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TAX REFORM, TAX SHIFTING AND ENTERPRISE INNOVATION

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Abstract. Fiscal and tax policies, as important forms of government regulation and control of the economy, have a profound impact on both macroeconomics and microeconomics and have been widely studied by scholars. To deeply explore the relationship between tax reform and enterprise innovation, based on classic financial theories such as financing constraints and tax shifting, annual data on Chinese A-share listed companies from 2009 to 2022 and the time-varying difference-in-differences method, we investigated the impact mechanism and economic effects of the "replace the business tax with a value-added tax" policy (VAT reform)on enterprise innovation and examined the moderating effect of the tax shifting ability during this process. The research results indicate the following: VAT reform can lower the tax base of enterprises, reduce cash outflows, and alleviate financing constraints, which helps enterprises stimulate innovation vitality and enhance R&D investments. The negotiation leverage that a company possesses in dealings with its providers and purchasers influences its capacity to transfer fiscal burdens. The enhancement of corporate innovation resulting from the VAT reform is notably pronounced. In contrast to state-owned enterprises, non-state-owned enterprises face fierce market competition and greater survival pressure and do not undertake policy-related activities. They are more sensitive to the tax reduction effect of the VAT reform and are more willing to carry out innovative activities when pursuing long-term development. At the same time, they are also more willing to enhance their tax shifting ability to fully obtain policy dividends for enterprise innovation. This conclusion can help the government correctly judge and comprehensively evaluate the effect of the VAT reform, providing management insights into how the government can better improve tax arrangements and promote enterprise innovation to achieve balanced development and how enterprises can better obtain policy dividends to promote technological innovation.

Keywords: tax reform, VAT, tax shifting, enterprise innovation, DID.

JEL Classification: H25, M10, O32.

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1. Introduction

Fiscal and tax policy, an important policy instrument for governments to use to regulate the economy, has a significant impact on economic development and has been widely studied by researchers. Therefore, fiscal and tax reform inevitably has a profound impact on macroeconomic trends and microeconomic development. Business taxes are usually levied directly based on the total amount of business revenue and the applicable tax rate, and input taxes cannot be deducted. However, the value-added tax is characterized by directly subtracting the

input tax from the output tax and allows taxpayers to only pay taxes on the value-added part of products and services. Obviously, the tax reduction principle of the VAT reform is to eliminate duplicate taxation. To promote supply-side structural reform, the Chinese government began the VAT reform pilot on January 1, 2012, and fully implemented it nationwide on May 1, 2016. The purpose of the VAT reform is to reduce the tax burden on enterprises through structural tax reductions, guide enterprises to allocate funds reasonably, release enterprise vitality, and promote enterprises to increase R&D investments and industrial structure upgrading. Consequently, it is of profound significance, both in theory and in practice, to explore the underlying dynamics and impacts of tax reforms specifically targeting micro-enterprises.

Most of the research on tax reform has focused on the policy effects of VAT on macroeconomics and microenterprises. At the macro level, scholars have studied the impact of VAT on the industry tax burden (Peng et al., 2021; Hindriks & Serse, 2022; Bilicka et al., 2023), economic efficiency (Hoseini & Briand, 2020; Sen & Wallace, 2022; Geringer, 2023), foreign trade (Wang et al., 2016; Yousefi & Vesal, 2023; Igbinenikaro & Adewusi, 2024), commodity prices (Ni et al., 2016; Lyssiotou & Savva, 2021), income distribution (Zhou & Du, 2016; Benzarti & Carloni, 2019; Warwick et al., 2022) and industrial transformation (Li & Yan, 2018; Zhou et al., 2022). At the microeconomic scale, researchers have dedicated their efforts to examining how the implementation of VAT policies influences the specialization of labor (Chen & Wang, 2016; Fan & Peng, 2017; Liu et al., 2017), investment decision making (Qi, 2022; Chen et al., 2023; Tang et al., 2024), financing constraints (Brown et al., 2012; Ju et al., 2013; Qiao & Chen, 2017), and labor employment (Mamboundou, 2022; Novoa-Hoyos et al., 2022). Whether VAT reform can reduce the tax burden and promote enterprises' long-term development is the key to evaluating policy effects at the micro level, especially its impact on enterprise innovation, which has become the core factor of sustainable development for enterprises (Lu et al., 2024). However, to explore the influence of VAT policy changes on the innovation capabilities of businesses, existing literature has predominantly employed theoretical frameworks (Gong et al., 2016; Mukherjee et al., 2017), individual industries (Shao et al., 2019; Liu et al., 2021; Dechezleprêtre et al., 2023), or regions (Wang et al., 2020; Sidek & Abdulraqeeb, 2022) and has conducted simple mechanism analyses (Mao et al., 2020; Qin et al., 2023). These studies have considered neither the tax shifting ability of enterprises (influenced by the bargaining power of its suppliers and buyers) nor the impact of enterprise heterogeneity, making the results one-sided and difficult to apply widely in practice. Therefore, based on classical financial theory and from the perspective of tax shifting, we select Chinese A-share listed companies from 2009 to 2022 as samples to explore the economic impact of tax reform on enterprise innovation and the moderating effect of tax shifting and further conduct heterogeneity analysis.

The novel contributions of this study include the following. (1) This study further enriches the relevant research results of tax reforms by analyzing the effect of the VAT reform on enterprise innovation. (2) Using bargaining power as a key variable, this study reveals how tax reform impacts enterprise innovation at different levels of tax shifting ability, allowing for more comprehensive research on enterprise innovation. (3) This study analyzes the heterogeneous impact of enterprise property attributes on the policy effects of the VAT reform and on the moderating effect of tax shifting in the Chinese context.

The remainder of this study is organized as follows. Section 2 provides a literature review and proposes are search hypothesis by combining the relevant literature. Section 3 describes

the research design and descriptive statistics, including the variable setting, model construction, and data selection, and conducts descriptive statistical analysis on the main data. Section 4 presents the results of the analysis, which empirically investigates the influence of VAT reform on enterprises innovation, as well as the role of tax shifting as a moderating factor, and further conducts grouping and robustness tests based on property attributes to reveal the differences in the effects mentioned above. Section 5 presents the discussion, which elaborates in detail on the reasons and impact process of the empirical results. Section 6 presents the research conclusions and management implications of this study and provides prospects for future research.

2. Theoretical background

2.1. The impact of the VAT reform on enterprise innovation

Financing constraint theory suggests that a company's financing behavior is constrained by its financial conditions, and enterprise innovation is hampered by financial constraints. The government can alleviate internal and external financing constraints through tax incentives and fiscal subsidies, thereby promoting the willingness and enthusiasm of enterprises to participate in R&D and investments. Compared to fiscal subsidies, tax incentives, which are related to obvious high transparency and strong expectations of enterprises, are beneficial for governments to flexibly regulate the market at a lower cost. The dual advantages of tax incentives can more effectively motivate enterprises to participate in independent innovation (Qin et al., 2023). Tax incentives increase enterprises' accumulation of funds by reducing the tax burden, alleviating financing constraints, and enhancing the willingness to engage in R&D (Liu et al., 2016; Nagato, 2024). Although tax incentives may not have a significant impact on innovation output, they can significantly increase enterprise innovation investments (Li & Guo, 2014). As an important form of tax incentives, the VAT reform can lower an enterprise's tax base, reduce cash outflows and financial risks, reduce external resource dependence, and suppress rent-seeking behavior. Despite the absence of policy incentives within the tax rate post-VAT reform, the government's taxation is confined to the increment in value of goods and services. This exempts enterprises from value-added taxes on technology transfers, development, consulting and other services, significantly reducing their tax base, cash outflow and dependence on external financing, and a direct reduction in their tax burden as well as an increase in their innovation investments and increased R&D investments (Mukherjee et al., 2017; Wang & Cao, 2018) and ability to respond to potential risks (Qin et al., 2023; Giedraitis et al., 2024). The VAT reform, through the reduction of tax rates, not only facilitates structural reforms on the supply side and the transformation of businesses, but also stimulates a more innovative spirit within enterprises. Enterprises with reduced tax burdens alleviate financial risks, enhance their financing capabilities, help them break through R&D funding bottlenecks (Liu et al., 2016; Qiao & Chen, 2017), stimulate innovation vitality, and enhance market value and operational efficiency (Bornemann et al., 2023). Enterprises with reduced tax burdens can reduce rent-seeking behavior (Li & Liang, 2016), inject more energy into R&D, and help transform their development philosophy from rent-seeking to innovation-driven, achieving enterprise transformation and upgrading. As a result, the first hypothesis for the study is proposed.

H1: *VAT reform can significantly increase enterprise innovation.*

2.2. The moderating effect of tax shifting

The theory of tax shifting holds that under market economy conditions, enterprise taxpayers commonly transfer tax burdens through commodity exchanges to maximize their profits. However, an enterprise's tax shifting ability is influenced by various factors. Compared with other types of taxes, value-added taxes have the characteristic of "easy transfer of tax burden". That is, in transactions with upstream suppliers or downstream buyers, taxpayers can transfer part or all of the value-added tax to their counterparts by changing the negotiated price. Although the tax burden can be transferred, an enterprise's tax shifting ability mainly depends on its bargaining power, which is limited by its dependence on resources from suppliers and customers. A lower dependency is associated with a higher enterprise position and initiative in price negotiations, and the stronger is their tax shifting ability (Tong et al., 2015; Zhang et al., 2019; Yousefi & Vessel, 2023). After the VAT reform, deducting input taxes on raw materials can reduce enterprises' procurement costs (Warwick et al., 2022). If the bargaining power of upstream suppliers is weak, enterprises are more likely to transfer input taxes to upstream suppliers by lowering costs during the procurement process. After VAT reform, enterprises can also transfer output taxes to downstream buyers. If downstream buyers have weaker bargaining power and the enterprise controls the selling price, elevating selling price may lead to downstream buyers bearing the output tax (Qiao & Chen, 2017). Enterprises' tax shifting ability is crucial to the impact of their operating cash flow. Enterprises with weak tax shifting ability find it difficult to transfer tax burdens through prices and enjoy policy dividends. Enterprises with strong tax shifting ability hold the dominant position in pricing, which makes it easy to transfer tax burdens to upstream and downstream partners and further alleviate their financing constraints R&D (Wang et al., 2020; Warwick et al., 2022). The second research hypothesis is derived from the above analysis.

H2: *Tax shifting ability exerts a positive moderating effect on the influence of VAT reform on enterprise innovation; that is, as the bargaining power of suppliers and buyers weakens, it is observed that the ability of enterprises to transfer their tax liabilities becomes correspondingly stronger, and VAT reform has a stronger effect on improving enterprise innovation.*

2.3. Differential impact of enterprise property rights on policy and moderating effects

In the Chinese context, there are special differences in property attributes among enterprises. Due to significant differences in the shareholding structure, the market environment, salary incentives, external supervision, and other aspects between state-owned and non-state-owned enterprises, the impact of the VAT reform on enterprise innovation may be diverse. In the Chinese context, in contrast to other non-state-owned enterprises, state-owned enterprises face weaker market competition and survival pressure but must undertake more policy tasks and diverse business objectives. Nevertheless, non-state-owned enterprises have more intense market competition and greater survival pressure, and need to invest continuously in technology in order to maintain long-term growth momentum. Additionally, non-state-owned enterprises have relatively simpler business objectives and rarely conduct policy tasks,

which make it easier to innovate. Based on the above analysis, we propose a third research hypothesis.

H3: *In contrast to that of state-owned enterprises, VAT reform has a stronger effect on R&D innovation in non-state-owned enterprises.*

In addition, different property attributes constrain the moderating effect of the ability of enterprises to shirt taxes. Non-state-owned enterprises do not have a strong relationship with the government, which prevents them from acquiring or expanding social resources (Tong et al., 2015). Therefore, in fierce market competition, non-state-owned enterprises attach more importance to maintaining relationships with suppliers or customers, and their dependence on partners' resources further increases, resulting in a weaker tax shifting ability. However, state-owned enterprises have relatively low dependence on the resources of suppliers and buyers and have strong bargaining power and tax shifting ability. In theory, there is a greater moderating effect of state-owned enterprises' ability to shift taxes on enterprise innovation than that of private enterprises. However, in the Chinese context, because state-owned enterprises undertake more policy tasks and face weaker market competition, their bargaining power does not have a significant impact on their operations. Therefore, for state-owned enterprises, the moderating effect of their tax shifting ability may not be significant to the effect of the VAT reform on enterprise innovation. To seek survival opportunities given fierce market competition, non-state-owned enterprises need continuous innovation to promote their rapid growth. Due to their relatively singular business objectives and lower policy burden, in comparison with state-owned enterprises, non-state-owned enterprises focus more on innovation and are more sensitive to the effectiveness of the VAT reform in alleviating financing constraints. Therefore, non-state-owned enterprises may fully utilize their bargaining power to achieve tax shifting, thereby enjoying more of the benefits from the VAT reform during the technological innovation process. Following the preceding analysis, we propose a fourth research hypothesis.

H4: *In contrast to that of state-owned enterprises, the moderating effect of tax shifting is stronger for non-state-owned enterprises.*

3. Research objective, methodology and data

3.1. Sample selection and data sources

China's VAT pilot reform began on January 1, 2012, and was fully promoted and implemented on May 1, 2016. The "1+6" model was adopted in the selection of industry models, where "1" refers to the transportation industry, including four major categories of transportation services: land, water, aviation, and pipeline. "6" represents the modern service industry, which mainly includes six types: technology and R&D, cultural creativity, logistics assistance, information technology, authentication consulting, and tangible movable property leasing. Therefore, to investigate the policy effects of the VAT reform, we focus on listed companies included in the VAT reform pilot program from 2009 to 2022 and explore how tax reform affects the enterprise innovative and the moderating effect of tax shifting ability. To make the research conclusions as robust and reliable as possible, we process the sample data as

follows: (1) deleting samples that do not belong to "1+6" industries; (2) excluding listed company samples that are ST; (3) removing samples with missing important indicators; and (4) subjecting all continuous variables to Winsor processing at the 1% and 99% levels to prevent the interference of outliers on the estimated results. After the above processing, the annual data of 2608 listed companies were finally obtained. The tax shifting data are sourced and compiled from the annual reports of listed companies, whereas other data are sourced from the CSMAR database (China Stock Market & Accounting Research Database, 2009–2022), and supplemented with data from the Wind Economic Database (2009–2022).

3.2. Variable setting and explanation

(1) Enterprise innovation (*ERD*). Enterprise innovation is the main dependent variable of this study, and scholars usually measure it at two levels: innovation input (Liu et al., 2016; Shao et al., 2019) and innovation output (Zhang et al., 2019; Cao et al., 2023). Enterprise innovation investments change more sharply when tax reforms are implemented as a policy shock. Therefore, we select the intensity of enterprise innovation investments as a proxy variable for enterprise innovation and specifically measure the proportion of annual R&D investments to operating income.

(2) Independent variables. VAT pilot reform is the independent variable that we focus on mainly by studying its policy effects on enterprise innovation. The VAT reform can be likened to a "quasi natural experiment," where for businesses impacted by the policy, it operates as an external shock rather than a voluntary move based on foreknowledge of the tax policy change. The efficacy of the VAT reform can be determined by assessing the comparative behavior and performance metrics of enterprises that were restructured under the reform versus those that were not. However, it is essential to control for the confounding effects of other factors that may have influenced all firms during the period surrounding the reform, thereby ensuring a robust comparison. Therefore, we use the DID method to empirically study the policy effects of the VAT pilot reform on enterprise innovation. The specific approach is to introduce the time (*Time*) and grouping (*Group*) variables of the VAT pilot reform.

Time is a dummy variable that takes the value of 1 if the sample is in the year after the implementation of the VAT reform and 0 otherwise.

Group is a dummy variable that takes the value of 1 if the VAT reform has affected the sample and 0 otherwise. When *Group* value is 1, the sample is in the experimental group; when *Group* value is 0, the sample is in the control group.

The experimental group mainly consists of enterprises in "1+6" industries, and was selected mainly because "1+6" industries can cover most industries involved with VAT. If the policy effect is significant, it should first be identified in these industries. China's VAT reform adopts a gradual, two-way expansion in regions and industries. Therefore, for the regions and industries that implemented VAT reform in the middle of the year, we refer to Chen and Wang (2016), Liu et al. (2017), Zhang et al. (2019) and categorize the enterprises that start piloting from January to June each year as the experimental group of that year. The enterprises that start piloting from July to December are the experimental group of the next year. Prior to

the VAT reform, China imposed a business tax on sectors such as services and construction, while the manufacturing sector was subject to a value-added tax. However, the value-added tax paid by manufacturing firms on acquired productive services was not deductible. Post-VAT reform, the acquisition of productive services became deductible, thereby broadening the eligibility for VAT credit among manufacturers. However, the inclusion of manufacturing entities in the control group could skew research outcomes. Consequently, we omit samples from the manufacturing sector and opt for service, construction, and real estate sectors' pilot firms as our experimental group; nonpilot firms serve as the control group. The classification of industry categories involved in this study is based on the 2012 industry classification standard of the China Securities Regulatory Commission.

(3) Moderating variables. Tax shifting is the moderating variable in this study. The influence an organization wields in negotiations is significantly shaped by its reliance on both its suppliers and its customer base. When a company's procurement of essential materials is concentrated among a few suppliers at the top of the supply chain, its revenue is correspondingly derived from a select few clients at the bottom. Consequently, a heightened reliance on suppliers and customers by a business typically correlates with diminished bargaining leverage. Consequently, enterprises with a weaker bargaining position are less likely to actively reduce procurement costs and change prices to shift their tax burden. Following the approach of Tong et al. (2015), bargaining power is mainly used as a proxy variable for tax shifting ability and is measured using two variables: supplier bargaining power (*Seller*) and buyer bargaining power (*Buyer*) as disclosed in the annual reports of listed companies. According to annual procurement amounts, *Seller* is represented by the proportion of purchases made from the top 5 suppliers, whereas the representation of *Buyer* is determined by the ratio of the sales revenue generated from the top five clients to the overall yearly sales revenue. Supplier and buyer bargaining power is opposite enterprise tax shifting ability; that is, Supplier and buyer bargaining power declines with a larger difference between these two indicators. Tax shifting ability also increases with a larger difference between these two indicators. The opposite is also true.

(4) Control variables. We also control for other characteristic variables that may affect enterprise innovation. Enterprise characteristics, such as Scale, financial conditions, and asset structure, have a significant impact on enterprise innovation. Government subsidies improve enterprises' cash flow and financial situations, supporting their innovation to a certain extent. In addition, the external environments – the economy and consumption – that enterprises face can also affect their innovation levels. Therefore, we refer to the practices of scholars (Wang & Cao, 2018; Zhang et al., 2019) and the following control variables have been identified for selection: the scale of the enterprise (*Scale*), the level of cash reserves (*Cahl*), the ratio of liabilities to assets (*Lev*), the proportion of fixed assets (*Far*), the market value of the enterprise (*Mava*), the profitability of the enterprise (*Roe*), the shareholding ratio of the largest shareholder (*Top1*), the amount of government subsidies received (*Sub*), the age of the enterprise (*Age*), the level of market competition (*Mcom*), the consumer price index (*CPI*), and the regional per capita Gross Domestic Product (*Pgdp*). Table 1 provides a detailed delineation and clarification of each variable's meaning.

Table 1. Definition and explanation of main variables

Types	Variables	Definitions and descriptions
dependent variable	*ERD*	*ERD* represents the intensity of enterprise innovation, measured by the proportion of the company's yearly expenditure on research and development relative to its operational income.
Independent variables	*Time*	*Time* represents the time dummy variable of the VAT reform. Before the implementation of the VAT reform the *time* value is 0, and after the implementation of the VAT reform the *time* values 1.
	Group	*Group* represents the grouping dummy variable of the VAT reform. Before becoming a pilot scope of the policy, enterprises are included in the control group, with the *Group* value of 0. After becoming a pilot area of the policy, enterprises are included in the experimental group, with the *Group* value of 1.
Moderating variables	*Seller*	*Seller* represents the bargaining power of suppliers, measured by the proportion of the top five suppliers' procurement to the total annual procurement amount disclosed in the annual report of a listed company. A lower numerical value indicates a greater capacity for a business to negotiate effectively and a more potent capability to shift tax burdens.
	Buyer	*Buyer* represents the bargaining power of buyers, measured by the proportion of income from the top five purchasers to the overall yearly sales, as outlined in the yearly corporate disclosures. A reduced proportion here suggests that the company possesses a more robust bargaining power and a heightened capacity to pass on tax costs.
Control variables	*Scale*	*Scale* represents the enterprise scale, measured by the total assets of the enterprise, and is taken as the natural logarithm in empirical research.
	Cahl	*Cahl* represents the level of cash holdings, measured by the ratio of cash assets to current liabilities.
	Lev	*Lev* represents the asset liability ratio, measured by the ratio of total liabilities to total assets.
	Far	*Far* represents the fixed asset ratio, measured as the ratio of fixed assets to total assets.
	Mava	*Mava* represents market value and is measured using Tobin's Q value.
	Roe	*Roe* represents the profitability of a company, measured by the ratio of after tax net profit to total assets.
	Top1	*Top1* represents the shareholding ratio of the largest shareholder.
	Sub	*Sub* represents government subsidies, measured by the amount of government subsidies, and taken as the natural logarithm in empirical research.
	Age	*Age* represents the age of the enterprise, represents the temporal span from the enterprise's establishment to the year in which the data was gathered.
	Mcom	*Mcom* represents market competitiveness, measured by the ratio of a company's sales expenses to operating revenue.
	CPI	Consumer Price Index, which is an indicator of the average prices paid by households for a basket of goods and services.
	Pgdp	Per capita GDP, the natural logarithm of the per capita GDP in the area where the enterprise is located.
	Firm	Firm fixed effect.
	Year	Year fixed effect.

3.3. Model construction

The VAT reform implemented in China between 2012 and 2020 was a gradual and multiple promotion process. Therefore, we employ a DID framework with time-varying coefficients to investigate how the VAT reform influences corporate innovation. During the empirical process, to avoid the impacts of individual heterogeneity, variability, and possible estimation bias, we control for individual and annual fixed effects and conduct clustering processing at the provincial level.

To test Hypothesis 1, we construct model (1):

$$ERD = \alpha_0 + \alpha_1 Time * Group + \sum \theta_i Controls + \sum Firm + \sum Year + \varepsilon. \quad (1)$$

In model (1), if the regression coefficient α_1 of the intersection term *Time*Group* is significantly positive, which indicates that the VAT reform can significantly improve enterprise innovation, and then Hypothesis 1 can be verified.

To test Hypothesis 2, we construct models (2) and (3):

$$ERD = \beta_0 + \beta_1 Time * Group * Seller + \beta_2 Time * Group + \beta_3 Seller + \sum \theta_i Controls + \sum Firm + \sum Year + \varepsilon; \quad (2)$$

$$ERD = \lambda_0 + \lambda_1 Time * Group * Buyer + \lambda_2 Time * Group + \lambda_3 Buyer + \sum \theta_i Controls + \sum Firm + \sum Year + \varepsilon. \quad (3)$$

In models (2) and (3), if the regression coefficients β_1 and λ_1 of the intersection terms *Time*Group*Seller* and *Time*Group*Buyer* are significantly negative, then the less influence suppliers and customers wield, the more formidable the negotiating strength of the enterprise becomes, which in turn enhances its capacity to foster innovation. That is, tax shifting ability positively modulates the impact of the VAT reform on enterprise innovation. Hypothesis 2 is validated.

To test Hypotheses 3 and 4, we use the above regression model and mainly use the group regression method to compare and analyze the estimated coefficients. Specifically, the sample is segmented into state-controlled and non-state-controlled enterprise categories, delineated by the proprietary nature of the entities. Subsequently, regression analysis is performed based on the aforementioned model, followed by a comparison of the interaction term coefficients derived from the segmented regressions.

3.4. Descriptive statistics and mean t test

Table 2 presents the outcomes of the descriptive statistics and the comparative tests for the mean values of the variables. For the full-sample statistical results, the mean values of *ERD*, *Seller*, and *Buyer* are 0.065, 0.310, and 0.262, respectively, with standard deviations of 0.078, 0.214, and 0.205, which indicating significant differences in innovation intensity and tax shifting ability among different enterprises.

Table 2. Descriptive statistics of variables and mean difference test

Variables	Full Samples		VAT group		Non-VAT group		Mean difference test
	Mean	S.d.	Mean	S.d.	Mean	S.d.	
ERD	0.065	0.078	0.093	0.087	0.019	0.020	0.074***
Seller	0.310	0.214	0.345	0.211	0.256	0.207	0.089***
Buyer	0.262	0.205	0.282	0.203	0.230	0.205	0.051***
Scale	21.893	1.441	22.376	1.079	22.707	1.577	–1.327***
Cahl	1.871	3.391	2.616	0.123	0.667	0.049	1.949***
Lev	0.393	0.231	0.298	0.186	0.538	0.210	–0.241***
Far	0.124	0.121	0.118	0.120	0.116	0.117	0.002***
Mava	3.172	2.841	4.012	2.967	1.811	1.980	2.201***
Roe	0.051	0.041	0.056	0.043	0.037	0.035	0.019***
Top1	33.807	14.437	31.453	13.527	37.617	15.023	–6.173***
Sub	15.839	1.571	15.709	1.421	16.054	1.754	–0.340***
Age	18.366	5.131	17.804	4.706	19.303	5.641	–1.508***
Mcom	0.081	0.091	0.096	0.094	0.048	0.063	0.048***
CPI	102.357	1.091	102.406	1.154	102.304	0.983	0.101*
Pgdp	11.168	0.371	11.187	0.371	11.143	0.353	0.051***

Note: *, **, and *** denote statistical significance at the 10%, 5%, and 1% confidence levels, respectively, for the differences in mean values.

We categorize the entire sample into two groups – those subject to the VAT reform and those not – based on the implementation status of the reform and then perform a t–test for means. The findings indicate that the mean level of innovation intensity for firms in the VAT-affected group stands at 0.093, which is significantly higher than the average innovation intensity (0.019) of enterprises in the non-VAT group, preliminarily indicating that the VAT reform can significantly improve enterprise innovation. Hypothesis 1 is preliminarily verified.

For the other variables, the average values of *Cahl*, *Far*, *Mava*, and *Roe* for firms within the VAT group significantly exceeds that of the non-VAT group, while the mean asset-liability ratio (*Lev*) of the VAT group is notably lower. These findings suggest that the VAT reform may have lightened the tax load, eased debt pressures, bolstered the accumulation of internal funds, and enhanced the operational efficiency of businesses. In addition, there is a significant difference of 0.089 and 0.051 at the 1% level in the average bargaining power of suppliers and buyers, respectively, between the two groups, indicating significant differences in the bargaining power of enterprises. This finding preliminarily indicates significant differences in the moderating effect of tax shifting ability between the two groups.

4. Results and discussion

4.1. The policy effect of tax reform on enterprise innovation

The first column in Table 3 is the regression analysis conducted using model (1), which reports the overall impact of the VAT reform on enterprise innovation. The regression coefficient of ERD for *Time*Group* is 0.713, which is considered statistically significant with a p-value less

than 0.05. This result indicates enterprises' R&D investment after the VAT reform increased by an average of 71.3% from that before the reform. The regression analysis for Model (1) indicates that the implementation of VAT reform can significantly enhance enterprises' R&D investments and promote technological innovation. Hypothesis 1 has been validated.

Table 3. Policy effects of VAT reform and moderating effects of tax shifting (full sample)

Variables	Model (1)	Model (2)	Model (3)
	ERD	ERD	ERD
*Time*Group*	0.713** (2.43)	0.422 (0.73)	1.677*** (4.17)
*Time*Group*Seller*		–0.013* (–1.75)	
*Time*Group*Buyer*			–0.036** (–2.37)
Seller		0.018* (1.88)	
Buyer			0.011 (0.84)
Scale	–0.147 (–0.42)	–0.106 (–0.34)	–0.129 (–0.32)
Cahl	0.154 (1.28)	0.179 (1.51)	0.148 (1.22)
Lev	–3.935*** (–3.44)	–3.703*** (–3.39)	–3.841*** (–3.47)
Far	0.226 (0.10)	0.244 (0.11)	0.107 (0.05)
Mava	0.039 (0.63)	0.034 (0.60)	0.040 (0.67)
Roe	–18.013*** (–2.96)	18.433*** (–3.12)	18.496*** (–3.13)
Top1	–0.009 (–0.38)	–0.013 (–0.52)	–0.010 (–0.39)
Sub	0.089 (0.59)	0.088 (0.60)	0.096 (0.63)
Age	0.606** (2.42)	0.663** (2.69)	0.560** (2.33)
Mcom	22.306*** (5.32)	22.514*** (5.40)	23.146*** (5.21)
CPI	0.351 (1.66)	0.358* (1.82)	0.338 (1.65)
Pgdp	–2.747 (–1.07)	–3.478 (–1.35)	–2.497 (–1.01)
_cons	–10.880 (–0.34)	–6.135 (–0.21)	–12.253 (–0.38)
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	2608	2608	2608
Adj_R2	0.921	0.923	0.922

Note: *, **, and *** denote statistical significance at the 10%, 5%, and 1% confidence levels, respectively, for the differences in mean values. The numbers in parentheses represent the t-value after the robust standard error of clustering.

4.2. The moderating effect of tax shifting

Although model (1) verifies that VAT reform can improve enterprise innovation, tax shifting ability has a direct impact on their operating costs, further incentivizing or inhibiting their innovation drive. The tax shifting ability of an enterprise is reflected in its bargaining power with upstream suppliers and downstream customers. Therefore, to test Hypothesis 2, supplier bargaining power (*Seller*) and customer bargaining power (*Buyer*), as well as the interaction terms *Time*Group*Seller* and *Time*Group*Buyer*, were added to model (1) to form models (2) and (3). The regression results for models (2) and (3) are shown in Table 3. The results show that the estimated coefficients for *Time*Group* are still positive; however, the regression coefficients for *Time*Group*Seller* and *Time*Group*Buyer* are –0.013 and –0.036 and significant at the 10% and 5% levels, respectively. The results indicate that even though the VAT reform can enhance innovation vitality, an enterprise with a strong dependence on upstream suppliers and downstream customers still inhibits the intensity of innovation investments. In other words, in the case of upstream suppliers and downstream customers with weaker bargaining power, the majority of the enterprise's tax shifting ability will be stronger, and the VAT reform will be more likely to promote enterprise innovation. Hypothesis 2 is verified.

4.3. Robustness test of the effects of tax reform

To test the robustness of the policy effects of tax reform, the effect of VAT reform on enterprise innovation is examined using a placebo test and variable substitution, as shown in Table 4.

(1) Placebo check. We increase the implementation time of the VAT reform for all enterprises in the experimental group by one year and rerun the regression analysis based on model (1) to test the robustness of the effects of the tax reform policy. If the VAT reform is the reason for increasing R&D investments, then enterprises' R&D investments should not have changed significantly in the year before the VAT reform.

(2) Variable substitution. This study redefines enterprise innovation and measures it using enterprise R&D investments divided by total assets. Based on this, a regression analysis is conducted, and the changes in the estimated coefficients are reanalyzed to evaluate the robustness of the consequences of policy changes brought about by the tax reform and the influence of tax shifting as a moderating factor.

Table 4 shows that after moving forwards one year, the interaction term *Time*Group* is no longer significant, indicating that in the placebo test, there was no significant change in R&D investments before and after the VAT reform. Even after redefining the measure of business innovation and swapping out the variable, the *Time*Group* interaction term maintains a significantly positive outcome at the 10% level, which points to the enduring potency of the VAT reform's policy influence. Accordingly, the above test confirms the robustness of the basic regression results and the fact that the VAT reform promotes enterprises innovation.

As shown in Tables 3 and 4, China's tax reform significantly promotes enterprise innovation, as indicated by the regression results and robustness test, and Hypothesis 1 is validated.

Table 4. Robustness test of the policy effect of the VAT reform

Variables	Placebo test	Variable substitution
*Time*Group*	0.782 (0.64)	0.289* (2.05)
Scale	0.352 (1.13)	0.590*** (9.92)
Cahl	0.419** (2.39)	–0.021 (–1.53)
Lev	–4.625** (–2.30)	–0.080 (–0.25)
Far	–2.261* (–2.01)	–0.760 (–1.38)
Mava	0.493*** (2.98)	0.031* (2.03)
Roe	21.757*** (–3.73)	2.184** (2.47)
Top1	–0.044*** (–3.20)	–0.007 (–1.64)
Age	–0.076* (–1.94)	–0.013 (–0.92)
Sub	0.461 (1.55)	0.158*** (5.21)
Mcom	20.100*** (5.02)	1.855*** (3.76)
CPI	–0.180 (–0.46)	0.042 (1.31)
Pgdp	0.746 (0.80)	0.286*** (3.01)
_cons	–5.262 (–0.13)	–7.632** (–2.41)
Firm	Yes	Yes
Year	Yes	Yes
N	2608	2608
Adj_R2	0.912	0.801

Note: *, **, and *** denote statistical significance at the 10%, 5%, and 1% confidence levels, respectively, for the differences in mean values. The numbers in parentheses represent the t-value after the robust standard error of clustering.

4.4. Robustness test of the moderating effect of tax shifting

To verify whether the moderating effect of tax shifting on enterprise innovation is robust, we use variable substitution and grouping tests to verify the policy effect of VAT reform on enterprise innovation, as shown in Table 5.

The first method is variable substitution. We have redefined the concept of corporate innovation and now quantify it by the ratio of a company's R&D expenditure to its total assets. Based on this, a regression analysis is conducted, and the changes in the estimated coefficients are reanalyzed to test the robustness of the policy effects of the tax reform and the moderating effect of tax shifting.

Table 5. Robustness test of the moderating effect of tax shifting ability

Variables	Variable substitution		strong shifting group		weak shifting group	
*Time*Group*	0.458* (2.02)	0.512** (2.54)	0.889** (2.26)	1.083*** (2.91)	0.085 (0.42)	–0.066 (–0.09)
*Time*Group*Seller*	–0.005* (–1.82)					
*Time*Group*Buyer*		–0.009* (–1.77)				
Scale	0.578*** (9.03)	0.615*** (14.48)	–0.131 (–0.12)	–0.263 (–0.27)	–1.172** (–2.10)	–0.360 (–0.95)
Cahl	–0.019 (–1.31)	–0.019*** (–2.74)	–0.030 (–0.30)	0.131 (0.83)	0.184 (1.01)	0.056 (0.49)
Lev	–0.075 (–0.24)	–0.070 (–0.33)	–4.070* (–2.02)	–4.069*** (–2.89)	–4.556*** (–3.01)	–4.089 (–1.59)
Far	–0.778 (–1.47)	–0.735** (–2.47)	0.300 (0.08)	2.266 (0.53)	0.055 (0.02)	1.010 (0.40)
Mava	0.035** (2.17)	0.036** (2.31)	–0.044 (–0.43)	–0.098 (–1.00)	0.043 (0.51)	0.137 (1.18)
Roe	2.123** (2.36)	2.028*** (2.82)	–15.897*** (–3.23)	–21.783*** (–2.98)	–19.699** (–2.11)	–11.359 (–1.31)
Top1	–0.007* (–1.72)	–0.007*** (–3.68)	–0.019 (–1.16)	0.005 (0.20)	–0.066 (–1.37)	–0.063** (–2.42)
Age	–0.014 (–1.04)	–0.014*** (–2.65)	0.446* (2.01)	0.362 (1.26)	–0.529 (–0.18)	0.403 (1.15)
Sub	0.156*** (5.13)	0.163*** (7.45)	0.010 (0.09)	0.007 (0.05)	0.107 (0.58)	0.049 (0.22)
Mcom	1.811*** (3.76)	1.809*** (5.54)	17.096** (2.74)	15.751 (1.69)	26.602*** (4.05)	29.161*** (3.96)
CPI	0.037 (1.12)	0.039 (0.69)	0.443*** (3.21)	0.239 (0.70)	0.592 (1.71)	0.430* (1.93)
Pgdp	0.291*** (3.12)	0.270*** (3.34)	–2.206 (–0.87)	–7.056* (–1.86)	–5.929 (–1.26)	–1.711 (–0.45)
_cons	–6.885* (–1.99)	–7.767 (–1.37)	–20.384 (–0.60)	45.746 (0.83)	31.161 (0.57)	–18.387 (–0.55)
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	2608	2608	1304	1304	1304	1304
Adj_R2	0.858	0.862	0.962	0.942	0.917	0.932

Note: *, **, and *** denote statistical significance at the 10%, 5%, and 1% confidence levels, respectively, for the differences in mean values. The numbers in parentheses represent the t-value after the robust standard error of clustering.

The second method is the grouping test. The entire set of samples is bifurcated into two distinct categories based on the median bargaining strength of suppliers and customers: one with robust tax shifting capabilities and another with limited such capabilities, designated as the strong-shifting group and weak-shifting group respectively. On this basis, further regression is conducted to analyze the changes in the estimated coefficients and test the robustness

of the moderating effect of tax shifting. The strong shifting group refers to enterprises for which the bargaining power of its suppliers and customers is less than the median, whereas the weak shifting group refers to enterprises for which the bargaining power of suppliers and customers is greater than the median.

Table 5 shows that after replacing the dependent variable, the interaction terms *Time*Group*Seller* and *Time*Group*Buyer* are still significantly negative at the 10% level. In the group regression, the estimated coefficient of the interaction term in the weak shifting group is still significantly positive. The above regression results indicate that stronger tax shifting ability is associated with a greater impact of the VAT reform on enterprise innovation, and the moderating effect of tax shifting is also stable.

Based on the regression results in Table 3 and robustness test results in Table 5, tax shifting ability positively regulates enterprise innovation promotion through tax reform. That is, as upstream suppliers and downstream customers' bargaining power weakens, the enterprise's tax shifting ability increases, which in turn promotes enterprise innovation through VAT reform. Hypothesis 2 is verified.

4.5. Heterogeneity analysis

The basic regression and robustness test of this study revealed that innovation capabilities of enterprises are notably boosted by the significant measures of China's tax reform, and the tax shifting ability of enterprises has an important positive moderating effect in this process. However, due to differences in resource endowments and industries, significant differences exist in the policy effects of tax reform and the moderating effects of tax shifting. To better understand how tax reform affects enterprise innovation, we divide the sample into two groups based on property attributes – state-owned enterprises and non-state-owned enterprises – and examine the impact of VAT on enterprise innovation and the moderating effect of tax shifting, as shown in Table 6.

(1) Heterogeneous impact of property attributes on the policy effect of VAT reform

Columns (1)–(2) in Table 6 show the differentiated effects of different property attributes on the policy effects of the VAT reform. After controlling for other factors, the estimated coefficient of the variable time*Group for non-state-owned enterprises is 0.687, which is significant at the 5% level; the estimated coefficient for state-owned enterprises is not significant. This result indicates that VAT reform can significantly improve the R&D innovation level of non-state-owned enterprises, whereas the promoting effect on state-owned enterprises is not significant. Hypothesis 3 is verified.

(2) The heterogeneity Impact of property attributes on moderating effect of tax shifting

Columns (3)–(4) of Table 6 report the moderating effect of tax shifting for suppliers with different attributes on the impact of VAT reform on enterprise innovation. The outcomes indicate no significant coefficient for *Time*Group*Seller* within the state-owned enterprises, in contrast to a significantly negative coefficient within the non-state-owned sector. Therefore, supplier bargaining power has a significant impact on the policy effect of VAT reform in non-state-owned enterprises, whereas the impact on those enterprises under state ownership is not significant.

Table 6. Heterogeneity impact of property attributes on policy effects and moderating effects

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	State	Non-State	State	Non-State	State	Non-State
*Time*Group*	0.062 (0.19)	0.687** (2.56)	0.661* (1.73)	0.473 (0.62)	0.525 (1.06)	1.771*** (4.89)
*Time*Group*Seller*			–0.024 (–1.37)	–0.027* (–1.83)		
*Time*Group*Buyer*					–0.019 (–1.54)	–0.038** (–2.42)
Seller			0.005 (0.52)	0.019 (1.28)		
Buyer					–0.004 (–0.30)	0.008 (0.59)
Scale	–0.431 (–0.67)	–0.011 (–0.03)	–0.448 (–0.72)	0.057 (0.16)	–0.436 (–0.68)	–0.005 (–0.01)
Cahl	–0.104 (–0.27)	0.163 (1.29)	–0.066 (–0.17)	0.187 (1.52)	–0.056 (–0.14)	0.156 (1.23)
Lev	–2.592 (–1.33)	–4.697*** (–3.28)	–2.662 (–1.40)	–4.369*** (–3.09)	–2.711 (–1.40)	–4.536*** (–3.27)
Far	1.095 (1.10)	0.362 (0.13)	1.115 (1.03)	0.328 (0.12)	1.120 (1.05)	0.054 (0.02)
Mava	–0.085 (–0.95)	0.075 (1.10)	–0.121 (–1.51)	0.075 (1.15)	–0.095 (–1.11)	0.074 (1.14)
Roe	–2.191 (–0.30)	–20.911** (–2.82)	–3.430 (–0.46)	21.290*** (–2.93)	–2.238 (–0.28)	21.190*** (–2.92)
Top1	–0.022 (–1.42)	–0.001 (–0.02)	–0.020 (–1.36)	–0.006 (–0.17)	–0.017 (-1.07)	–0.001 (–0.04)
Age	–0.001 (–0.00)	0.778*** (3.36)	0.042 (0.09)	0.829*** (3.72)	0.105 (0.23)	0.747*** (3.39)
Sub	–0.081 (–0.61)	0.127 (0.75)	–0.056 (–0.48)	0.115 (0.71)	–0.069 (–0.55)	0.134 (0.79)
Mcom	15.111 (1.37)	21.853*** (4.89)	15.673 (1.50)	22.099*** (4.99)	15.693 (1.44)	22.770*** (4.76)
CPI	0.167 (1.27)	0.398 (1.37)	0.164 (1.43)	0.388 (1.53)	0.164 (1.23)	0.367 (1.36)
Pgdp	–2.326 (–1.52)	–1.392 (–0.41)	–2.587* (–1.82)	–2.188 (–0.64)	–2.062 (–1.37)	–1.066 (–0.34)
_cons	20.849 –1.24	–38.398 (–0.87)	23.292 (1.33)	–31.575 (–0.81)	17.11 (1.06)	–38.937 (–0.88)
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	691	1917	691	1917	691	1917
Adj_R2	0.969	0.909	0.970	0.911	0.969	0.910

Note: *, **, and *** denote statistical significance at the 10%, 5%, and 1% confidence levels, respectively, for the differences in mean values. The numbers in parentheses represent the t-value after the robust standard error of clustering.

Columns (5)–(6) of Table 5 report the moderating effect of tax shifting for customers with different attributes in the process of VAT reform impacting enterprise innovation. The findings indicate that the coefficient associated with *Time*Group*Buyer* does not reach statistical significance among state-owned enterprises, but it is markedly negative among non-state-owned enterprises. Consequently, the influence of customer bargaining strength significantly alters the impact of VAT policy changes in non-state -owned enterprises, whereas it does not exert a notable effect on state-owned enterprises.

Therefore, weaker bargaining power of suppliers and customers is associated with these enterprises having stronger tax shifting ability and a stronger promoting effect of VAT reform on enterprise innovation. Moreover, the moderating effect of tax shifting is more significant for non-state-owned enterprises than for state-owned enterprises, and Hypothesis 4 is validated.

5. Discussion

This study investigated the policy effect of the VAT reform on enterprise innovation and the moderating effect of tax shifting and further explored the heterogeneous impact of property attributes. The details are as follows:

First, empirical evidence suggests that China's VAT reform has a significant promoting effect on enterprise innovation. The regression results in Tables 3 and 4 confirm this conclusion, and Hypothesis 1 passes the test. This conclusion is consistent with previous findings (Liu et al., 2016; Mukherjee et al., 2017; Qin et al., 2023). The VAT reform directly reduces enterprises' tax burden, stimulates innovation vitality, and increases innovation investment and intensity. After practicing the VAT reform, the government only taxed the value-added part of the goods or services. Even if the tax rate remains unchanged, the tax base and burden are significantly reduced, thereby reducing enterprise cash outflows and financing constraints. Reducing financial risk helps enterprises enhance their R&D investments and break through R&D financial bottlenecks.

Second, the results in Tables 3 and 5 indicate that tax shifting ability exerts a positive influence on the innovation outcomes stemming from the VAT reform within enterprises, and Hypothesis 2 is validated. Specifically, weaker bargaining power of suppliers and buyers is associated with stronger enterprise tax shifting ability and a stronger effect of the VAT reform on enhancing R&D investments. This conclusion is consistent with the research findings (Zhang et al., 2019; Warwick et al., 2022; Yousefi & Vessel, 2023). Empirical evidence shows that because value-added taxes are easily transferable, the tax burden that they generate can be transferred to suppliers and customers through enterprises' bargaining power. A stronger tax shifting ability can not only reduce operating costs but also control commodity prices, resulting in increased cash flow and alleviating financing constraints in an enterprise's R&D process. The scope of a company's negotiating leverage is constrained by its reliance on the resources provided by both suppliers and customers. Low resource dependence puts enterprises in a dominant position in price negotiations. In the procurement process, it is easy to transfer input taxes to upstream suppliers by lowering material prices. In the sales process, it is easy to transfer output taxes to downstream customers by increasing selling prices.

Therefore, strong bargaining power enables enterprises to reduce their tax burden, diversify financial risks, and enhance financing capabilities by shifting input and output taxes, further stimulating their innovation vitality.

Third, in the Chinese context, special differences exist in property attributes among enterprises, creating differences in equity structures, corporate governance, and the market environment and resulting in differentiated effects of the VAT reform on enterprise innovation. The VAT reform significantly improves the innovation level of non-state-owned enterprises, in contrast to that of state-owned enterprises, as shown in Table 6. Hypothesis 3 is validated. This conclusion is a new discovery in this study, possibly because the Chinese market economy environment, low market competition and survival pressure are typical characteristics of state-owned enterprises. The attributes of state-owned enterprises require them to undertake additional policy tasks, and their bargaining power does not have a significant impact on their operations and R&D. Therefore, for state-owned enterprises, the promoting effect of the VAT reform on enterprise innovation is not significant. In contrast, non-state-owned enterprises face stronger market competition and greater survival pressure and require continuous technological innovation to improve their proficiency in obtaining and enlarging their social connections. Therefore, the promoting effect of the VAT reform on innovation activities is obvious for non-state-owned enterprises.

Fourth, the empirical evidence in Table 6 also indicates that in the process of VAT reform impacting enterprise innovation, tax shifting ability has a more significant moderating effect on technological innovation for non-state-owned enterprises, which is also a new discovery in this study. Hypothesis 4 is validated. One plausible explanation is the tenuous connection between non-state-owned enterprises and governmental bodies, which hampers their capacity to secure and augment societal assets amidst intense market rivalries and existential pressures. They require continuous technological innovation to pursue long-term development. In addition, non-state-owned enterprises rarely undertake policy tasks, have relatively single business objectives and are more focused on and can more easily carry out innovative activities. Therefore, they are more likely to use their bargaining power to transfer tax burdens, alleviate financing constraints, and fully utilize the benefits that the VAT reform brings to enterprises.

6. Conclusions

6.1. Research conclusions

As a major revolution in the tax system, China's VAT reform can not only reduce enterprises' tax burden but also has a substantial promoting effect on enterprise innovation. Based on the theoretical analysis and literature review, we use annual data on Chinese A-share listed companies from 2009 to 2022 to study the policy effects of tax reform on enterprise innovation and the moderating effects of tax shifting. We conduct empirical testing using the time-varying difference-in-differences method. The following conclusions can be drawn. (1) China's VAT reform can obviously bring policy dividends to enterprises, significantly stimulating their R&D behavior. (2) Tax shifting ability, that is, the bargaining power over upstream suppliers and downstream customers, positively moderates the policy effect of the VAT re-

form on enterprise innovation. (3) In contrast to state-owned enterprises, non-state-owned enterprises facing fierce market competition and high survival pressure are more sensitive to financing constraints brought about by the VAT reform, which can significantly increase their investments in research and development. (4) Non-state-owned enterprises have a weaker ability to obtain resources. To fully seize the policy dividends brought about by the VAT reform and to seek long-term development through technological innovation, these enterprises are more willing to use tax shifting to reduce costs and increase profits.

6.2. Managerial implications

The VAT reform policy is crucial to the success or failure of China's structural tax reduction and comprehensive deepening of financial and tax system reform. The tax reduction effect of the policy results in vitality being injected into enterprise innovation. The Chinese government has used the VAT reform to exchange tax reductions for enterprise benefits and has achieved a comprehensive enhancement of social innovation vitality. This research finding provides empirical evidence for correctly judging and comprehensively evaluating the policy effects of the VAT reform, which helps enterprises and governments streamline the relationships between various entities in the tax reform process, better promotes balanced development among various entities, and enhances enterprises' innovation vitality.

(1) Enterprises should focus on changes in the bargaining power of suppliers and customers and the potential impacts on procurement costs and sales prices, strive to improve their competitive position in the market, enhance their bargaining power with upstream suppliers or downstream customers, strive for market pricing initiatives, maximize tax shifting, reduce operating costs, improve operating income, and fully enjoy the policy dividends of the VAT reform.

(2) The government should complete the tax system, thoroughly eliminate duplicate taxation, create a fairer market competition environment, and formulate relevant deduction regulations as soon as possible, penetrate the value-added tax deduction chain, maximize the tax reduction effect of the VAT reform, and stimulate the vitality of enterprises' technological innovation.

(3) The government ought to take into account the varied effects that tax policy changes may have on the innovative endeavors of businesses with distinct characteristics. Given the disadvantaged position of non-state-owned enterprises and SMEs in the market, to increase their innovation vitality and further promote balanced development among enterprises of different natures, the government should purposefully deepen the VAT reform and provide policy support.

(4) The government should create a favorable tax environment, further optimize tax services, strengthen tax collection and management, and enable enterprises to truly enjoy the benefits from tax system reform. At the same time, the government should increase punishments for tax evasion, create a fairer market competition environment, and fully unleash the policy dividend of the VAT reform.

(5) The government should also fully consider monopolistic market behavior and attempt to prevent the effect of the implementation of tax reform from deviating from its purpose due to market monopolies.

6.3. Research limitations and future prospects

This study has several limitations. One reason is that the tax reform is a gradual and phased pilot program, resulting in a smaller sample size in the experimental group and asymmetry compared to the control group. Second, we were unable to obtain international data on tax reform, and the available overall sample size was limited. In summary, this study may have some bias in the estimation results because of the relatively small sample size.

Over time, the scope of the impact of tax reform gradually expands, the time span and spatial breadth of the sample gradually increase, and the policy effect further manifests. In future research, more observation samples, including international data, can be collected to further validate the conclusions of this study and provide more empirical evidence for further in-depth research on the impact of tax reform on microeconomics.

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Author contributions

Rangkun Qi conceived this study, processed and analyzed the data in detail, and completed the first draft of the study. Zhuang Xiong is responsible for collecting and organizing data. Yuriy Bilan and Zhuang Xiong revised the manuscript based on the comments of the reviewers.

Disclosure statement

The authors of this study declare that they have no competing financial, professional, or personal interests that could influence the content, findings, or conclusions presented in this study.

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