed companies from 2007 to 2013 and found that “replacing business tax with VAT” significantly promoted the total investment of enterprises, especially the amount of capital per capita, thus leading to a chain reaction of wage level and enterprise R & D ability improvement [8].

3 Data and Methods

3.1 Data

According to the basic setup of the "Differences-in-Differences method" model, other factors are excluded by creating two variables: policy and time. Although the policy of "business tax with VAT" was mostly piloted in some industries only in 2012, this paper mainly aims to explore the effect of the policy of "business tax to VAT" on the macroeconomic development of different regions. The extent of the policy's influence should be taken into account both before and after it is put into effect, including, but not limited to, the industries mentioned, and it is more important to choose indicators that are direct and representative of the macroeconomy to scrutinize the effects of the policy.

According to the policy of "Business Tax with VAT" as the most influential policy in China's economy, this paper selects the GDP value, the percentage of primary, secondary, and tertiary industries, the total investment in fixed assets of the whole society, and the nighttime lighting index of all the provinces in China, except for Taiwan, Hong Kong, and Macao, between 2005 and 2017 as the research object. In

the selection of specific indicators, GDP, as the core indicator of national economic accounting, directly reflects the regional economic situation and development level; The change in the proportion of tertiary, secondary, and primary industries effectively measures the effectiveness of the process of structural transformation and upgrading of the regional economy; The total investment in fixed assets of the whole society reflects well the vitality and enthusiasm of regional enterprises; finally, the night lighting index confirms the activity level of the regional economy from the side. The collection of this article the total number of samples totaled 2,262, of which each indicator contains 377 data, those data are derived from the flush ifind database and wind database, and all the data are relatively complete during the 12 years, with comprehensive, authoritative, and representative characteristics. In terms of handling the data, this paper converts all cross-sectional data into panel data, which is multidimensional and intuitive to show the comprehensiveness of the data and helps to utilize Stata for regression tests at a later stage.

3.2 Differences-in-Differences Method

3.2.1. Theoretical Basis

Differences-in-Differences (DID), also known as the "Double difference method" as a feasible universal method in policy effect evaluation, has been favored by more and more scholars in recent years.

According to the research of Xu [9], the theoretical framework of the difference-in-difference method is based on the 'Natural Experiment'. The basic idea is to compare the differences between the Control Group and the Treatment Group before and after the implementation of the policy. Requirement to measure data from the treatment and control groups at two or more different time periods and after testing for parallelism, a double difference statistic reflecting the effect of the policy is constructed.

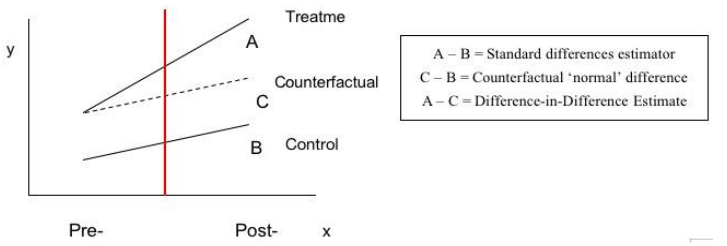

Fig. 1. Differences-in-Differences basic model.

3.2.2 Practical Applications.

In the model construction of this paper, we take the provinces (Shanghai, Beijing, Jiangsu, Anhui, Fujian, Guangdong, Tianjin, Zhejiang, and Hubei) that implemented the "replacing business tax with VAT" pilot in 2012 as the treatment group, and other provinces that only implemented the "replacing business tax with VAT" policy in 2016 as the control group. The pilot year began in 2012.

In light of the basic setting of the difference-in-differences model, this paper uses the following model:

$$Y_{it} = \beta_0 + \beta_3 \, treat_{it} \cdot post_{it} + \beta 2 \, treat_{it} + \beta_1 post_{it} + \varepsilon_{it} \quad (1)$$

In this formula, we introduce Y as a proxy variable to reflect the economic indicators of this paper, id as an individual variable, and rank 30 provinces from 1 to 30 according to the alphabetic initials; As a time variable, t ranks each province from 2005 to 2017. Two dummy variables were used to distinguish the samples. Treat is used as a staging dummy variable to distinguish the years of policy implementation. The policy year of "replacing business tax with VAT" is 2012. Therefore, we set treat = 1 in 2012, else treat = 0. Post is a grouping dummy variable to distinguish whether the policy is implemented or not. If the province implements the "replacement of business tax with VAT" in 2012, then post = 1, else post = 0.

After such a scientific setting, the actual economic meaning of the coefficient β3 is the incremental difference between the provinces that piloted "replacing business tax with VAT" in 2012 and the provinces that did not carry out "replacing business tax with VAT" after the implementation of the policy.

To obtain the final value β_3, the experiment should make the following differential processing:

The Y value obtained by setting treat = 1, post = 1 minus the Y value obtained by setting treat = 1, post = 0, the result 1 is $\beta_1 + \beta_3$. Among them, β1 has a common time effect on the treatment group， and the control group. In this case, it is not possible to accurately analyze the real benefits of "replacing business tax with VAT," that is, the following step requires excluding time interference..

The Y value obtained by treating = 0, post = 1 minus the Y value obtained by treating = 0, post = 0, the result 2 is β_1.

Finally, β3 is obtained by subtracting result 2 from result 1, that is, after removing some common factors affecting the two groups by the difference-in-difference technique, the real net effect of "replacing business tax with VAT" is obtained.

Table 1. Differences-in-Differences method

Treated / Post	$Treat_i=0$	$Treat_i=1$	Δ
$Post_t=0$	β_0	$\beta_2+\beta_0$	β_2
$Post_t=1$	$\beta_1+\beta_0$	$\beta_3+\beta_2+\beta1+\beta0$	$\beta_3+\beta_2$
Δ	β_1	$\beta_3+\beta_1$	β_3

4 Empirical Results

4.1 Parallelism Trend

The basis for applying the difference-in-difference method in empirical research is the parallel trend test. That is to say, the target variables of the treatment group and the control group need to satisfy the test of parallelism trend prior to the policy occurs. Otherwise, if they are not satisfied, the result (β_3) cannot correctly represent the net benefit of the policy, and other factors will likely lead to overestimation or underestimation of the final result. In this paper, it should be satisfied that the economic development level of the treatment group and the control group before and after the "replacing business tax with VAT" has a common trend transformation.

In this study, Before2 and Before1 are dummy variables that take 1 if the observations are data from year 2 and year 1 before the policy shock, respectively, and 0 otherwise; Current takes the value of 1 if the observation is for the year in which the policy shock occurred, and 0 otherwise; After1, After2, and After3 are taken to be 1 when the observations are data from years 1, 2, and 3 after being subjected to the policy shock, and 0 otherwise.

We see that the coefficients of Current, After1, After2, and After3 are significant, however the coefficients of Before2 and Before1 are not, indicating that the treatment group and the control group satisfy the parallel trend hypothesis in the experiment, so the differences-in-Differences test can be carried out.

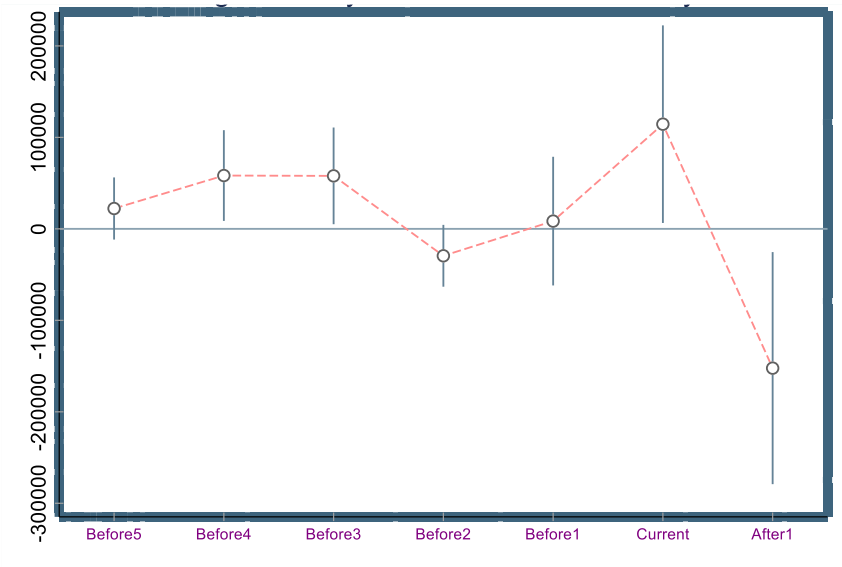

Fig. 2. Parallel trend test (partial screenshot)

4.2 DID Results

From a regional perspective, GDP can show the relationship between the demand and industrial structures of various regions as well as the overall economic health of each region, which is a multi-angle and multi-faceted economic indicator. Therefore, this paper selects GDP as an indicator to measure policy effectiveness.

To eliminate the differences between different regions and control confounding factors. this paper will set other factors as control variables, In experiments for multiple factors we plan to select 2 indicators as a variable to control geographical differences. The research found:

Percentage of different industries: In the case of large differences in the economic structure of different regions, resulting in different benefits of economic development as well as the effects of the industrial chain, the results of economic development as well as future trends will also show greater heterogeneity. Yuan Congshuai, Luo Ge,and Qin Xi said that a large number of studies have verified that the economic benefits of "replacing business tax with VAT" are mainly concentrated between the secondary and tertiary industries [10]. To balance the differences between diverse areas to meet the principle of non-repetitive control, this experiment selects the percentage of the primary industry as the first control variable.

Total Investment in Fixed Assets of the Whole Society: This indicator is a comprehensive measure of regional development that shows the amount, rate, and percentage of fixed asset investment in a region. Liu Yong, Chen Wenni, and Li Pengshi pointed out that their differences and similarities lead directly to gaps in local competitiveness between industries, reflecting differences in demand and supply between different regions [11]. Therefore, so as to balance the differences between diverse regions and also to satisfy the principle of non-duplication of control, the total investment in fixed assets of the whole society is selected as the second control variable.

Table 2. Difference-in-differences estimation

	m0	m1
Dyear	1058.1***	-736.0***
	(5.54)	(-6.66)
Treat	11196.2**	6437.7**
	(2.82)	(3.17)
_diff	2195.0*	857.4
	(2.15)	(1.66)
Industry1		-35149.4***
		(-5.79)
Investment~s		1.264***
		(32.30)
_cons	13501.5***	4661.6***
	(19.02)	(5.14)
N	377	377

t statistics in parentheses ,* $p<0.05$, ** $p<0.01$, *** $p<0.001$.(The significance levels of 5 %, 1 % and 0.1 % of t statistics calculated based on conditional heteroscedasticity consistent standard deviation in brackets are expressed as*,**and*** , respectively.)

Table 2 displays the experiment's regression results, where columns m0 and m1 are the results of the baseline regression with only the core explanatory variables and the regression results with the addition of other control variables (the percentage of the primary industry and the total investment in fixed assets of the whole society), respectively. One of the most noteworthy is the intersection data 2195.0 of the 'diff' row and the m0 column, that is, the difference-in-differences to gain the net benefit of policy implementation for GDP increment. The data shows that the influence of "replacing

business tax with VAT" on regional GDP is significantly positive at the statistical level of 5%, which strongly confirms the previous hypothesis that economic development benefits from the policy.

4.3 Mechanism Analysis

The following three mechanisms account for the majority of the policy's beneficial effects on the economy when business taxes are replaced with VAT:

First, as China's economy has made leapfrog progress since the reform and opening up, the rapid progress has given rise to more industries. Bai Yachen was sure that the original tax structure is unable to support the development of the various industries required for development, thus hindering the economic process to a great extent [12]. The emergence of the "replacing business tax with VAT" hits the pain point of the duplicated tax burden, eliminates the unreasonable part of the traditional tax system, eases the pressure of economic downturn, and provides a fair platform for the development and competition of enterprises. Under the urgent requirements of supply-side structural reform, enterprises, as the core of promoting regional economic development, obtain the cost-saving benefits brought about by the policy, and transform this cost into the basis for expanding capital and upgrading production capacity, generating expansive benefits, and carrying out a new round of reforms to gain competitiveness in the market. As Li Cheng and Zhang Yuxia mentioned, "replacing business tax with VAT" effectively promotes the enterprise's investment, sales, and technology research and development behavior, significantly enhancing the total factor productivity of enterprises in the pilot area, the enterprise in the level of technical productivity level of the obvious advancement, to achieve significant micro-effects on the regional economic development to play a catalytic role [13].

Second, the full execution of the "replacing business tax with VAT" policy is conducive to solving the inherent requirements of economic structure optimization and industrial-level improvement. According to Liao Hongwei, and Liu Yongfei, the adjustment benefits of industrial organization can be divided into direct and indirect paths, which are mainly reflected in the reduction of tax burden, reduction benefits and separation of departments. After the policy reform, the service sector issued special VAT invoices to downstream enterprises to be offset by downstream enterprises, which reduced the tax burden of downstream industrial and commercial enterprises and stimulated the joint development of the service sector and commerce and industry [14].

At the same time, the credit mechanism of the "business transformation" has eliminated the tax barriers to the outsourcing of enterprise services and the separation of the main and auxiliary services, so that the production enterprises can independently outsource their service departments and become more efficient entities, thus realizing a more focused main business and a more specialized auxiliary business, which will lead to further integration of the production factor resources, and at the meantime, expanding the scale of the market's services and upgrading the level of the industry, thus encouraging the industry's modernization and change. From a long-term perspective, the optimization of the tax structure is conducive to nurturing new momentum for economic development, thereby promoting the upgrading of industries and consumption.

Third, although the policy of "replacing business tax with VAT" is powerless to increase income, Zhang Qing,and Zhou Quanlin said that it effectively improves the purchasing power of consumers from the side. According to Deng Fei, in the past two decades, the distribution ratio of labor-capital income in China has been unbalanced, and the share of labor income in GDP has shown a downward trend [15-16]. However, after the implementation of the policy of replacing business tax with value-added tax, on the one hand, the reform has lowered the overall tax burden on households, and low-income earners have benefited from the reform to a greater extent than high-income earners, with strong support for the service sector and other industries, jobs have been further increased, thus ameliorating income inequality to a certain extent. On the other hand, the "replacing business tax with VAT" by reducing the indirect tax burden of the pilot businesses, through the price transfer benefit, so that the tax reduction is partially reflected in the market price. Analyzing the pilot industries of the policy, especially for the reform of the living service industry accounts for a large proportion and a large range, to a certain extent, to reduce the burden of living, to stimulate residents' consumption power and market vitality.

4.4 Robustness Tests

To ensure the validity of the findings and ensure that there are no contradictions between the indicators, we will put in the second indicator, "nighttime lighting data" as evidence to support the previous point.

Feng Kai and Li Ronglin pointed out in their research that With the development of productivity and changes in living habits in contemporary societies, nocturnal economic activities are becoming more sustainable [17]. The number of nighttime lighting

is directly collected by high-altitude satellites, with broad coverage and little human intervention, which can more accurately capture the performance of human economic activities and better reflect the underground economic activities that are difficult to count, with strong objectivity. This more technical nighttime lighting data serves as a proxy variable for GDP data and can compensate for the shortcomings of traditional manual statistics.

Table 3. Difference-in-difference stability test

	m0	m1
Dyear	9699.8***	-11670.2***
	(3.42)	(-5.08)
Treat	128708.5*	53733.0
	(2.18)	(1.27)
_diff	38545.1*	22454.7*
	(2.54)	(2.09)
Industry1		-731821.3***
		(-5.80)
Investment~s		14.85***
		(18.26)
_cons	188418.0***	121900.3***
	(17.89)	(6.46)
N	377	377

t statistics in parentheses，* p<0.05, ** p<0.01, *** p<0.001，(The significance levels of 5 %, 1 % and 0.1 % of t statistics calculated based on conditional heteroscedasticity consistent standard deviation in brackets are expressed as*, **and***, respectively.)

As shown in Table 3, under the premise of controlling the percentage of the primary industry and the total investment in social fixed assets, the intersection data of m0 column and 'diff' row is 38545.1, which shows that the effect of 'replacing business tax with VAT' on the number of nighttime lighting is significant at the statistical level of 5%, which is the same as the previous impact on GDP. From another perspective, it effectively confirms the positive benefits of the policy of "replacing business tax with VAT" for regional economic development.

5 Conclusions

5.1 Summary

This study looks at China's annual panel data for all Chinese provinces and cities, excluding Taiwan, Hong Kong, and Macao, from 2005 to 2017, and finds that compared with the provinces that did not implement the policy in 2012, the provinces that did implement the policy in the same year have already shown significant positive benefits for regional economic development. Through further analysis of the policy transmission mechanism, we find that there are three main reasons: The replacement of business tax with VAT eliminates the unreasonable part of the traditional tax system and solves the issue of double taxation to a great extent. Therefore, enterprises transform cost savings into development basis and contribute to regional economic activities; The full implementation of the policy of "replacing business tax with VAT" is favorable for addressing the intrinsic requirements of optimizing the economic structure and upgrading the industrial level by lessening the burden of taxes, the benefits of deductions and the separation of sectors; "Replacing business tax with VAT" can bring a certain degree of residents' welfare effect, through the price transmission mechanism of price level reduction, at the same time, jobs have been further increased, regional consumption, investment capacity has been enhanced.

5.2 Policy Recommendations

After analysis, given the above conclusions, we put forward some substantive suggestions on the policy of "replacing business tax with VAT."

First of all, the comprehensive "replacing business tax with VAT" should not only do a good job of subtracting tax revenue but also do something about the addition. By encouraging enterprise science and technology research and development, supporting entrepreneurship and innovation, extending the industrial chain and other substantive practices, reducing the cost of enterprises to apply to the support of the regional economy, and in the current economic situation of uncertainty in the background, the introduction of relevant policies to reduce the risk of enterprise research and development is particularly necessary.

Secondly, after Yuan Congshuai and others ' research, the effect of smaller enterprises on stimulating investment and employment in the 'replacing business tax with VAT' is more obvious, and such businesses have a higher potential for economic con-

tribution. Therefore, the "replacing business tax with VAT" should adopt more comprehensive supporting measures for smaller enterprises, so that all of the factor market can be fully competitive and free-flowing [8].

Finally, because of the effectiveness of the transmission of market price mechanism in the context of "replacing business tax with VAT, " the policy should ensure that the real benefits fall into the pockets of the masses, improve the purchasing power of the demand side, to truly stimulate the economic vitality.

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