

Study on the Impact of Financial Decentralization on China's Green Welfare

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Abstract. The 20th Party Congress pointed out that development should be planned on the basis of the harmonious coexistence of human beings and nature. A reasonable allocation of financial resources is a crucial guarantee for achieving the growth of green welfare. This paper empirically examines the impact of financial decentralization on green welfare based on panel data of 30 Chinese provinces from 2005 to 2019. Results demonstrate that: (1) Financial decentralization significantly promotes regional green welfare, and the effect is more significant in the eastern region than in the central and western region; (2) In terms of specific sub-welfare dimensions, financial decentralization can significantly foster economic welfare, social welfare and environmental welfare, but not resource welfare; (3) Furthermore, political incentive cannot enhance the contribution of financial decentralization to green welfare, and fiscal incentive can significantly reduce the contribution. The findings of this paper provide a new reference for deepening the financial decentralization system reform, ameliorating the assessment system of local governments and upgrading the level of green welfare of Chinese residents.

Keywords: Financial Decentralization; Green Welfare; Political Incentive; Fiscal Incentive.

1. Introduction

Since the reform and opening up, China has constantly been concentrating on economic construction. In 2010, China overtook Japan to become the world's second largest economy, and its GDP exceeded 120 trillion RMB in 2022. However, behind the remarkably rapid economic development, environmental issues have also become progressively prominent. In the Environmental Performance Index (EPI) 2020 report, jointly released by Yale University and other research institutions, China ranks 120th out of 180 countries and regions, which is in the lower middle class. According to the United Nations Development Programme's Human Development Report 2021-22, China ranks 79 out of 191 participating countries and regions, which is egregiously inconsistent with its economic status as the world's second largest economy. The Fifth Plenary Session of the 19th CPC Central Committee pointed out that China had switched from high-speed development to a phase of high-quality development, which would require economic development to fundamentally aimed at fulfilling people's incremental need for a better life. Green welfare (subsequently abbreviated as GW) contains both green and welfare dimensions, and its connotation lies in providing a high-quality material life for all members of society while increasing resource utilization efficiency and improving environment quality (Liao et al., 2020). Therefore, enhancing the level of regional GW coincides with our economic development philosophy.

Limitless extensive economy damages both ecology and welfare (Yuan et al., 2022). The extensive mode of production is intimately allied to economic decentralization, which includes both fiscal decentralization and financial decentralization (subsequently abbreviated as FD). Up to now, a substantial number of scholars have conducted extensive studies on the relationship between fiscal decentralization and green economic development, green innovation, and green TFP. FD, on the other hand, has frequently been regarded as "second fiscal" and neglected. There is only a small amount of literature investigating the association between FD and green economic development or environmental pollution, and there is a gap in research on the connection between FD and GW. In the study by Xie and He (2021), it has been confirmed that FD can promote high-quality economic

development. From the above, it can be recognized that exploring the impact of FD on GW is of practical significance for China's economic development in this phase.

Potential contributions of this paper are: (1) This study innovatively introduces FD as a new theoretical paradigm into the study of GW and analyzes its mechanism from both theoretical and empirical aspects, expanding a new research perspective and providing a basis and inspiration for existing polity to elevate regional GW. (2) This essay constructs an assessment technique of GW indicator through multiple welfare dimensions, which can measure the development of GW in each province more comprehensively. (3) This paper adopts a moderating effect model to investigate the transmission channels of FD influencing GW from the perspective of local government incentives, concretely political incentives and fiscal incentives, which enriches the research on the influencing factors of GW. (4) This research conducts group regressions based on geographical regions, further revealing the heterogeneous impact under different regional conditions.

2. Theoretical Analysis and Hypothesis Formulation

2.1 FD

Among existing studies on Chinese-style FD, scholars have predominantly centered on the impact of FD on macroeconomic growth, but findings are inconsistent. Xie and Jiang (2016) found that FD can promote economic growth by upgrading the performance of the banking system. Fu and Li (2017) argued that too high a degree of FD can lead to inflation and economic overheating, which is detrimental to macroeconomic stability. Lu and Jin (2020) concluded that FD is hazardous to indigenous economic growth but has a facilitating effect on surrounding areas.

In addition, as environmental pollution issues in China are closely affiliated with the long-standing extensive economic development mode (Yao et al., 2020), some scholars have conducted studies on the effect of FD on the environment. Yao et al. (2020) found that the impact of FD on environmental pollution has a "positive U-shaped" nonlinear relationship. Wang et al. (2021) concluded that FD can diminish industrial emissions. Liu et al. (2021) pointed out that FD can contribute to taking advantage of local information and enhancing the emission reduction effect of financial development. Zhu and Lu (2022) concluded through an empirical study that FD in China has a distinguished carbon emission reduction effect and there is a spatial spillover effect. Indigenous governments can refine the energy consumption structure by intervening in the allotment of local financial resources. Zeng and Zhao (2023) demonstrated that FD can lead to the promotion of carbon tax in 14.92% of Chinese industries, mitigate 29% of climate change, contributing to green development.

2.2 FD and GW

The essence of FD is authentically the competition for financial resources between the central government and local governments (Xie and He, 2021). To start with, FD provides local governments with a certain degree of financial autonomy, which can stimulate them to play an active role in the allocation of financial resources. By formulating a sequence of differentiated financial policies, more financial resources can be allocated to green sectors and green projects (Liu, 2021), aggrandizing the development of regional green economies and improving the GW of residents. Additionally, with people's demand for a better life increasing, FD permits local governments to act in the interest of local ecology and respond to public opinions. More adequate financial resources will be used to extend the investment in environmental pollution control (Han, 2018), develop green industries and upgrade the level of regional GW. Last but not least, compared with the central government, local governments have the advantage of geographic information and are able to better recognize actual pressing needs of local residents, so they can supply public goods that best satisfy residents' preferences. FD empowers local governments to have a considerable amount of capital to invest in infrastructure constructions, which can effectively enhance social welfare.

Conversely, FD may also decrease the level of GW. First, in order to obtain more fiscal revenue and stimulate economic growth, local governments may interfere with local financial institutions to

support the development of large industrial enterprises that are severely high-pollution and high-emission, but can prompt high returns and have a direct accelerate to GDP. Thus, FD will aggravate environmental pollution and is not conducive to GW development. Second, the increase in financial autonomy gives local governments more possibilities for rent-seeking, which would distort entrepreneurs' activities and reduce their R&D activities. This tends to ultimately make enterprises' R&D investment insufficient (Gu and Shen, 2012), which is not salutary to regional green technology upgrade and GW level improvement.

Accordingly, hypothesis 1 of this paper is proposed:

H1: FD positively promotes GW.

2.3 FD, Local Government Incentives and GW

FD gives local governments more authority over the allocation of regional financial resources, generating fiscal incentives for them. Meanwhile, local government officials confront political incentives under promotion tournaments. The impact of FD on regional GW development may be adjusted by the effect of fiscal incentives and political incentives.

In terms of environmental pollution, Han and Zhang (2018) empirically tested that political incentives are positively associated to environmental pollution, and the political promotion mechanism with GDP as the principal assessment index extensively exacerbates urban environmental pollution in China. Local government officials have a strong eagerness for fiscal revenue and political performance in order to satisfy their own promotion needs. Therefore, they will concentrate on economic construction in policy making and will not take other indicators that are beneficial to long-term sustainable development into account. They may deregulate intensely polluting enterprises and interfere with local banks or other financial institutions to provide them with more financing channels in order to attract investments. Yuan and Li (2015) pointed out that under the promotion pressure, local government officials conspiring with enterprises to pursue maximum output is the primary reason for the increasing emissions.

In terms of public goods inputs, under the current promotion assessment mechanism in China, local governments devote more exertions to the performance of quantifiable assessment indicators and have no impetus to increase non-economic public goods inputs. This leads to their fiscal expenditure being excessively biased towards investments in developmental public goods, causing a crowding-out effect on the supply of livelihood-based public goods (Fu, 2010). Therefore, political incentives are not beneficial to the enhancement of regional GW level.

In terms of R&D investment, influenced by fiscal and political incentives, local governments will intervene in local financial markets to make a substantial amount of financial capital flow to investment projects with short cycle time, low risk exposure and high tax income. In contrast, innovation is characterized by prominent positive externalities, high risk, and high investment, and green technology innovation even has quasi-public goods properties (Liu, 2021). Therefore, regional green technology R&D investment will be crowded out, which is detrimental to the improvement of green TFP and inhibits regional GW.

Accordingly, hypotheses 2 and 3 of this paper are proposed:

H2: Political incentives will inhibit the promoting effect of FD on GW.

H3: Fiscal incentives will inhibit the promoting effect of FD on GW.

3. Data and Methods

3.1 Sample Selection and Data Sources

The sample of this study consists of panel data for 30 provinces in China (excluding Tibet, Hong Kong, Macao and Taiwan) from 2005 to 2019. Data is obtained from the EPS database and China Statistical Yearbook, and missing data is supplemented by the average growth rate (trend method). Specific definitions and descriptive statistics of main variables are shown in Table 1. In the

subsequent empirical study of this paper, all data are taken as natural logarithms except for political incentives.

Table 1. Variable definition and descriptive statistics

Variable name	Variable symbol	Definition of variables	Obs	Mean	Std.dev.	Min	Max
Green welfare	GW	Constructed through a system of indicators	450	0.443	0.076	0.274	0.705
Financial decentralization	FD	Loans by province / national loans	450	0.033	0.026	0.003	0.116
Government intervention	FE	Fiscal expenditure / GDP	450	0.223	0.098	0.080	0.628
Trade factors	XM	Import and export / GDP	450	0.304	0.368	0.013	1.721
Infrastructure	ROAD	Road area by province / population	450	13.984	4.639	4.040	26.196
Population size	PD	Population / province area	450	448.946	662.211	7.518	3912.941
Industrial structure	IND	Tertiary sector value added / secondary sector value added	450	1.057	0.596	0.500	5.169

3.2 Variable Settings

3.2.1 Explained Variable - GW

GRE evaluation metrics are not directly obtainable. Referring to Fukuyama and Weber (2009) and Andersen and Petersen (1993), 15 indicators are selected from four dimensions: economic welfare, social welfare, resource welfare and environmental welfare to measure regional GW through the entropy weighting method (Table 2).

Table 2. GW indicator evaluation system

System	Welfare dimension	Indicators	Attribute
GW	Economic welfare	GDP per capita	Positive
		Fiscal revenue per capita	Negative
		R&D investment / GDP	Positive
		Percentage of added value in tertiary industry	Positive
	Social welfare	Number of college students	Positive
		Buses per 10,000 people	Positive
		Health technicians per 10,000 people	Positive
		Public toilets per 10,000 people	Positive
	Resource welfare	Energy consumption intensity	Negative
		Electricity consumption intensity	Negative
		Water consumption per capita	Negative
		Forest coverage rate	Positive
	Environmental welfare	Sulfur dioxide emission per unit GDP	Negative
		Industrial solid waste generation per unit GDP	Negative
		Wastewater emission per unit GDP	Negative

3.2.2 Explanatory Variables - FD

Referring to Yao et al. (2022), FD is measured using the proportion of loans in each province to the nation (30 provinces). Furthermore, loans per capita by province as a percentage of loans per capita nationwide (30 provinces) is employed in the robustness test.

3.2.3 Intermediary Variables

Drawing on Xie et al. (2022), the discrepancy between the average GDP growth rate of the region where the province is located (eastern or central & western) and the province's GDP growth rate is

applied to measure political incentives (POI), and the ratio of local fiscal expenditure to national fiscal expenditure is employed to measure fiscal incentives (FISE).

3.2.4 Control Variables

Referring to the literature associated to FD and GW, taking the effects of government intervention, trade factors (Yao et al., 2022), infrastructure development (Wu and Wang, 2021), population size (Brilhante and Klaas, 2018) and industrial structure (Yuan et al., 2022) on GW into consideration, fiscal expenditure as a percentage of GDP (FE), import and export as a percentage of GDP (XM), road area per capita (ROAD), population density (PD), and the ratio of tertiary sector value added to secondary sector value added (IND) are selected as control variables.

3.3 Model Construction

3.3.1 Baseline Regression Model

To recognize the influence of FD on regional GW, this paper constructs a panel fixed effects model as shown in equation (1):

$$\ln GW_{it} = \beta_0 + \beta_1 \ln FD_{it} + \lambda \ln X_{it} + \sum Year + \sum State + \varepsilon_{it} \quad (1)$$

where, i represents province; t represents time; lnGW represents the natural logarithm of GW; lnFD represents the natural logarithm of FD; lnX represents the natural logarithm of other control variables affecting GW; and ε represents random error terms. In addition, this paper controls time fixed effect and province fixed effect to enhance the robustness of study findings.

3.3.2 Regression Models for Moderating Effects

To probe the moderating effects of political and fiscal incentives between FD and GW, this paper establishes models shown in equations (2) and (3) as follows:

$$\ln GW = \gamma_0 + \gamma_1 \ln FD_{it} + \gamma_2 \ln POI_{it} + \gamma_3 \ln X_{it} + \sum Year + \sum State + \varepsilon_{it} \quad (2)$$

$$\ln GW = \theta_0 + \theta_1 \ln FD_{it} + \theta_2 \ln FISE_{it} + \theta_3 \ln X_{it} + \sum Year + \sum State + \varepsilon_{it} \quad (3)$$

where, lnPOI represents the natural logarithm of political incentives; and lnFISE represents the natural logarithm of fiscal incentives. Other variables are set in the identical way as equation (1).

4. Empirical Results

4.1 Baseline Regression

Table 3. Baseline regression results

	lnGW(1)	lnGW(2)	lnGW(3)	lnGW(4)
lnFD	0.388** (2.24)	0.045*** (2.88)	0.042** (2.57)	0.052*** (3.07)
lnFE		-0.118*** (-6.10)	-0.109*** (-5.72)	-0.119*** (-6.11)
lnXM		0.049*** (7.97)	0.053*** (8.66)	0.056*** (8.97)
lnROAD			0.026** (2.03)	0.030** (2.38)
lnPD			0.150*** (3.82)	0.156*** (3.98)
lnIND				0.029** (2.28)
Year	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes
R2	0.846	0.876	0.881	0.882
Obs	450	450	450	450

Note: t-values are in brackets; *, * and *** indicate significant at 10%, 5% and 1% levels respectively. Same as below.

Results of the full-sample regression of "FD - GW" are presented in Table 3. Column (1) reports results without adding any control variables. 1% increase in FD will contribute to an average 0.388% increase in GW at the 5% significance level. The effect direction is consistent as anticipated and validates hypothesis H1. This indicates that in the context of FD, the expansion in financial resources accessible to local governments facilitates their active role in the allocation of financial elements, which is beneficial to develop green economy and enhance GW of residents.

Column (2) adds control variables fiscal expenditure as a percentage of GDP (FE) and import and export as a percentage of GDP (XM). The regression coefficient of FD is significant at the 1% level. When column (3) adds control variables road area per capita (ROAD) and population density (PD) to column (2), it is significant at the 5% level. Furthermore, when column (4) adds the control variable the ratio of tertiary sector value added to secondary sector value added (IND), it is significant at the 1% level. Therefore, FD can alleviate information asymmetry and upgrade the efficiency of local financial resource allocation, fostering the improvement of regional GW level. The research hypothesis H1 of this paper is verified.

4.2 Robustness Tests and Endogenous Issues

To enhance the robustness of the findings, the following four methods are selected for robustness tests in this paper: 1. Replace the explanatory variable. Drawing on Yao et al. (2020), the proportion of loans per capita by province to loans per capita nationwide (30 provinces) is employed to supersede the initial FD indicator, avoiding overestimation of the degree of FD in populous provinces. 2. Supplant the sample. The samples of Beijing, Shanghai, Tianjin and Chongqing are excluded here in consideration of the unique characteristics of directly administered cities. 3. Lagged effects. As there may be a lagged effect on the impact of FD on GW, this paper treats the explanatory variable (FD) and all control variables with a one-period lag. 4. Endogenous issues. Regarding the potential endogenous problems, this essay introduces the first-order lagged term and second-order lagged term of FD as instrumental variables to assess the effect of FD on GW employing the 2SLS method. The results of robustness tests, shown in Table 4, all support hypothesis H1, which states that there is a positive contribution of FD to GW.

Table 4. Robustness test

	Replacement of explanatory variable	Removal of 4 municipalities	Lagged by one period	Instrumental variables method
lnFD (lnL.FD)	0.515 ^{***} (3.07)	0.395 ^{**} (2.01)	0.630 ^{***} (3.60)	0.037 [*] (1.74)
lnFE (lnL.FE)	-0.119 ^{***} (-6.11)	-0.112 ^{***} (-4.83)	-0.113 ^{***} (-5.09)	-0.106 ^{***} (-5.10)
lnXM (lnL.XM)	0.056 ^{***} (8.97)	0.049 ^{***} (6.54)	0.055 ^{***} (8.50)	0.050 ^{***} (7.42)
lnROAD (lnL.ROAD)	0.030 ^{**} (2.38)	0.042 ^{**} (2.14)	0.021 [*] (1.66)	0.043 ^{**} (2.28)
lnPD (lnL.PD)	0.207 ^{***} (4.82)	0.192 ^{***} (3.81)	0.115 ^{***} (2.83)	0.156 ^{***} (3.17)
lnIND (lnL.IND)	0.029 ^{**} (2.28)	0.030 ^{**} (2.08)	0.019 (1.47)	0.229 [*] (1.85)
Kleibergen-Paap rk Wald F statistic				1125.399
Year	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes
R2	0.882	0.872	0.878	0.977
Obs	450	390	420	390

4.3 Regional Heterogeneity Test

There are substantive discrepancies in the financial development base, financial resources and environmental endowment in different regions of China. Therefore, the entire sample is classified into two regions, according to the conventional geographical division method in China, to further investigate the regional heterogeneity effect of FD on GW. One is the eastern region and the other is central and western region. As is shown in Table 5, the contribution of FD to GW is more significant in the eastern region than in the central and western region. The reason may be that the financial development system in the eastern region is more comprehensive than that in the central and western region, and financial resources are also more abundant than those in the central and western region. Thus, FD has a more pronounced degree of improvement in the efficiency of financial resource allocation in the eastern region, which is more salutary to regional GW development.

Table 5. Regional heterogeneity

	Eastern	Central & Western
lnFD	0.079*** (3.63)	0.056** (2.04)
lnFE	-0.036 (-1.39)	-0.156*** (-5.18)
lnXM	0.006 (0.36)	0.062*** (7.76)
lnROAD	0.014 (1.12)	0.044* (1.73)
lnPD	0.066 (1.24)	0.078 (1.06)
lnIND	0.065*** (2.95)	0.022 (1.20)
Year	Yes	Yes
State	Yes	Yes
R2	0.933	0.872
Obs	165	285

4.4 Influence Mechanisms

Table 6. Regression results by 4 welfare dimensions

	ECO	SOC	RES	ENV
lnFD	0.088*** (3.51)	0.371*** (5.08)	0.048 (1.56)	0.153*** (3.77)
lnFE	-0.094*** (-3.24)	-0.156* (-1.84)	-0.115*** (-3.22)	-0.120*** (-2.55)
lnXM	0.033*** (3.52)	0.186*** (6.89)	0.046*** (4.08)	0.048*** (3.23)
lnROAD	0.055*** (2.92)	0.221*** (4.02)	-0.075*** (-3.23)	0.111*** (3.62)
lnPD	0.209*** (3.57)	0.492*** (2.89)	-0.046 (-0.64)	0.045 (0.48)
lnIND	0.294*** (15.49)	-0.082 (-1.48)	-0.043* (-1.86)	-0.121*** (-3.94)
Year	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes
R2	0.942	0.739	0.173	0.499
Obs	450	450	450	450

The GW indicator used in this paper consists of four dimensions: economic welfare, social welfare, resource welfare and environmental welfare. As obtained above, FD has a positive effect on the growth of GW, but further analysis is integral to clarify which dimension of welfare plays a dominant role. Therefore, based on equation (1), GW is substituted by economic welfare (ECO), social welfare

(SOC), resource welfare (RES) and environmental welfare (ENV), respectively, while others variables remain unchanged. Regression results of sub-welfare dimensions are shown in Table 6. FD is positively, but not significantly, correlated with resource welfare, but it is positively correlated with the remaining three welfare dimensions at the 1% significance level. This indicates that the contribution of FD to the growth of GW is chiefly accomplished by promoting economic welfare, social welfare and environmental welfare. A deep degree of FD will motivate regional governments to develop green finance. The development of differentiated financial policies can promote the upgrade of industrial structure, which in turn has a positive impact on the growth of green economic welfare. FD capacitates local governments to directly or indirectly influence local banks and financial institutions to invest large volumes of funds in the construction of livelihood-based public goods, effectively enhancing social welfare. The elevated financial autonomy motivates local governments to allocate more financial resources to green projects and pollution control, improving environmental quality and enhancing residents' environmental welfare.

4.5 Conduction Paths

Table 7 presents results of the mechanism identification tests based on the political incentive (POI) and fiscal incentive (FISE) perspectives. It is found that interaction coefficients of FD with POI and with FISE are both not significant. Although the introduction of the interaction term between FD and POI does not change the significance level of the positive association between FD and GW, the value of the t-statistic is slightly reduced. The introduction of the interaction term between FD and FISE causes the positive correlation between FD and GW, which was significant at the 1% level originally, to be no longer significant. It can be drawn that the increase of POI does not deepen the promotion of FD on GW, and FISE even inhibits the promotion to a large extent.

Table 7. Regression results on the moderating effect of local government incentives

	GW	GW
FD	0.052*** (2.99)	0.009 (0.27)
FD*POI	0.0003 (1.19)	
FD*FISE		-0.007 (-1.36)
FE	-0.120*** (-6.17)	-0.135*** (-5.93)
XM	0.055*** (8.96)	0.055*** (8.96)
ROAD	0.030** (2.36)	0.030** (2.37)
PD	0.153*** (3.91)	0.142*** (3.52)
IND	0.029** (2.26)	0.036** (2.62)
Year	Yes	Yes
State	Yes	Yes
R2	0.883	0.883
Obs	450	450

5. Conclusion and Insights

This paper draws the following conclusions based on a regional panel data study of 30 Chinese provinces (excluding Tibet, Hong Kong, Macao and Taiwan) from 2005-2019. Overall, FD significantly contributes to the development of GW. By dimension, FD has the strongest promotion effect on social welfare, followed by environmental welfare and economic welfare, while its effect

on resource welfare is not significant. By region, FD is more effective in promoting GW in the eastern region than in the central and western region. Further tests find that the effect of FD is slightly reduced by local government political incentives and is extensively reduced by fiscal incentives. Based on this, the following recommendations are proposed:

First, deepen FD and increase the financial autonomy of local governments to promote GW development. The central government can consider giving more financial allocation and control rights to local governments in order to motivate them to develop green finance, build livelihood-based public goods and combat environmental pollution. At the same time, local governments should also make full use of financial resources within their scope to play a function-oriented role in order to promote the development of regional green industries and improve the GW of residents.

Second, optimize local government incentives, reform and improve the promotion and assessment mechanism of local officials. Instead of solely using GDP growth as a crucial factor to adjudicate political performance, introduce quantifiable "green" assessment indicators. This will encourage local officials to conserve resources and protect the environment in the process of economic development, increasing residents' well-being and promoting sustainable development.

Third, for provinces in the eastern region, improve the efficiency of financial resource allocation and develop GW under the positive effect of FD. For provinces in the central and western region, accelerate the construction of financial development system and consolidate the financial foundation. Reduce the acceptance of highly polluting enterprises transferred from the eastern region and utterly leverage FD to develop green industries, which in turn can enhance GW of residents in the jurisdiction.

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