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The Impact of Vertical Fiscal Imbalances and Local Government Tax Efforts on the Quality of Economic Development—A Study Based on Threshold Regression and Simultaneous Equation Models

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Abstract: China's economy has been growing at a rapid pace in recent years, but the quality of economic development has not been consistent with the quantity, which is not conducive to sustainable economic development. How to improve the quality of economic development and achieve sustainable economic development has become an urgent economic issue for the Chinese government to address. Utilizing panel data encompassing 30 provinces in China from 2008 to 2022, we explore the mechanisms and impacts of vertical fiscal imbalances and tax efforts on the quality of local economic development. For this purpose, this investigation employs threshold regression and three-stage least squares methodologies. The results of the study show that an increase in the level of vertical fiscal imbalance does not contribute significantly to the improvement of the quality of local economic development. However, a vertical fiscal imbalance can suppress the level of tax effort of local government. Moreover, a reduction in local government tax efforts has a favorable effect on the quality of local economic development. As such, a vertical fiscal imbalance promotes economic development indirectly. Therefore, it is necessary to reasonably control the level of vertical fiscal imbalance, build a fiscal relationship between the central and local governments with clear powers and responsibilities, coordinate financial resources and regional balance, and prevent excessive tax efforts from suppressing the production enthusiasm of microeconomic subjects to improve the quality of China's economic development and realize the sustainable development of the local and national economies.

Keywords: vertical fiscal imbalances; tax effort; quality of economic development; threshold effect

1. Introduction

According to the report to the 19th National Congress, China's economy has progressed from massive expansion to high-quality development, and the quality of people's needs is upgrading. It is urgent to solve the problems of people's livelihoods [1]. At the Economic Work Conference in December 2017, the central government pointed out that promoting high-quality development is the fundamental requirement for defining development ideas, formulating economic policies and exercising macro-control at present and in the coming period [2]. At the Central Economic Work Conference in December 2019, it was further pointed out that the economy should achieve reasonable quantitative growth and steady qualitative improvement, and it should strive to promote high-quality development [3]. General Secretary Xi Jinping stated in the report of the 20th Party Congress that it is necessary to accelerate the construction of a new development pattern and focus on promoting high-quality development, stressing that "all-round high-quality development is the essential job of constructing a modern socialist country" [4].

However, in recent years, affected by the global economic downturn and the COVID-19 pandemic, China's economy has shifted from high-speed growth to medium-to-high-speed growth, and the downward pressure on the economy has continued to increase, with a slowdown in the growth of fiscal revenues, while at the same time, fiscal expenditures have been rigidly growing, and the gap between fiscal revenues and expenditures has been widening [5]. In addition, as local governments need to increase fiscal expenditure to cope with environmental remediation and governance and population aging, fiscal revenue and expenditure contradictions are very sharp in some regions, and individual less economically developed regions have even experienced negative growth in fiscal revenue [6]. While the central government's fiscal revenues are greater than its expenditures, local governments have experienced an imbalance between expenditures and revenues, and the devolution of expenditure responsibilities has not always been accompanied by a transfer of tax revenues, which is a vertical fiscal imbalance [7]. As local finance is an important component of the modernization of the country's level of and capacity for governance, exploring the mechanism by which a vertical fiscal imbalance affects the tax collection efforts of local governments is conducive to analyzing the psychology and behavioral characteristics of local governments in the area of tax collection [8].

Tax efforts are not simply an economic issue, as they are closely related to social development and political stability. Effective adjustment of tax efforts has become a focus of attention for government administrators, the public and research scholars [9]. The key to the effective adjustment of tax effort is to find out what factors will have an impact on it, and only in this way can we organically mediate the fiscal revenue from a more objective point of view [10].

To address sustainability concerns, it is crucial to examine the impact of vertical fiscal imbalances and local government tax efforts on the quality of economic development. Vertical fiscal imbalances refer to the mismatch between revenue-raising capacities and expenditure responsibilities among different levels of government. When local governments face significant fiscal constraints due to these imbalances, they might resort to maximizing tax efforts to generate revenue, potentially influencing the quality of economic development and subsequently jeopardizing the sustainability of regional and national economic development. Therefore, from the research perspective, this paper explores the impact of vertical fiscal imbalances and local government tax efforts on the quality of economic development and examines the inner mechanism. Thus, it provides suggestions for the government and policymakers to find the optimal path, which is of great significance for improving the quality of economic development. In terms of the research content, this paper incorporates the vertical fiscal imbalances, local government tax efforts and the quality of economic development into a unified research framework and analyses in depth the mechanism of the vertical fiscal imbalances on the high-quality development of the economy from both direct and indirect effects, which is an enrichment of the previous theoretical mechanism. Regarding the research methodology, this paper innovatively adopts the threshold effect model and the three-stage least squares method to examine in depth the effects of the vertical fiscal imbalances on the tax efforts of local governments and the high-quality development of the economy and identify the transmission mechanism of all three through the standardized treatment.

Having introduced the background to the study, the remainder of this article is structured as follows. Section 2 provides the definition and development of vertical fiscal imbalance, tax effort and quality of economic development, respectively, and the related literature review. Section 3 puts forward the four research hypotheses and the conceptual framework constructed based on the reviewed literature. Section 4 elaborates the meaning of the variables, calculation methods and data sources, and it establishes the threshold effect model and the system of joint equations. Regression analyses are carried out on the above two models to verify the four research hypotheses proposed and the results are presented and interpreted in Section 5. By changing the calculation method for vertical fiscal imbalances and re-regressing the system of joint equations, the results are found to be

robust. To explore the dual path of the impact of vertical fiscal imbalances on the quality of economic development, this research conducts a three-stage least squares regression on the set of joint equations, again after standardizing the explanatory variables to isolate the direct effect of vertical fiscal imbalances on the quality of economic development as well as the indirect effect on it through tax efforts. The conclusion in Section 6 puts forward the corresponding policy recommendations derived from the regression results in Section 5 to improve the quality of economic development and then to achieve sustainable economic development.

2. Literature Review

Recently, the quality of economic development in China has attracted much research interest; for instance, Chen and Huo [11], Mao et al. [12], Xiao et al. [13] and Li et al. [14], to name just a few. In particular, Chen and Huo [11] have formulated an extensive assessment framework for China's high-quality economic development indicators, grounded in the principles of innovation, coordination, environmental consciousness, openness, and collaboration. Their analysis reveals notable variations in regional economic quality despite China maintaining a robust, equitable, and forward-moving economic landscape. Moreover, their examination, based on panel data spanning from 2011 to 2019 across 30 provinces, demonstrates that enhancing the industrial structure, elevating technological innovation, boosting infrastructure investments, and improving digital financial inclusion positively influence high-quality economic development. In a separate attempt, Mao et al. [12] devise a set of indicators to gauge the level of high-quality economic development in western China. These indicators encompass dimensions such as the innovation support capacity, coordination support capacity, opening up support capacity, green support capacity, and sharing support capacity. The research reveals a continuous improvement in high-quality economic development across western China from 2000 to 2020. However, a substantial disparity persists among the 11 provinces in the region. The finding on the rising trend of high-quality economic development and regional disparity is consistent with Chen and Huo [11].

On the other hand, Xiao et al. [13] explore the effects of an innovation-driven strategy on the China economy by employing systematic cluster analysis and conducting regression analyses to assess the impact of innovation on the quality of economic development. Their examination is grounded in China's macroeconomic data spanning from 2000 to 2019. The empirical findings underscore the significant role played by China's innovation-driven strategy in enhancing the quality of economic development. Meanwhile, drawing from panel data spanning Chinese provinces from 2011 to 2020, Li et al. [14] present empirical findings on the quantitative correlation between China's national quality and sustainable development. Notably, the results of the panel data Granger causality analysis suggest that national quality indexes possess the capacity to significantly influence sustainable economic development across all economic tiers, along with their sustainable capabilities.

While studies on the quality of economic development, for example, those mentioned above, examine factors such as the industrial structure, technological innovation, innovation strategy, infrastructure investments, digital financial inclusion and national quality, the current study differentiates itself from the existing literature by examining a different set of factors: vertical fiscal imbalances and local government tax efforts.

Vertical fiscal imbalance (VFI) was first proposed by Wagner in 1973 and normalized by Hettich and Winer [15]. According to them, vertical fiscal imbalance is implied when there exists an excessive supply of revenue to the central government of a country, while at the same time, the local governments face a strong demand for funds. Hunter [16] explains the vertical fiscal imbalance in terms of revenues controlled by the central and local governments, i.e., if the revenues controlled by the central government are greater than the revenues controlled by the local governments, the economy is considered to be in a state of vertical fiscal imbalance. Li and Zhang [17] argue that reforms that do not synchronize the adjustment of the government's expenditure responsibilities with

the distribution of revenues among the local governments have created a vertical fiscal imbalance. China's vertical fiscal imbalance could be the result of the central government being responsible for managing too few affairs and intervening too much in the process of subsidizing local affairs through transfer payments. In this regard, Cai and Chen [18] believe that the "centralization of fiscal power" has led to a natural mismatch between local government revenues and expenditures, resulting in a "natural fiscal gap" that triggers a vertical fiscal imbalance. Notably, vertical fiscal imbalance is a phenomenon in which the central government has more revenues and fewer affairs, while the local governments have more affairs and fewer revenues, due to the imbalance in the division of powers and responsibilities between the central government and the local governments.

Regarding the quality of economic development (Quality), this research considers it to be the unity of quality and quantity, encompassing not only the total volume of the economy but also the quality measured by composite indicators. At the Fifth Plenary Session of the 18th CPC Central Committee, President Xi Jinping first put forward and systematically explained the "Five Development Concepts" of innovation, coordination, green, openness and sharing. The "Five Development Concepts" involve all aspects of China's economic development and are an important basis for scientifically measuring the quality of economic development in the new period and constructing a system of economic development quality indicators. Therefore, this research constructs a comprehensive indicator system for the quality of economic development based on the "Five Development Concepts", following the relevant studies of Chu and Shao [19], to scientifically measure the quality of economic development.

Regarding tax effort (Teffort), in the second half of the 20th century, the International Monetary Fund (IMF) and the World Bank began to use the term "tax effort" in their studies and reports to guide countries to formulate more effective and sustainable tax policies for economic stability and sustainable development. Eyraud and Lusinyan [7] assess the level of tax effort in each country through indicators such as the ratio of tax revenues to gross domestic product (GDP). Chu et al. [20] first measure potential tax revenues by adopting the "Tax Handle Method" and then calculate the level of tax effort of each local government based on the ratio of actual tax revenues to potential tax revenues. Referring to Chu et al. [20], tax effort is the proportion of potential tax revenue that is collected by local governments.

3. Research Hypotheses Development

The relationship between vertical fiscal imbalances and the quality of economic development has attracted interest from researchers and government policymakers recently, especially in the context of China. Theoretically, it is believed that a moderate vertical fiscal imbalance is not only conducive to strengthening the central government's effective control over the financial power of local governments, which promotes the achievement of macroeconomic policy objectives and the sound growth of the national economy [21,22] but also to promoting an overall improvement in the performance of local governments using the central government's cost-compensating mechanism of transfer payments [23]. As an attempt to reform the tax system, in the past, China's central governments decentralized its authority and expenditure responsibilities and also transferred its financial authority. However, as a result, local governments used to face heavy financial pressure, thus resulting in fiscal imbalances, i.e., the mismatches between the local financial authority and the revenues and expenditure responsibilities of the local authorities [24]. This directly leads to local protection and intergovernmental competition among China's local governments to obtain more limited resource elements. If the intergovernmental game is conducted through channels such as market segmentation, duplicated construction, and distorted fiscal expenditures, it will inhibit technological innovation and efficiency enhancement, thus resulting in the mismatch and distortion of factor markets [25,26]. On the other hand, due to the existence of the central financial underwriting policy, the aggravation of the vertical fiscal imbalance will prompt local governments to rely too much on transfer payments,

which will push local governments into the "incentive trap", such as lowering the tax effort and relaxing the soft budget constraint [27]. This will induce local governments to reduce the level of public service expenditures and favor more economic expenditures, which will have a dampening effect on regional livelihoods and high-quality development [28,29]. In light of this background, the following research hypothesis is put forward:

H1: *The current level of vertical fiscal imbalance limits China's economic development quality.*

From another perspective, the local government's tax effort has a detrimental impact on economic development quality. When tax effort is low, it exhibits a prominent negative correlation with economic development quality [30]. Loosening taxation by local governments not only disrupts regional resource allocation and accentuates horizontal disparities but also raises concerns about relying on land finance and local government debt funds. This eventually obstructs the enhancement of local economic development quality. The dependence of local governments on the introduction of preferential tax policies to attract investment induces the rapid expansion of the investment scale and aggregation in a small number of government-supported industries, which promotes regional industrial structure imbalance and overcapacity. However, the decline in the level of self-owned income brought about by the efforts of tax relaxation is often made up by local governments using land sales or debt financing. The ongoing expansion of the local real estate market bubble not only exacerbates concerns about the costly management of government funds and debt repayment but also undermines the prospects for achieving macroeconomic stability and fostering high-quality economic development [31].

Concurrently, regions with stronger economic development profiles tend to exert a heightened pull on capital. Under this circumstance, the introduction of preferential tax policies among regions may not achieve the icing on the cake effect of attracting foreign investment. It may lead to the outflow of the financial capital of the party that loses the competition, subsequently resulting in the imbalance of investment allocation among regions, which will hinder the high-quality development of the local economy in the long run [32]. On the other hand, with the gradual increase in local government tax efforts, the negative effect of local government tax efforts on the quality of economic development is more significant. Excessive tax efforts will cause the loss of tax sources and hinder the improvement of regional economic growth quality [30]. Under the dual influence of natural resource endowment stock and policy orientation differences in China's vast territory, the development direction of the industrial structure in different regions shows the characteristics of divergence, and the difference in the driving effect of different industries on economic growth determines that it is difficult to achieve the convergence of economic development among regions.

Different from economically developed areas with sufficient tax sources that can easily complete the tax tasks of their superiors, less developed areas with weak tax capacity often need to increase tax efforts to complete the tax plans of their superiors [33]. However, the large tax burden brought about by the excessive tax effort will directly suppress the production enthusiasm of microeconomic entities, and a large number of enterprises will flee the region, resulting in the loss of tax sources. The resulting loss of fiscal revenue may exceed the increase in fiscal revenue from the tax effort; on the contrary, it will cause the decline of the local government's governance ability and ultimately hinder the improvement of the quality of regional economic development [27]. As such, this study hypothesizes that:

H2: *Local government tax effort has a dampening effect on the quality of economic development.*

Moreover, under a system of vertical fiscal imbalance, local governments face both greater fiscal pressure and promotion incentives, which may in turn lead to a continued decline in tax collection efforts [34]. On the one hand, the pressure of the fiscal gap brought about by the asymmetric decentralization system has led local governments to excessively rely on land finance and debt revenue, which, while alleviating local revenue and expenditure difficulties relatively quickly, will also lead to slackness in tax collection [35]. On

the other hand, China's top-down performance appraisal mechanism for officials has only taken the GDP as the key indicator for quite a long time, which promotes the prevalence of "economic tournaments" and "political promotion tournaments" among local governments, leading to a situation in which the development of localities is always in a state of "GDP as the hero" and "GDP as the hero" is always the key indicator [7]. This has led to the prevalence of "economic tournaments" and "political promotion tournaments" among local governments, and local development has always been in the atmosphere of "judging heroes by GDP" [36]. Faced with the scarcity of resources in the market and the characteristics of capital tendency to profit flow, local governments have been in a state of competition or game with each other for a long time. To attract the inflow of capital, the settlement of enterprises and the competition for limited resources, local officials are always keen to use tax incentives to attract investment, thus increasing the relaxation of their tax efforts [20].

Therefore, a higher vertical fiscal imbalance has a distorting effect on the local government's tax collection efforts, especially when the vertical fiscal imbalance is higher than the optimal threshold. A more serious disconnection between the local government's revenues and expenditures will not only lead to the over-reliance of the local government on centralized transfer funds and a soft constraint on government budgets but will also induce the local government to loosen its fiscal disciplines, making it more inclined to risky decision-making or over-expenditure plans [35]. This is not conducive to the intrinsic balance of the local government's fiscal revenues and expenditures. In which case, even with the expansion of local governments' autonomy in tax collection, rational local governments may still seek to obtain more funds from the central government for transfers or to make use of transfers to make their tax revenues and expenditure [37].

The "public pool" effect of the transfer payment is to transfer the cost of expenditure and choose to reduce the tax effort [38]. In particular, higher vertical fiscal imbalances have a dampening effect on local governments' tax efforts when the transfer system is not sufficiently transparent and regulated [39–41]. For example, Ren et al. [8] regard transfer payments as a tax on tax revenue, i.e., the reduction of transfer payments due to local governments' efforts to raise tax revenue is regarded as a tax on local governments' tax revenues, and therefore suggest that the income effect and substitution effect of transfer payments tend to reduce the tax revenue of local governments, and the substitution effect of transfer payments tends to reduce the tax revenue of local governments. Therefore, it is proposed that the income effect and substitution effect of transfer payments both tend to reduce the tax efforts of local governments:

H3: *Vertical fiscal imbalances inhibit local governments' tax efforts.*

Finally, summing up H2 and H3, the following research hypothesis is in order:

H4: *Vertical fiscal imbalances can indirectly affect the quality of economic development by influencing the tax efforts of local governments.*

In a nutshell, the resulting conceptual model of this study is shown in Figure 1 below:
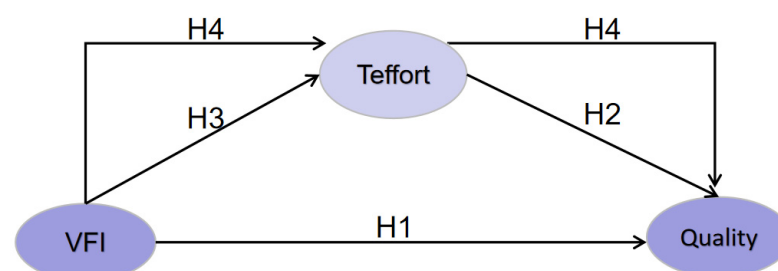

Figure 1. Conceptual framework. Note: Kindly refer to Table 1 for the operationalization of the related concepts.

Table 1. Definition and calculation of variables.

Variable	Definition	Calculation
Quality	Economic growth is not just about pursuing quantitative expansion but also about quality, efficiency and overall sustainability	Calculated by principal component analysis of five indicators: innovation, coordination, green, openness and sharing
Teffort	Actual level of collection of local government tax revenues	Ratio of actual to potential tax revenues
VFI	Misalignment of fiscal revenues and expenditures between the center and localities	Refer to Table 2
Open	Openness of regions to the external economy	Total exports and imports as a share of GDP
Ind	Share of different industries in the economy of each region	Share of tertiary sector output in GDP
Compete	Horizontal competition among local governments to generate higher economic performance and achieve greater promotion benefits	Competitiveness of neighboring provinces in terms of GDP per capita
Transfer	Non-reimbursable financial assistance provided by local governments to individuals, families, businesses or other organizations	General transfers as a percentage of total gross transfers
Urban	Population migration from rural to urban areas	Proportion of urban population in the resident population at the end of the year
Density	Population per unit area	The ratio of total population to land area at the end of the year
Ptax	The average tax burden is borne by each person in the region	Natural logarithm of the proportion of tax revenues to population size
Pgdp	Economic value created by each person in the area	Natural logarithm of the ratio of GDP to population size

Table 2. The measurement formula for the vertical fiscal imbalance.

Index Name	Measure Formula
VFI	$\text{VFI} = 1 - \dfrac{\text{FD}_R}{\text{FD}_S} \times (1 - \text{LFSR})$
FD$_R$	$\text{FD}_R = \dfrac{\frac{\text{LP}_R}{\text{LPOP}}}{\frac{\text{LP}_R}{\text{LPOP}} + \frac{\text{CP}_R}{\text{NPOP}}}$
FD$_S$	$\text{FD}_S = \dfrac{\frac{\text{LP}_S}{\text{LPOP}}}{\frac{\text{LP}_S}{\text{LPOP}} + \frac{\text{CP}_S}{\text{NPOP}}}$
FSS	$\text{FSS} = \dfrac{\text{LP}_S - \text{LP}_R}{\text{LP}_S}$
Variable Definitions	

FD$_R$: Decentralization of Fiscal Revenue
FD$_S$: Decentralization of Fiscal Spending
FSS: Local Financial Self-sufficiency Rate of Gap
LP$_R$: Local Public Revenue
LP$_S$: Local Public Spending
CP$_R$: Central Public Revenue
CP$_S$: Central Public Spending
LPOP: Local Population
NPOP: National Population

4. Data and Methods

4.1. Variables

In this study of the effect of vertical fiscal imbalances and local government tax efforts on the quality of development, the quality of economic development (Quality) is regarded as the dependent variable, and the tax effort (Teffort), vertical fiscal imbalance (VFI), degree of openness to the outside world (Open), industrial structure (Ind), local government competition (Compete), and the structure of transfer payments (Transfer), urbanization (Urban), population density (Density), per capita tax income (Ptax) and per capita GDP (Pgdp) are independent variables. There are secondary indicator variables under each variable, and the detailed definitions and measurements of each variable are provided in Table 1.

4.2. Data Sources

The raw data of the variables involved in this research come from the China Statistical Yearbook, China Financial Yearbook, China Urban Statistical Yearbook, National Government Debt Audit Results, China Land and Resources Yearbook, Wind Database, China Economy Net Statistical Database, financial budget reports of provinces and cities, and statistical annual reports.

Considering that China implemented new classification standards and the statistical caliber of government revenues and expenditures in 2007, the sample period of this research is 2008–2022 to make the data comparable. Moreover, because of the lack of statistical data, such as in Tibet, the sample only covers 30 provinces, municipalities and autonomous regions, excluding Tibet, Hong Kong, Macao and Taiwan.

4.3. Threshold Effects Model

Previously, when examining the factors that differentially affect the explanatory variables by influencing a particular variable, interaction term tests or group tests were usually used. However, the interaction term test can only be limited to a monotonically increasing or decreasing effect of the measured indicator, which does not correspond to the actual economic situation. For the traditional grouping test, the sample can only be grouped according to a certain impact indicator, which makes it difficult to accurately reflect the impact of various factors on the explanatory variables. Threshold effects are the phenomenon that when an economic parameter reaches a specific value, it causes another economic parameter to undergo a sudden shift to another form of development, and the critical value that serves as the threshold for the shift is referred to as the threshold. The threshold effects model proposed by Hansen is designed for non-dynamic panels in the presence of individual fixed effects. The thresholds can be transformed using fixed effects to obtain regression slopes through least squares estimation, which are then inferred using a non-standard asymptotic theory and allow the construction of confidence intervals for hypothesis testing. The idea is to select a certain variable as the threshold variable and distinguish the regression model into intervals based on the searched threshold, with each interval having a different expression for the regression equation. The other sample values are categorized according to the interval divided by the threshold, and the changes in the coefficients of the different intervals are compared after regression.

To test Research Hypothesis 2, H2, this study considers that the effect of local government tax efforts on the quality of economic development is non-linear, along with the increase in the degree of vertical fiscal imbalances [30]. In addition, to accurately judge whether this non-linear effect exists and what is the direction of change, this research considers the vertical fiscal imbalance as a threshold variable and constructs a panel threshold model (Equation (1)) to carry out empirical research [42].

$$
\begin{aligned}
Quality_{it} = \beta_0 \quad & + \beta_1 Teffort_{it} \cdot I(VFI_{it} \leq \gamma_1) + \beta_2 Teffort_{it} \cdot I(\gamma_1 < VFI_{it} \\
& \leq \gamma_2) + \cdots + \beta_{n+1} Teffort_{it} \cdot I(VFI_{it} > \gamma_n) + \alpha_1 X_{it} + \mu_i + \varepsilon_{it}
\end{aligned} \tag{1}
$$

In Equation (1), the quality of economic development (Quality) is the explanatory variable, the vertical fiscal imbalance (VFI) and local government tax effort (Teffort) are the core explanatory variables, and the vertical fiscal imbalance (VFI) is the threshold variable. Meanwhile, based on the theoretical analysis and the conclusions of existing studies, this study introduces a series of control variables (X_{it}) into the model to avoid the impact of omitted variable bias on the model estimation results, specifically including local government competition (Compete), industrial structure (Ind), transfer payment structure (Transfer), fiscal self-sufficiency rate (FSS) and population density (Density). In addition, $I(\cdot)$ is the indicative function, γ is the threshold, μ_i is the individual fixed effect, and ε_{it} is the random perturbation term.

4.4. System of Simultaneous Equations

Single-equation estimation methods tend to ignore the links between individual equations and between the perturbation terms of each equation, but system estimation methods can compensate for these shortcomings. In general, it is more efficient to estimate all the equations as a whole. If the variables in the equations are all strictly exogenous and do not contain endogenous explanatory variables, the results of OLS single-equation estimation and systematic estimation taken for the equations are consistent. If the explanatory variables in the equations are endogenous, then 2SLS can be taken to eliminate possible endogeneity problems, but it cannot deal with possible correlations between the perturbation terms of the equations. If the 3SLS estimation method is adopted, it can eliminate the endogeneity of the model and can also deal with the possible correlation between the perturbation terms of the equations, thus improving the validity of the estimation of the joint equations [43]. Therefore, the 3SLS method is used in this research to estimate the regression results of the system of joint equations.

To test the Research Hypotheses 1, 3 and 4, (H1, H3 and H4) this study constructs a panel system of joint equations, as shown in Equation (2) below, to launch the empirical analysis:

$$Quality_{it} = \theta_0 + \theta_1 VFI_{it} + \theta_2 Teffort_{it} + \theta_3 Open_{it} + \theta_4 Ind_{it} + \epsilon_{it}$$
$$Teffort_{it} = \vartheta_0 + \vartheta_1 VFI_{it} + \vartheta_2 Compete_{it} + \vartheta_3 Transfer_{it} + b\vartheta_4 Urban_{it} \tag{2}$$
$$+\vartheta_5 Density_{it} + \vartheta_6 Ptax_{it} + \vartheta_7 Pgdp_{it} + \xi_{it}$$

4.5. Stability Test

Considering that the panel data used in this research have a long period and a large sample size, which is prone to the pseudo-regression phenomenon, a combination of the LLC test and Fisher–ADF test is used to test the stability of the panel data to determine whether there is a unit root in the data.

The unit root test model is as follows:

$$y_{it} = \rho_i y_{i,t-1} + X'_{it}\beta_i + \mu_{it} \tag{3}$$

where i = 1, 2,...N, denotes the cross-sectional individuals; t = 1, 2,...T, denotes the observation period; and X'_{it} denotes the exogenous variables. ρ_i is the autoregressive coefficient. If $|\rho_i| < 1$, it means that the series y_{it} is stationary, i.e., there is no unit root; if $|\rho_i| = 1$, it means that the series y_{it} is non-stationary, i.e., there is a unit root. This is a prerequisite for the Equation (1) threshold effect model test.

5. Results and Discussion

5.1. Descriptive Statistics

The definitions and calculations of the variables in this study are summarized in Table 1 and the descriptive statistics of each variable are shown in Table 3.

Table 3. Descriptive statistics of variables.

Variables	Observation (N × T)	Standard Error	Minimum	Maximum	Average
Quality	30 × 15	1.2424	−1.7500	7.5800	0.0000
Teffort	30 × 15	0.0878	0.7678	1.3027	1.0021
VFI	30 × 15	0.1909	0.1490	0.9383	0.6855
Open	30 × 15	0.3263	0.0076	1.6701	0.2929
Ind	30 × 15	0.0932	0.2979	0.8373	0.4764
Compete	30 × 15	2.8549	0.4697	17.1979	3.6960
Transfer	30 × 15	0.1691	0.0319	0.7528	0.4810
Urban	30 × 15	0.1343	0.2824	0.8960	0.5696
Density	30 × 15	1.2838	2.0337	8.2753	5.4537
Ptax	30 × 15	0.8144	6.3235	10.4425	8.2508
Pgdp	30 × 15	0.5761	2.0592	5.2338	3.7117

5.2. Panel Unit Root Test

Before the estimation of the panel regression models, the order of integration of the variable needs to be determined in advance to avoid spurious regression. Levin, Lin, and Chu [44] and Fisher–ADF panel unit root tests are adopted for this purpose. The null hypothesis of these tests maintains that the series y_{it} contains a unit root, implying it is non-stationary. In contrast, the alternative hypothesis states that there is no unit root in the series y_{it} and so y_{it} is stationary. The null hypothesis could be rejected in favor of the alternative hypothesis if the marginal significance value (*p*-value) of the respective test statistics (LLC, P, Z, P* or Pm) is less than the conventional level of significance (normally 1%, 5%, or 10%). Note that y_{it} is said to be integrated of order zero, denoted as I(0) if it is stationary in the level. However, if it achieves stationarity after performing n-th differencing on it, then it is an I(n) variable. The panel unit root test results are reported in Table 4. It is evident from Table 4 that the *p*-values of all the test statistics for all the variables are consistently lower than the 5% significance level. This suggests that the null hypothesis of the non-stationary series could be rejected for all these variables at a 5% significance level. Many of them are stationary at a 1% significance level. As such, they are stationary in their levels, and in other words, they are I(0) variables. With that, Equation (2) could be estimated with the variables in the level form, and the results are summarized in Table 4.

Table 4. Panel unit root test results.

Variables	LLC	Fisher-ADF				Conclusion
		P	Z	L*	Pm	
Quality	−1.4 × 10^{13} *** (0.0000)	90.8665 *** (0.0062)	−1.8364 ** (0.0332)	−1.9276 ** (0.0279)	2.8177 *** (0.0024)	I(0)
VFI	−1.5 × 10^{13} *** (0.0000)	133.9130 *** (0.0000)	−6.2351 *** (0.0000)	−6.1312 *** (0.0000)	6.7473 *** (0.0000)	I(0)
Ind	−2.5 × 10^{13} *** (0.0000)	141.2966 *** (0.0000)	−5.7091 *** (0.0000)	−5.9491 *** (0.0000)	7.4213 *** (0.0000)	I(0)
Transfer	−2.9 × 10^{14} *** (0.0000)	90.3639 *** (0.0068)	−1.7811 ** (0.0374)	−1.6725 ** (0.0482)	2.7718 *** (0.0028)	I(0)
Open	−1.5 × 10^{13} *** (0.0000)	162.4680 *** (0.0000)	−7.4742 *** (0.0000)	−7.6513 *** (0.0000)	9.3540 *** (0.0000)	I(0)
FD$_R$	−1.7 × 10^{13} *** (0.0000)	183.1957 *** (0.0000)	−8.6709 *** (0.0000)	−8.9606 *** (0.0000)	11.2462 *** (0.0000)	I(0)
FD$_S$	−8.1 × 10^{12} *** (0.0000)	236.4852 *** (0.0000)	−9.0932 *** (0.0000)	−11.1187 *** (0.0000)	16.1108 *** (0.0000)	I(0)
Compete	−4.9 × 10^{13} *** (0.0000)	355.7075 *** (0.0000)	−14.3859 *** (0.0000)	−17.9064 *** (0.0000)	26.9943 *** (0.0000)	I(0)
Teffort	−1.1 × 10^{14} *** (0.0000)	144.2382 *** (0.0000)	−6.6799 *** (0.0000)	−6.6238 *** (0.0000)	7.6899 *** (0.0000)	I(0)

Note: ① LLC refers to Levin, Lin, and Chu (LLC, 2002) panel unit root test, while P, Z, L* and Pm of the Fisher–ADF test refer to inverse Chi-squared (χ^2), inverse standard normality, inverse logit and modified inversed χ^2 statistics respectively. ② Numbers in parentheses are *p*-values; ③ *** and ** denote the rejection of the null hypothesis at 1% and 5% significance levels, respectively, and I(n) denotes that the series is smooth after nth-order differencing. ④ The data in this table were computed by Stata 17.0.

5.3. Panel Threshold Model Test

This study uses Stata 17.0 software to estimate Equation (1) to determine the number of thresholds using the minimum residual sum of squares (RSS) criteria. The maximum number of thresholds is set as two for a start. The test results are shown in Table 5 and the likelihood ratio statistics are plotted in Figure 2. As shown in Table 5, the test results show that there is only one threshold. With that, there is no need to estimate the number of thresholds more than two.

Table 5. Threshold effect test for tax effort.

Threshold Types	RSS	F-Statistics	p-Value	Test Results
Single threshold (H_0: no threshold)	31.8802	96.01	0.0000 ***	Rejection
Double threshold (H_0: single threshold)	22.6314	20.54	0.3333	Acceptance

Note: ① RSS is the minimum residual sum of squares criteria, while F-statistics refers to the test of overall significance on the variables included in the model and the *p*-value is the marginal significance value of the F-statistics. ② *** denotes the rejection of the null hypothesis at 1% significance level.

With a single threshold, the estimated threshold value of the fiscal vertical imbalance is 0.2542. According to the above model setting and the threshold test results as reported in Table 5, this study proceeds to estimate Equation (1), and the estimation results are shown in Table 6 below.
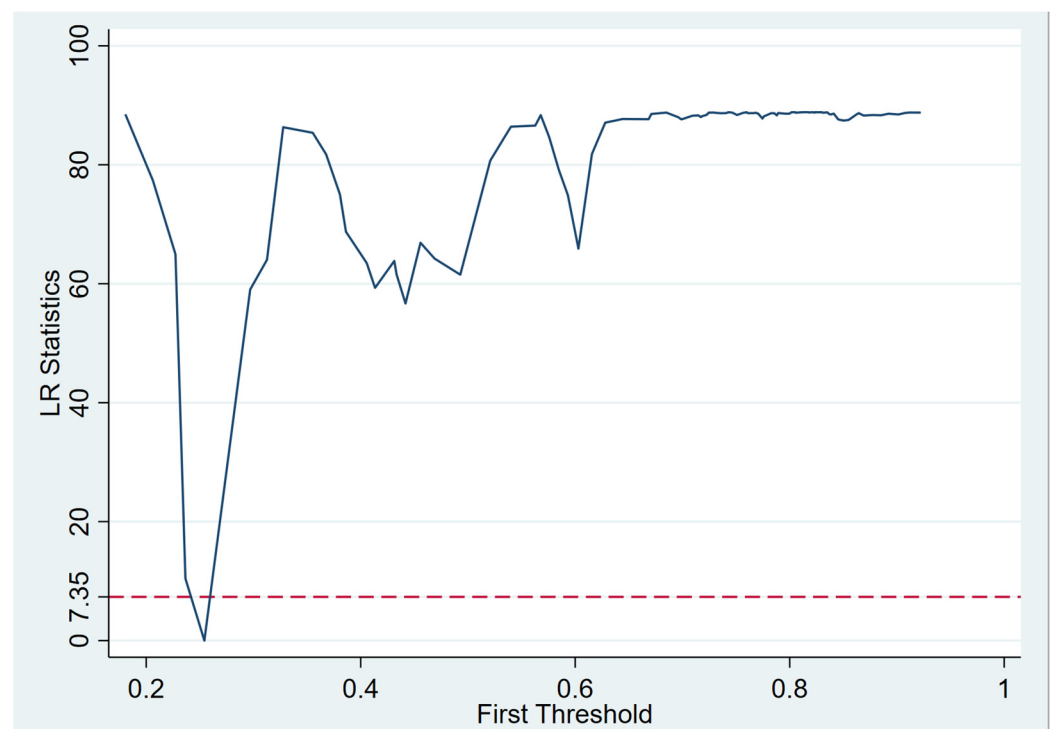

Figure 2. Threshold estimates and 95% confidence intervals for VFI.

According to the regression results in Table 6, it can be seen that VFI has a significant inhibitory effect on Quality, as the estimated coefficient (-5.6499) carries a negative sign and is statistically significant at a 1% level. These empirical estimation results well verify Research Hypothesis 1, indicating that an increase in the level of the vertical fiscal imbalance in China significantly hinders the process of economic quality development to some extent. This may be because, on the one hand, the higher level of local vertical fiscal imbalances has led to an increase in the gap between fiscal expenditures and revenues, which has

intensified local protection and government competition through the "grasping hand" of local governments to gain access to more resource factors. At the same time, local government competition has a "crowding out effect" on the profits of regional enterprises, raising the cost of economic production and lowering production efficiency, resulting in a mismatch between the demand and supply of economic production in the region, lowering the efficiency of regional factor allocation, and ultimately inhibiting the level of high-quality economic development.

Table 6. Estimated results of tax effort thresholds.

Explanatory Variable		Explained Variable: Quality
Zone 1 (VFI ≤ 0.2542)	Teffort	−1.1396 *** (0.2296)
Zone 2 (VFI > 0.2542)		−0.0172 (0.1738)
VFI		−5.6499 *** (1.4069)
Compete		−0.0541 *** (0.0113)
Ind		5.2583 *** (0.4844)
Transfer		3.0131 *** (0.1732)
FSS		−5.8320 *** (1.2151)
Density		1.3666 *** (0.3658)
_cons		−4.3480 (2.7226)
N		450
R-square		0.9188

Note: *** indicate indicates significance at the 1% significance level; standard errors corresponding to estimated coefficients are in parentheses for each variable.

On the other hand, the deterioration of the vertical fiscal imbalance means that the gap between fiscal revenues and expenditures continues to expand. At this time, the transfer payment has a low marginal cost and easy-to-transfer characteristics, which will stimulate the local government to reduce the tax effort to obtain more transfer payment funds. The high dependence on fiscal transfers is likely to induce the "public pool problem", weakening the economic promotion function played by fiscal policy and thus inhibiting the level of regional economic development.

In addition, when VFI is smaller than the threshold value of 0.2542, Teffort has a significant negative effect on Quality, and the estimated coefficient of its effect on Quality is −1.1396, which is an empirical estimation that well verifies the Research Hypothesis 2. The possible reason is that the tax efforts undertaken by local governments have largely dampened the motivation of market microeconomic agents, which has in turn resulted in the narrowing of the jurisdictions' tax base, the loss of tax sources, and the decline of tax revenues. Subsequently, this dampening effect far outweighs the positive effect of improving the efficiency of the collection and management of the tax. Furthermore, this dampening effect also indicates that the positive effect of the tax reform oriented toward reducing the tax burden of microeconomic agents is offset by the negative effect of the local government's efforts to gradually increase tax revenue. As such, despite the gradual implementation of a series of policies to reduce taxes and fees, there has been no significant

increase in the incentives for the development of enterprises and the enthusiasm for the consumption of the population.

When VFI exceeds the threshold value of 0.2542, Teffort has a negative but insignificant effect on Quality, even at the 10% significance level. Despite the positive incentives for enterprise innovation and personal consumption by local governments to introduce tax incentives, their negative effects on promoting the expansion of the investment demand, the industrial structure imbalance, and the surge of debt repayment and management pressure are even greater, and thus the negative inhibitory effect on Quality is relatively larger in magnitude when the degree of Teffort is relatively low. In contrast, the higher tax effort adopted by the local government to a large extent inhibits the production and investment incentives of the market microeconomic subjects, which in turn results in the narrowing of the tax base of the jurisdiction, the loss of tax sources and the decline in tax revenues. Thus, this study argues that when the degree of VFI is substantially high, the effect of Teffort on Quality may rely more on the indirect mechanism to play out. Nonetheless, it is beyond the scope of this study and interested researchers could take it up for further exploration in the future.

The analysis of the quality of economic development by each control variable is as follows.

Local government competition (Compete) has a significant dampening effect on Quality, with each unit increase in local government competition leading to a 0.0541 unit decrease in the quality of economic development. This paper suggests that the possible reason for this is that, with the excessive expenditure pressure brought about by the asymmetric decentralization of revenue and expenditure and the imperfect transfer payment system, it is difficult for local governments to have the actual financial resources and motivation to promote institutional innovation, and thus local government competition hinders the quality of economic development in the region.

Industrial structure (Ind) shows a significant positive contribution to Quality, that is, the optimization and upgrading of the industrial structure significantly promotes the improvement of the quality of economic growth. This is because the local government promotes the continuous optimization transformation and upgrading of the industrial structure through the development of the tertiary industry, which can not only increase the employment level and income level of the residents in the jurisdiction but also get rid of the economic development from the traditional development mode of relying on the secondary industry. That is to say, through the improvement of the tertiary industry, the quality level of economic development can be continuously promoted.

There is a significant positive correlation between the structure of transfer payments (Transfer) and the quality of economic development. This research suggests that the possible reason is that the central government's increase in general financial transfers can effectively alleviate the pressure of the local fiscal balance gap. Once the local government has sufficient financial resources, the impetus for economic development is strong, and the transfer payment can further optimize the allocation of local resources as a supplementary fund to a large extent, thus helping to gradually improve the quality of economic development.

There is a significant negative correlation between the fiscal self-sufficiency rate (Fss) and Quality. This finding suggests that in the current context of asymmetric decentralization of revenues and expenditures, the increase in the level of local governments' revenues is still limited, resulting in higher fiscal pressure on local governments, which hinders the improvement of the quality of economic development.

There is a significant positive correlation between population density (Density) and Quality. This conclusion shows that along with the rising population density, the increased demand brought about by the population concentration constantly requires local governments to improve the quality of public service provision. At the same time, the concentration of high-quality talent also brings about a continuous increase in the innovation output, which ultimately shows the promotion effect on the quality of economic development.

5.4. Analysis of Empirical Results

Two methods are used in this research to estimate Equations (2) and (3), and they are the single-equation estimation and system estimation methods. The single-equation estimation method tends to ignore the links between the individual equations and between the perturbation terms of the equations. In this respect, the system estimation method can compensate for the above shortcomings. In general, it is more efficient to estimate all the equations as a whole. If the variables in Equations (2) and (3) are all strictly exogenous and do not contain endogenous explanatory variables, the results of the OLS single-equation estimation and systematic estimation taken for the equations are consistent. If the explanatory variables of Equations (2) and (3) are endogenous, then 2SLS can be taken to eliminate the possible endogeneity problem, but it cannot deal with the possible correlation between the perturbation terms of each equation. If the 3SLS estimation method is adopted, it can eliminate the endogeneity of the model and also deal with the possible correlation between the perturbation terms of the equations, thus improving the validity of the estimation of the joint equations [43]. Therefore, the measurement model in this study ranges from simple to complex, from general regression to endogeneity discussion, and adopts two-stage least squares, three-stage least squares and their iterations to estimate the model, respectively, and the specific estimation results are detailed in Table 7.

From Table 7, it can be observed in the first, second, fourth and sixth columns that the estimated coefficient of VFI is negative, which again verifies Research Hypothesis 1, indicating that VFI has a more inhibitory than promotional effect. From column 6, it is evident that for every unit increase in VFI, Quality decreases by 1.167 units, i.e., VFI inhibits Quality. At this stage, China's VFI has a greater inhibitory than a promotional effect on Quality. This study suggests the following possible reasons: the increase in the degree of VFI indicates that the gap between the decentralization of local revenue and expenditure has widened, the gap between fiscal revenue and expenditure has widened, and local finances are under greater pressure. The promotional effect of VFI on Quality is mostly reflected in the creation of a stable institutional environment, the role of transfer payments in regulating the allocation of factors, and inter-regional learning and competition at the macro level, which has a long-term and slow impact.

The inhibitory effect of VFI on Quality is short term and direct, which is reflected in the following three points. First, local governments rely too much on transfer payments and central government underwriting policies, which has led to phenomena such as loosening budgetary soft constraints and lowering tax collection efforts. The "fiscal illusion" and the "public pool effect" have led to a continuous expansion of fiscal expenditure, which has brought about investment inefficiency and inflation, all of which have had a greater negative impact on economic development. Secondly, local governments compete with each other to obtain limited factors and resources, resulting in negative behaviors such as local protection, duplicated construction and market segmentation, which are not conducive to the division of labor and resource allocation in the market. Thirdly, China's economic decentralization has been accompanied by political centralization, and under political centralization and the performance appraisal mechanism, competition for growth has developed in China. This has led to short-sighted behavior on the part of local officials, such as relaxing the supervision of enterprises and obtaining economic benefits by destroying the ecological environment, undermining the endogenous dynamics of sustainable economic development.

From another perspective, there is a significant negative correlation between VFI and Teffort, i.e., an increase in the level of VFI significantly reduces the level of the local government's Teffort, and this empirical result verifies Research Hypothesis 3. On the one hand, although a moderate VFI can motivate local governments to raise tax revenue to fulfil their responsibilities, this positive incentive is weakened by the relatively high degree of VFI in China. In addition, high VFI magnifies the negative effect on local governments' tax efforts, which is reinforced by their over-reliance on central government transfers. Unlike the Western fiscally federalist countries, China's decentralization reform based on a political

unitary system not only leads to a higher level of VFI due to the asymmetry between the revenue and expenditure division of power but also exacerbates the inhibitory effect of VFI on local government's Teffort while weakening the positive incentives of VFI on local government's Teffort. This explains why the dampening effect of VFI on local governments' tax efforts is significant in China.

Table 7. Benchmark regression results on VFI, Tax Effort and Quality.

Dependent Variables	Two-Stage Least Squares		Three-Stage Least Squares		Three-Stage Least Squares ~r	
	Quality	Teffort	Quality	Teffort	Quality	Teffort
Teffort	−0.487 *** (−2.59)		−0.500 *** (−2.81)		−0.509 *** (−2.86)	
VFI	−1.253 ** (−2.38)	−0.299 *** (−3.23)	−1.205 ** (−2.42)	−0.305 *** (−3.51)	−1.167 ** (−2.34)	−0.310 *** (−3.56)
Open	−1.599 *** (−10.64)		−1.538 ***	(−10.85)	−1.492 *** (−10.53)	
Ind	0.123 (0.20)		0.192 (0.33)		0.241 (0.42)	
Compete		0.0049 ** (2.26)		0.0050 ** (2.42)		0.0050 ** (2.44)
Transfer		−0.101 *** (−3.01)		−0.120 *** (−3.83)		−0.134 *** (−4.29)
Urban		0.857 *** (6.49)		0.879 *** (7.09)		0.896 *** (7.24)
Density		−0.730 *** (−12.13)		−0.716 *** (−12.65)		−0.706 *** (−12.50)
Ptax		0.850 *** (29.20)		0.844 *** (30.83)		0.840 *** (30.65)
Pgdp		−1.459 *** (−32.52)		−1.460 *** (−34.57)		−1.460 *** (−34.53)
Constant	5.225 *** (9.78)	3.833 *** (9.02)	5.103 *** (10.12)	3.773 *** (9.45)	5.013 *** (9.95)	3.734 *** (9.37)
Region	Y	Y	Y	Y	Y	Y
Time	Y	Y	Y	Y	Y	Y
R-square	0.9589	0.8005	0.9588	0.8002	0.9588	0.7997

Note: ① Numbers in parentheses are t-values. ② *** and ** indicate the rejection of the original hypothesis at 1% and 5% significance levels, respectively. ③ The data in this table were calculated by Stata 17.0. ④ Y is an abbreviation for YES, which means that the variable was controlled for in the regression model. ⑤ ~r refers to the iterative method, based on the three-stage least squares method, where the parameters are optimized by iteration until the stopping criterion is satisfied or the maximum number of iterations is reached.

Thirdly, the estimated coefficient of local government Teffort is −0.500, indicating that for every unit increase in local government Teffort, the index of Quality decreases by 0.500 units. Furthermore, this effect is statistically significant at a 1% level. Once again Research Hypothesis 2, i.e., Teffort inhibits Quality, is verified. This research argues that this phenomenon is caused by the fact that the higher tax effort adopted by local governments largely inhibits the enthusiasm of market microeconomic agents, which in turn causes the narrowing of the tax base of the jurisdiction, the loss of tax sources and the decline in tax revenues. The disincentive effect far outweighs the positive effect of improving the efficiency of tax administration. Furthermore, this dampening effect also indicates that the positive effect of the tax reform oriented toward reducing the tax burden of microeconomic agents is offset by the negative effect of the gradual increase in tax collection efforts by local governments. As a result, despite the current series of policies to reduce taxes and fees, there has not been a significant increase in the development of enterprises and the consumption enthusiasm of residents.

Fourthly, in terms of the control variables, there is a significant negative association between openness to the outside world and Quality, i.e., an increase in the level of openness to the outside world significantly inhibits the improvement of Quality. This study argues that this phenomenon is caused by the fact that China's export-driven economic growth model has fueled the country's ultra-high-speed economic growth in the past. In the future, along with the continuous growth of the people's need for a better life, China needs to require local governments to absorb the advanced experiences and beneficial practices of developed countries as much as possible and pay more attention to the quality of foreign investment based on satisfying people's needs for a better life.

Industrial structure (Ind) has a positive effect on the quality of economic growth, i.e., the optimization and upgrading of the industrial structure promotes the improvement of Quality, but the difference is insignificant. By developing the tertiary industry to promote the continuous optimization transformation and upgrading of industrial structure, the local government can not only increase the employment level and income level of the residents in the jurisdiction but also get rid of the economic development from the traditional development mode of relying on the secondary industry. This means that the improvement of the service level of the tertiary industry can continuously promote the improvement of the quality level of economic development.

The regression coefficient of local government competition (Compete) on tax effort is 0.005 and is significant at the 5% level, which indicates that an increase in the level of competition significantly contributes to an increase in tax effort. The fundamental reason for this phenomenon is that the transformation of economic development goals has prompted a change in the means of local government policy implementation. Along with China's economy gradually turning to a new stage of high-quality development and the continuous improvement of the budget management system, local governments pay more and more attention to improving the level of basic public services for residents and thus pay more and more attention to improving their tax efforts to obtain sufficient fiscal revenues. As a result, local governments' tax efforts have been significantly increased.

There is a significant negative correlation between transfer structure (Transfer) and tax effort, i.e., an increase in the proportion of balanced transfers inhibits Teffort. Among them, the regression coefficient of equalization transfer on tax effort is −0.120, and the coefficient is significant at a 1% significance level according to the t-test. This indicates that for every 1-unit increase in the proportion of equalization transfer, Teffort decreases by 0.120 units. On the one hand, the increase in equalization transfers can significantly alleviate the pressure on local governments' revenue and expenditure, prompting local governments to use the transfer funds as a substitute for their tax revenue, which leads to a decrease in tax effort. In contrast, local governments, motivated by the "public pool" effect, will actively use the redistributive effect of transfer funds to draw on the fruits of economic development in other regions, thus losing their development incentives. This conclusion shows that China's current transfer payment system not only fails to give full play to its normative effect on the tax behavior of local governments but also has the suspicion of intensifying local tax competition and exacerbating the relaxation of tax efforts.

The regression coefficient of population density (Density) is −0.716 and is statistically significant at the 1% level, which indicates that a rise in Density significantly inhibits Teffort. This study argues that high Density increases the difficulty of tax collection and tax enforcement, and thus it hinders Teffort.

There is a significant positive correlation between per capita tax revenue (Ptax) and tax effort, i.e., an increase in Ptax promotes Teffort. The regression coefficient of Ptax on Teffort is 0.844 and it is statistically significant at the 1% significance level, which indicates that for every 1-unit increase in Ptax, Teffort increases by 0.844 units. On the one hand, an increase in Ptax means that local governments have more financial resources. This can induce local governments to be more capable of providing public services, infrastructure and social welfare as they have more funds to support these projects. On the other hand, if the local economy performs well and business profits increase, then tax revenues increase.

In this case, it is easier for local governments to implement tax policies because businesses and individuals have more capacity to pay more taxes.

There is a significant negative association between per capita gross domestic product (Pgdp) and tax effort, i.e., an increase in Pgdp inhibits Teffort. In particular, the regression coefficient of Pgdp on tax effort is −1.460 and it is statistically significant at a 1% significance level, which indicates that for every unit increase in Pgdp, Teffort decreases by 1.460 units. On the one hand, higher Pgdp may attract more inflows of population, especially the affluent. As Pgdp increases, the proportion of affluent groups in society increases. Affluent groups tend to have a lower tolerance for higher taxes and are more inclined to avoid taxes through various means. In this case, local governments feel the pressure to reduce tax collection, thus reducing their willingness to implement higher tax policies. On the other hand, some local governments may adopt a more conservative tax policy and choose to maintain relatively low tax levels to stimulate the vitality of enterprises and individuals, even if the Pgdp increases, through factors such as attracting investment and promoting economic development.

5.5. Robustness Test Results

To test the robustness of the above regression results and mechanism analysis, this study adopts another caliber of VFI for regression. Firstly, the VFI is redefined, i.e., VFI is measured from the perspective of the traditional fiscal revenue and expenditure gap. It is specifically defined as VFI II = 1 − (local general public budget revenue/local general public budget expenditure). Substituting the VFI II into the panel joint equation, the three-stage least squares method is used for the estimation. The results of the robustness analysis are shown in Table 8, which shows that the signs of the coefficients of VFI, Teffort, and other key variables are basically the same, and only the coefficients of the individual control variables are slightly changed, indicating that the regression results have good robustness.

Table 8. Robustness test regression results.

Dependent Variables	Two-Stage Least Squares		Three-Stage Least Squares		Three-Stage Least Squares ~r	
	Quality	Teffort	Quality	Teffort	Quality	Teffort
Teffort	−0.417 *** (−2.31)		−0.432 *** (−2.53)		−0.443 *** (−2.59)	
VFI	−0.989 ** (−2.00)	−0.221 *** (−2.65)	−0.961 ** (−2.05)	−0.227 *** (−2.90)	−0.939 ** (−2.00)	−0.232 *** (−2.95)
Open	−1.540 *** (−10.71)		−1.486 *** (−10.95)		−1.445 *** (−10.66)	
Ind	0.054 (0.09)		0.118 (0.20)		0.164 (0.28)	
Compete		0.0049 ** (2.24)		0.0050 ** (2.40)		0.0050 ** (2.41)
Transfer		−0.102 *** (−3.05)		−0.122 *** (−3.85)		−0.135 *** (−4.30)
Urban		0.887 *** (6.73)		0.909 *** (7.34)		0.927 *** (7.50)
Density		−0.744 *** (−12.38)		−0.731 *** (−12.94)		−0.722 *** (−12.80)
Ptax		0.869 *** (31.82)		0.863 *** (33.60)		0.859 *** (33.41)
Pgdp		−1.466 *** (−32.67)		−1.468 *** (−34.75)		−1.469 *** (−34.73)
Constant	4.927 *** (9.82)	3.721 *** (8.81)	4.829 *** (10.19)	3.667 *** (9.24)	4.755 *** (10.05)	3.632 *** (9.17)
Region	Y	Y	Y	Y	Y	Y
Time	Y	Y	Y	Y	Y	Y
R-square	0.9588	0.7989	0.9588	0.7986	0.9587	0.7980

Note: ① Numbers in parentheses are t-values. ② *** and ** indicate the rejection of the original hypothesis at 1% and 5% significance levels, respectively. ③ The data in this table were calculated by Stata 17.0. ④ Y is an abbreviation for YES, which means that the variable was controlled for in the regression model. ⑤ ~r refers to the iterative method, based on the three-stage least squares method, where the parameters are optimized by iteration until the stopping criterion is satisfied or the maximum number of iterations is reached.

5.6. Standardized Regression Results

According to the previous analysis and the benchmark regression results, it can be seen that there are dual paths of VFI on Teffort. To separate the direct path and indirect transmission effect of VFI on Teffort, this study adopts the standardized treatment for each variable and uses the three-stage least squares method to estimate it again, and the regression results are shown in Table 9 [45]. The standardized regression results show that the significance of each variable is consistent with the baseline regression results and that VFI and Teffort significantly inhibit the improvement of Quality, while at the same time, VFI significantly inhibits Teffort.

Table 9. Results of standardized regressions on VFI, Teffort and Quality.

Dependent Variables	Two-Stage Least Squares		Three-Stage Least Squares		Three-Stage Least Squares ~r	
	Quality	Teffort	Quality	Teffort	Quality	Teffort
Teffort	−0.487 *** (−2.59)		−0.500 *** (−2.81)		−0.509 *** (−2.86)	
VFI	−0.239 ** (−2.38)	−0.0570 *** (−3.23)	−0.230 ** (−2.42)	−0.0583 *** (−3.51)	−0.223 ** (−2.34)	−0.0591 *** (−3.56)
Open	−0.522 *** (−10.64)		−0.502 *** (−10.85)		−0.487 *** (−10.53)	
Ind	0.0114 (0.20)		0.0179 (0.33)		0.0225 (0.42)	
Compete		0.0141 ** (2.26)		0.0142 ** (2.42)		0.0142 ** (2.44)
Transfer		−0.0170 *** (−3.01)		−0.0204 *** (−3.83)		−0.0227 *** (−4.29)
Urban		0.115 *** (6.49)		0.118 *** (7.09)		0.120 *** (7.24)
Density		−0.937 *** (−12.13)		−0.919 *** (−12.65)		−0.907 *** (−12.50)
Ptax		0.692 *** (29.20)		0.687 *** (30.83)		0.684 *** (30.65)
Pgdp		−0.840 *** (−32.52)		−0.841 *** (−34.57)		−0.841 *** (−34.53)
Constant	3.956 *** (14.01)	1.700 *** (15.81)	3.919 *** (14.69)	1.666 *** (16.47)	3.891 *** (14.59)	1.642 *** (16.26)
Region	Y	Y	Y	Y	Y	Y
Time	Y	Y	Y	Y	Y	Y
RR-square	0.9589	0.8005	0.9588	0.8002	0.9588	0.7997

Note: ① Numbers in parentheses are t-values. ② *** and ** indicate the rejection of the original hypothesis at 1% and 5%, a significance levels, respectively. ③ The data in this table were calculated by Stata 17.0. ④ Y is an abbreviation for YES, which means that the variable was controlled for in the regression model. ⑤ ~r refers to the iterative method, based on the three-stage least squares method, where the parameters are optimized by iteration until the stopping criterion is satisfied or the maximum number of iterations is reached.

Based on the standardized regression results in Table 9, this study calculates the direct, indirect and total effects of VFI and Teffort on Quality, and the results are detailed in Table 10 [30]. The calculation results in Table 10 summarize the direct path of VFI on Quality, i.e., "the direct negative effect of VFI on Quality is 0.223". In the earlier part of this study, it has been established that VFI has an indirect transmission mechanism on Quality by providing empirical evidence to verify Research Hypothesis 4. Multiplying the direct

effect of VFI on Teffort −0.223 with the direct effect of Teffort on Quality −0.509 yields an indirect effect of VFI on Quality of 0.0301.

The reason for this result is that the current level of the vertical fiscal imbalance in China discourages local governments from increasing their tax efforts and instead encourages them to introduce various tax incentives to attract investment and promote economic development. In addition, with the increasing level of information technology in the tax administration, local enterprises are facing relatively high tax burdens, and the competitive strategy of low tax burdens among local governments as a result of the vertical fiscal imbalance has helped to improve the quality of economic development. The direct inhibitory effect of the vertical fiscal imbalance on the quality of local economic development is relatively larger than the indirect promotional effect, which ultimately leads to a total effect of −0.1929, still showing an inhibitory effect on the quality of economic development. This finding suggests that the current level of the vertical fiscal imbalance in China is significantly high, although it can indirectly improve the quality of economic development by suppressing the tax efforts of local governments. The excessive pursuit of a low tax burden competition strategy by local governments is not only detrimental to the promotion of the process of tax law but also affects the sustainability of local finances, and thus the positive effect is only short term and still not favorable to the development of the local economy in the long run.

Table 10. Paths and transmission mechanisms of VFI on Teffort and Quality.

Mechanisms	Paths and Transmission	Effect	Result	Total Effect
Direct Effect	VFI → Quality	θ_1	−0.223	−0.223
Direct Effect	Teffort → Quality	θ_2	−0.509	−0.509
Indirect Effect	VFI → Teffort	ϑ_1	−0.0591	0.0301
	VFI → Teffort → Quality	$\vartheta_1 \times \theta_2$	0.0301	

6. Conclusions

Among the few major findings obtained are the following. First, both vertical fiscal imbalances and local government tax efforts significantly inhibit the quality of local economic development. Second, father analysis reveals that when the vertical fiscal imbalance stays below the 0.2542 threshold, local government tax effort hinders local economic development quality, but this inhibitory effect becomes insignificant beyond this threshold. Third, it is found that the vertical fiscal imbalance itself has a pulling effect on the local government tax effort. In addition, the vertical fiscal imbalance has an indirect effect on local economic development quality, moderated by the local government tax effort. Finally, the industrial structure, transfer structure and population density promote the quality of economic development, while local government competition, fiscal self-sufficiency and openness to the outside world harm the quality of economic development. At the same time, the local government competition, urbanization rate and per capita tax revenue increase local government tax efforts, whereas transfer structure, population density and per capita GDP decrease tax efforts.

Based on these findings, the following targeted recommendations are made. First, the local authority needs to control and reduce the vertical fiscal imbalance that has been found harmful to local economic development. The key reason for the high degree of vertical fiscal imbalance at the local level is the low degree of revenue decentralization and the high degree of expenditure decentralization. To build a reasonable pattern of fiscal power between the central government and the local government, it is important to ensure that local governments have fiscal power that matches their authority and expenditure responsibilities and that each region has the most appropriate degree of revenue autonomy. The way forward requires courage to start by cultivating the following three local quality tax sources.

For property tax, it is necessary to promote property tax legislation. Property tax, as the main local tax, is also a direct tax, which is very much in line with the current background of the country's reform of the tax system. After the implementation of pilot reforms in China, property tax has been outstanding in raising local tax revenues, but there are problems, such as the co-existence of rent tax and fees. Therefore, the legislation on property tax will help to give better play to the natural endowment of property tax, gradually take up the burden of the local main tax and stabilize the local tax source.

For resource tax, although 90% of the current resource tax revenue goes to localities, the distribution of tax revenue among provincial, municipal and county governments is not reasonable, with provincial governments retaining most of the resource tax revenue, while the places with the most resource exploitation are in municipalities or counties. Therefore, more resource tax revenues should be given to the city- and county-level governments so that they have some financial resources to use to improve the environmental damage caused by resource extraction, thus promoting green development.

For environmental protection tax, according to the results of this research's measurement of the indicators of high-quality economic development, in recent years, the "green" indicators have been significantly improved and the environmental protection tax has largely influenced the behavior of enterprises, which not only reduces pollutant emissions but also brings in fiscal revenues. Therefore, we should continue to expand the scope of the environmental protection tax, refine the collection standards, increase the supervision and enforcement of taxpaying enterprises, improve the cross-regional environmental protection information platform, and realize the regional interaction and connection of environmental protection information.

Second, enhance local government tax efforts. The most direct method is to enhance tax autonomy and moderately increase the share of local tax revenue, a method that presupposes ensuring the stability of the central government's fiscal power. However, in the context of China's vertical fiscal imbalance, it is not enough to give local governments a certain percentage of tax revenue sharing; it can be said that this treats the symptoms but not the root cause, and it does not fundamentally enhance the government's revenue-raising capacity. It is necessary to create a favorable institutional environment for local governments at the root, that is, to appropriately strengthen the limited tax legislation power of local authorities. The Legislation Law confirms the principle of tax legislation in the form of law, which provides an institutional guarantee of the regulation of local tax legislation, and at the same time, it should be supplemented by a certain monitoring mechanism. For some taxes that require central macro-control and can be realized by the local authorities according to local conditions, the local authorities should be given certain tax autonomy, such as granting some local authorities the right to reduce or exempt taxes, adjusting the scope of tax rates, increasing or decreasing the number of tax items, etc. This will be conducive to the stability of local tax revenues, thereby enhancing local tax efforts, forming a mechanism for fiscal revenue growth, and raising the degree of revenue decentralization.

Third, a system of indicators for economic development quality should be constructed according to local conditions. Based on the results of the previous measurements, China's overall level of such quality is insufficient, and there is a large development gap between the provinces. In response to these circumstances, the central government should provide appropriate policy or financial support to help the regions improve their shortcomings and raise the overall level of economic development quality based on the new development concept of "innovation, coordination, greenness, openness and sharing".

In conclusion, local government tax efforts can directly affect regional sustainability by shaping resource allocation, investment priorities, and overall economic health. If local governments prioritize short-term revenue generation over long-term sustainable development goals, it could lead to detrimental effects such as environmental degradation, social inequality, and economic instability.

As such, understanding the relationship between vertical fiscal imbalances, local government tax efforts, and the quality of economic development is essential for promoting

regional and national sustainability. Policymakers need to implement measures that encourage fiscal balance, promote efficient resource allocation, and incentivize local governments to prioritize sustainable development initiatives in their tax policies and expenditure decisions. By addressing these issues, it becomes possible to foster economic growth that is not only robust but also environmentally, socially and economically sustainable in the long run.

Author Contributions: Writing—original draft, K.W.; Supervision, V.K.-S.L. All authors have read and agreed to the published version of the manuscript.

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