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Do Collective Operating Construction Land (COCL) Transactions Inhibit Land Fiscal Revenue? Evidence from Deqing County, China

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ABSTRACT
China's local governments monopoly land market, and the land revenues account for a large proportion of the local government fiscal revenues. In 2015, collectively-owned operating construction land (COCL) entering the market was piloted across China, which is an institutional reform that provides rural collectives with transfer rights of COCL. Taking Huzhou City as an example, this paper first discusses the COCL transaction and its disintegration of government monopoly in land supply. Using the panel data of 3644 pieces of industrial land transactions from 2010 to 2019, we investigated and examined the impact of COCL reform on government land fiscal revenue with Spatial difference-in-difference (SDID) method. The results show that: (1) The policy of COCL entering the market has a significant effect on county-level government industrial land fiscal revenue. (2) As the COCL is scattered and its mortgage rights remain constrained, COCL fails to compete with state-owned industrial land and COCL transactions have no significant impact on the total leasing-area of state-owned industrial land. (3) While COCL entering the market contributing to industrial agglomeration, significantly increase the price of state-owned industrial land. This study provides an evidence that COCL reform fails to restrain the local government's land fiscal revenue, and contributes to industrial development in rural China. Policy implications are drawn from this analysis, for the further reform of China's rural land marketization.

Keywords: *COCL transaction; Land fiscal revenue; land price; agglomeration effect; China.*

1. INTRODUCTION

Land resource is administratively allocated across many developing countries where the government is de facto manager and de jure supplier of land in primary land market. In particular, land acquisition is viewed as an important state strategy for supporting spatial plan implementation and funding for urbanization development [1]; [2]; [3]; [4]. For example, China's Land Management Law (2004) stipulated that rural land was banned from being traded, unless local governments had requested that it be transferred from collective ownership to state ownership, in which case it can be supplied to urban developers. In such rural-urban dual land system framework, local government are highly motivated to gain revenue from profit-oriented land leasing, in order to support for urban infrastructure and public provision, attract investment, and facilitate economic assessment [5]; [6]; [7]). Land finance (tudi caizheng), refers to a fiscal phenomenon that local government fiscal income heavily relies on the revenue that is land-related (such as conveyance, leasing, and tax fees) [8]; [9]. China's land fiscal revenue has been a main source of local public revenue since tax system reform in 1994 and fueled its urbanization and industrialization (Xu, 2011). However, the rapid expansion of the urban area has suffered the extensive use of land resources and the reduction of arable land. The land supply regulation from land expropriation prohibits rural collectives from

exercising their land transfer rights and violate their right to land development [2]. Meanwhile, local governments adopt dual development strategies, namely attaching importance to urban rather than rural areas (Duan et al., 2020), further leading to 'urban progress and rural decline' [10]). Therefore, land acquisition system is generally regarded as an unsustainable land policy.

Since marketization changes the nature of land, converting it from a means of subsistence into a commodity and ultimately placing it in the hands of those who can use it to generate the highest returns [11]. Optimal allocation land resource through market mechanism has received extensive attention, and land marketization allocation is one of the main economic reforms in China [12].

To activate the idle rural land assets and promote the rational and effective allocation of land resources, in recent years, Chinese state government has started reforming the laws of rural land market. In 2013, the government proposed establishing a unified market of urban-rural construction land [13], which is a strong signal that the Chinese government intends to liberalize rural-urban land transfers [14]. At the beginning of 2015, 15 counties (cities, districts) across China were chosen as the first trial for COCL2 entry the market. In pilot areas, land owners were given the rights to transfer COCL, and the COCL transactions can be conducted legally. As of 2018, 11,180 plots of COCL, covering an area of more than 60 km2, have been traded in the rural land market in 33 pilot areas across China. The land value-added revenue is approximately 25.7 billion yuan. As one of the pilot projects for the market- oriented reform of rural land, the entry of COCL into the market broke the pattern of local governments are monopoly suppliers of the primary land market.

A sizeable body of literatures have demonstrated that COCL entering into the market is an essential trial for rural land marketization, protect rural residents' development rights of land and increase their income [14]; [15]; [16]. While some scholars worried that COCL transaction would result in land oversupply and challenge existing land finance, which has driven the rapid urbanization and socio-economic development in China [14]; [17]. However, few empirical studies have been done to examine the impact of rural construction land marketization on land finance, especially from the perspective of supply-side and demand-side. To fill this gap, this study explores the roles and interactions of stakeholders in construction land transactions and their effects to land fiscal revenue.

This study aims to understand the effects of rural land marketization on land finance, to provide relevant policy guidelines and refine the current theory. There are 5 counties (districts) and 35 towns in Huzhou city selected as samples. Difference-in differences (DID) method and Spatial Difference-in-differences (SDID) method are adapted to investigate the relationship between the COCL reform and industrial land finance evenue from 2009 to 2019. The specific questions addressed were: (1) DO COCL reform affect State-owned construction land transaction? (2) DO COCL transaction reduce the local government's land fiscal revenue?

The remainder of this paper is organized as follows. In Section 2, we outline an analysis framework. In Section 3, we introduce the study area, data, and samples. The model specification, descriptive statistics, and estimation strategy are presented in Section 4. Section 5 presents the research findings, and Section 6 concludes the paper and discusses policy implications.

2. THEORETICAL FRAMEWORK

Giving the fact that COCL located at the urban fringes and commonly transferred for industrial use, this paper focus on the influence of COCL entry the market on industrial land fiscal revenue (ILFR). A theoretical framework (Figure.1) was developed to analysis the change of state-owned industrial land (SIL) transactions including perspectives from both the supply-side and demand-side of SIL.

From supply side. In China, rural land is owned by rural collectives, and rural collective composed by individual farmers are the original suppliers of new construction land. Land acquisition was the unique legal way to transfer land from agricultural sector to nonagricultural sector. For local governments, their ultimate goal of the dependence on land finance is the pursuit of high domestic product (GDP) and fast political promotion [4]. That is, the most concern of local government is GDP-oriented political performance [9]. As monopoly supplier of new urban land, local governments provide continuously large-scale SIL with public infrastructure and services, then they achieve fiscal revenue and attract manufacturing investment through land transactions [6]. Farmers' willingness to allow their land be expropriated depends on the land compensation, and the compensation they demand for their land will affect local governments' cost for land acquisition, thereby influencing the progress of land supply [4]. The entry of COCL into the market broke the local government's monopoly on the primary land market, rural collective economic organizations (RCEOs) and local governments have become co-suppliers of the industrial land. In COCL market, the income from leasing land use right is allocated among local governments, rural collectives and individual farmers. According to the

Interim Measures for the Administration of the Collection and Use of the Adjustment Fund for the Value-added Revenue of Rural Collective Operating Construction Land, local government can levy 20%-50% of land value-added of COCL. For farmers, they can obtain much more income from COCL transactions compared with land compensation from land acquisition [14]. Benefit from the COCL reform, farmers' expectations of land value have increased. However, local governments still tend to capture a windfall of land value through land acquisition and prefer large-sale investment projects. Therefore, the conflict that 'local government tend to land acquisition, whereas farmers (rural collectives) prefer COCL entering the market directly' will increase land compensation cost and hinder the land acquisition progress. In such a disagreement, it will be much difficult for local government to supply state-owned construction land through land expropriation.

For Demand side. In practice, large-scale enterprises are attracted by development zones and industrial parks set up by local governments which are equipped with superior infrastructure and exclusive preferential policies. For industrial enterprises, their location preference lies in transportation accessibility, land prices, public infrastructures, and agglomeration degree [18]; [4]. Under the current mature industrial development model, enterprises are deeply embedded in the economic system, and the close interaction of manufactures depends on the high- level supply of public facilities (Qiu, 2020). That is, enterprises have put forward higher requirements for large-scale transportation systems, communication facilities, as well as public security, and land use planning. Therefore, industrial enterprises have a stronger preference for state-owned construction land. Since developers can affect local governments' land supply [4], this paper proposes hypothesis 1.

Hypothesis 1: The COCL enter into the land market has insignificant effect on Sta-owned construction land leasing area.

Compared with state-owned industrial land, the size of each COCL plot is smaller and plots are usually scattered throughout the villages and lacking adequate infrastructure, meanwhile, mortgage rights remain constrained resulting in low credit accessibility for land users [14]. For small and medium enterprises (SMEs), particularly township and village enterprises (TVEs), they may not be permitted entry into the well-equipped State-owned land [18]. However, the price of COCL is acceptable and the COCL transferred satisfies the development of SMEs. The local government sales state-owned construction land, supporting public goods needed for industrial development to meet the land needs of large-scale enterprises, while rural collectives attract SMEs by leasing COCL, thus promoting the development of industries in rural areas. This facilitates the formation of upstream and downstream related industrial chains and promotes regional industrial agglomeration effects. Industrial agglomeration will enhance the overall competitive advantage of the region and further bring about appreciation of land [19]. Therefore, the entry of COCL into the market contributes to promoting the regional industrial development and further promoting the increase in the price of state-owned industrial land.

Based on the above analysis, this paper proposes hypothesis 2.

Hypothesis 2: The entry of COCL into the land market will promote the increase in the price of state-owned land through the effect of industrial agglomeration.

Then, based on hypothesis 1 and hypothesis 2, we propose hypothesis 3.

Hypothesis 3: The entry of COCL into the market contribute to the increase of local government land finance revenue.

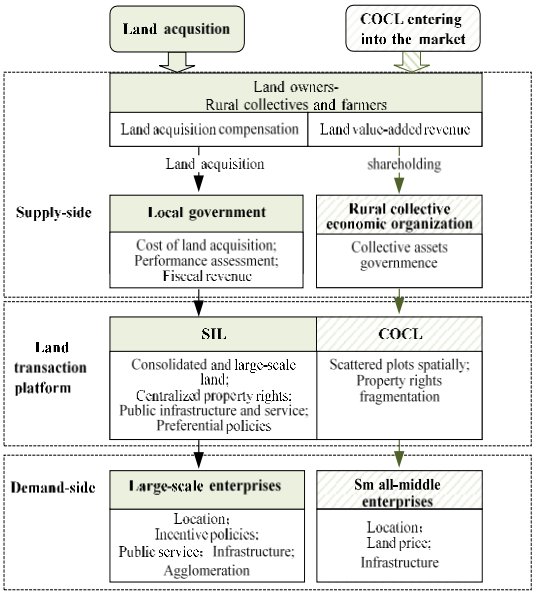

Figure 1. Theoretical framework

3. STUDY AREA AND DATA SOURCE

3.1. Study Area and Data Source

Deqing County (30°261′-30°412′N, 119°451′-120°211′) is situated in Huzhou City, Zhejiang Province. The study area, which covers 935.9km2, is located in a well- developed region [20]. In 2019, the regional GDP per-capita was 121.29 thousand yuan, which was 1.81

times that of the whole of China. Deqing County has a total population of 443 thousand people of which 39.50% (175 thousand) are urban residents. In this paper, we choose Deqing County as our research area for two reasons. First, it is one of China's earliest 15 pioneers for the reform of "rural construction land entering the market," which has taken the lead in realizing the first legal COCL transaction in the RCCL market and the first mortgage with COCL [21]. Second, the volume of COCL transactions in Deqing County is larger than that in most pioneers [22], and the updated and comprehensive statistical data in Deqing County has been released. As of December 2020, 255 plots of COCL, with an area of 136.18 hectares, were traded in the market. As a result, farmers and rural collective organizations gained 48.2 billion yuan from land value-added revenue, benefiting more than 220 thousand farmers.

3.2. Data Source

County-level socioeconomic data from Huzhou Statistical Yearbooks (2011-2020) were used. Variables including land leasing price, the allowed floor area ratio, plot information of the address, plot area, etc., are calculated using land transaction data, which is obtained from a unique database of micro transaction records of land parcels. The land parcel data are from the China Land Market webpage (https://www. landchina. com) that is sponsored by the Ministry of Nature Resources. This website is the largest nationwide land information platform in China, gathering and publishing land supply data in the primary market. Thus, we used a Python program to obtain 2010-2020 land transaction data from China's Land Market Network. In our analysis, we used the records for industrial land parcels identified based on the proposed usage of each parcel of land. Then, we removed all records with incomplete information and those with pretty low or pretty high values and unit prices (the bottom and top 1%). As result, 3644 industrial land transaction records were left from 2010 to 2019 in Huzhou City.

3.3. Variable Selection and Description

3.3.1. Dependent Variables

Industrial land fiscal revenue. The land conveyance revenue has been widely used in existing literatures to measure the magnitude of land finance (Wu et al., 2015; [9], in this paper, we calculate the total income of land parcels transferred for industrial use to measure industrial land fiscal revenue (ILFR).

Land transaction area. We matched the land parcels at town level (35 towns)4, and calculated the total land transaction price as the final value for each town.

Land transaction price. We matched the land transaction parcels at town level (35 towns), and calculated the average land transaction price (Price) as the final value for each town.

3.3.2. Explanatory Variables

COCL transaction. The trials of COCL entering the market in Deqing County were legalized and went into effect in January 2015. We have observed 5 counties (cities, districts) in Huzhou City; the first one is Deqing County, which has been exposed to the intervention of COCL transactions since 2015, and the others are optional controls.

3.3.3. Control Variables

(1) Control variables for land fiscal revenue

Economic level. Use per-capita income (income, yuan) to measure the economy of the region, use the proportion of secondary and tertiary industry output value (industry, %) to measure the regional industrial structure.

Government competition. The local government's land supply decision-making is highly determined competition between governments, including GDP growth targets, investment and public fiscal pressure [23]; [24]. The GDP growth rate (gdprate, %) is used to measure the regional economy growth. Foreign direct investment (FDI, 10000yuan), reflecting competition among governments to attract capital, which is the main area of local government competition. The existing literatures have revealed that China's tax system reform in 1994 is the main reason for land finance [11]. This paper chooses the public fiscal expenditure in previous year (lag_fisex, 100 million yuan) to represent the local fiscal pressure.

Population density. It was pointed areas with higher population density (population, person/km2) tend to have greater planning restrictions and less elastic landsupply, which has a negative effect on land fiscal growth (Li et al., 2013).

(2) Control variables for land transaction price

For the control variables, many indicators have relationships with the change of industrial land transaction price and land transaction area. In this paper, variables including Floor area ratio, land fragment degree, land location, and town-level economy were selected.

Floor area ratio. Referring to (Han et al., 2020), allowed floor area ration (FAR), which reflects a city's land use regulation regarded as one of the most crucial means of macro-control of urban growth, has significantly positive affect on land price.

Land fragment degree. The degree of land fragment (LFD) is expressed by the ratio of total transaction area of state-owned industrial land parcels to the total area of the town.

Land location. Land location, generally using distance to government center or main road as a proxy, is a good way to capture the social environment where the land parcel is located (Cervero & Duncan, 2004). In this paper, the API of AutoNavi Map is first used to extract the latitude and longitude of each land parcel center, highway entrance and exit, county center and city center, and then we calculated the distance from one parcel to the nearest highway (D_highway, km), distance to the county center (D_county, km), and to the city government (D_city, km), respectively.

Town economy. Due to a lack of economy information regarding the town where the land parcels are located, an alternative solution is to use land grade (Grade), which is mainly defined by the natural and economic attributes of land parcels. Land grade was classified from 1 to 15, with lower numbers representing a higher land grade and a better economy level, is an important reference in relation to land price system. The description of variables is shown in Table 1 and Table 2.

Table 1. Variable description in Model 1

Variables	Description(unit)	Obs.	Mean	Std. Dev.	Min	Max
lnILFR	The logarithm of industrial land fiscal revenue (10000 yuan)	50	10.70	0.55	9.690	11.92
COCL	1, if COCL transaction occurs; 0, otherwise.	50	0.20	0.40	0	1
lnincome	The logarithm of per-capita income (yuan)	50	10.60	0.26	10.13	11.01
industry	Proportion of the secondary sector and tertiary sector in total output (%)	50	93.65	1.90	88.54	96.65
lnFDI	The logarithm of foreign direct investment (10000 yuan)	50	11.60	0.45	10.12	12.42
GDP rate	The practical GDP growth rate (%)	50	8.73	1.73	3.600	12
lnpre_fisex	The logarithm of public fiscal expenditure in previous year (10000 yuan)	50	12.54	0.61	11.26	13.52
population	The population density in a town（person/km^2）	50	512.90	176.90	243	733

Table 2. Variable description in Model 2.

Variables	Description(unit)	Obs.	Mean	Std. Dev.	Min	Max
lnPrice	The logarithm of land transaction price (10000 yuan)	350	5.77	0.28	4.92	6.53
COCL	1, if COCL transaction occurs; 0, otherwise.	350	0.83	0.38	0	1
Rate	Rate of land parcel, 1-15	350	8.88	4.17	2	13
D_city	Distance between land parcel and city government (km)	350	30.09	11.63	11.50	60.34
D_county	Distance between land parcel and county government (km)	350	15.37	7.88	0.170	33.64

4. METHODOLOGY

This section describes a three-step econometric approach for assessing the effects of COCL transactions on industrial land fiscal revenue. Specifically, we first examine whether COCL reform reduce the industrial land revenue, then we explore and test the mechanism from the perspectives of land transaction area and land transaction price, respectively.

4.1. General Difference-in-differences (DID) Method

The difference-in-difference (DID) method is a widely-used quasi-experimental research design, it adopts an identification strategy that is implemented using an interaction term between group and time indicators whose coefficient describes the difference in the outcome variable of the differences between groups across time [25]. A simple DID design observes outcomes for two groups over two time periods. The treated group is exposed to treatment in one of the time periods, and another group is never exposed to the treatment and serves as a control. Estimating the effects of COCL reform requires a strategy that can isolate the impact of the COCL transactions on the land fiscal revenue of Deqing County from contemporaneous policies implemented in Huzhou City. The entry of COCL into the market was piloted in Deqing County in 2015, our main identification strategy is to design a control group composed by other counties (districts) in Huzhou City. This strategy along with DID method enable other time-varying factors controlled that would have led the treatment group to experience different change of state-owned industrial land transactions after reform. In this paper, we utilized the DID method to estimate the treatment effect of COCL entering into the market by two steps. Firstly, we conducted Model 1 to estimate the effects of COCL reform on industrial land fiscal revenue, then Model 2 is used to test the effects of COCL on land price. Therefore, the effects of COCL entering into the market is estimated by the observed LFR and Price controlled by the potential outcome without COCL reform.

The effects of COCL reform on industrial land revenue based on a DID specification can be expressed as Model1:

$\ln ILFRcy = \alpha_1 + \beta_1 COCL_{cy} \times year + \gamma_c COCL_{cy} + \delta_y year + \sigma X_1 + \varepsilon_1$ (1) where ln ILFRcy is the logarithm of state-owned industrial land leasing revenue (SILUR) of county c in year y . $COCL_{cy}$ represents the trial of COCL transactions. Both $COCL_{cy}$ and year are dummy variables, since Deqing County has been one of the trials of COCL entering the market since 2015, we suppose $COCL_{cy} = 1$ in Deqing County, and $COCL_{cy} = 0$ in control regions. Meanwhile, in 2009–2014, year = 0, and year = 1 otherwise. Our estimate of the average effect of COCL transactions on land fiscal revenue is indicated by β_1, the coefficient of $COCL_{cy} \times$ year. X_1 refers to control variables, γ_c and δ_t represent individual effects and time-specific effects, respectively; and the remainder error term is ε_1 .

The DID design requires a strong underlying assumption, that is in the absence of policy's implementation, (average) outcomes for treatment and control units will follow parallel paths over time [26]; **Ashenfelter & Card, 1985)**. Equation (2) is used to test the parallel trends of land fiscal revenue of Deqing County and other counties(districts) in Huzhou City.

$\ln ILFRcy = \sum_{y=2010}^{2019} \beta y COCLc \times year_y + \gamma cCOCLcy + \delta_y year + \sigma X_1 + \varepsilon_1$ $(y \neq 2014)$ (2) if the treated and control units follow the parallel paths during period 2010-2013, the estimated coefficients including $\beta 2010$, $\beta 2011$, $\beta 2012$, and $\beta 2013$, will equal to zero significantly (i.e. the Confidence Interval of above coefficients contain 0).

The effects of COCL reform on industrial land transaction price based on DID method can be expressed as Mode1 2:

$\ln LP_{ty} = \alpha_2 + \beta_2 COCL_{ty} \times year_y + \gamma_t COCL_{ty} + \delta_y year + \sigma_2 X_2 + \varepsilon_2$ (3) where $\ln LP_{ty}$ represents the logarithm of state-owned industrial land transaction price (LP) in town t in year y, and the effect on average of COCL reform on LP is associated with the parameter $\beta 2$. Control variables influencing LP are contained in vector X_2 , and the remainder error term is ε_2.

4.2. Spatial difference-in-differences (SDID) Method

A sizable body of studies have suggested that neighborhood effects, which are regarded as an essential determinant of land price, are extend over multiple spatial levels (Owen, Harries et al., 2016; [24]. Specifically, the land leasing prices in a given town is a function not only of the treatment in that town but also of the treatment in all the other towns in the system, in the form of a spatial multiplier effect (Anselin 2003b). Therefore, Model 3 is referred to the spatial difference- in- differences model built by [26], where a spatially lagged dependent variable captures the contemporaneous outcomes in the neighboring areas.

$\ln LP_{ty} = \rho W \ln LP_{th} + \alpha_3 + \beta_3 COCL_{ty} \times year_y + \gamma_t treat + \delta_y year + \sigma_3 X_3$ (4) where W is spatial weights matrix (constant over time), in this paper, we choose the widely-used binary continuity matrix, which is defined by whether two units are neighbors. If town *t* and town *h* are adjacent, $w_{th} = 0$; else,

$w_{th} = 1$ $(t \neq h)$. The spatial autoregressive coefficient is ρ , given the spillover effect, the estimated effect on average of COCL reform on LP is donated by β_3 .

4.3. Difference-in-differences Model with mediator variables

As mentioned in Section 2, we are interested in assessing the effect of the entry of COCL into the market on industrial land transaction price as well as on the potential channel, that is industrial agglomeration. Formula (3) shows the total effect of COCL transaction on land transaction price. Further, in Model 4 we add industrial agglomeration as mediator based on Model 2, then test the mediation effect with the estimate strategy conducted by Baron and Kenny (1986). The direct and indirect effects of the entry of COCL into the market on land transaction price can be defined as:

$agglomera_{ty} = \alpha_4 + \beta_4 COCL_{ty} \times year_y + \gamma_t treat + \delta_y year + \sigma_4 X_2 + \varepsilon_4$

$\ln LP_{ty} = \beta_5 COCL_{ty} \times year + \sigma_5 agglomera_{ty} + \beta_5 X_2 + \alpha_5 + \zeta_5 + \varepsilon_5$ (5) (6) where agglomeraty is mediation variable, representing the industrial agglomeration effect in town *t* in year *y*. β_4 represents the average effect of COCL reform on industrial agglomeration effect, while $\beta 5$ is the direct effect of COCL reform on industrial land transaction price after controlling for the mediator and other control variables.

5. EMPIRICAL RESULTS

5.1. Effects of COCL truncation on ILFR

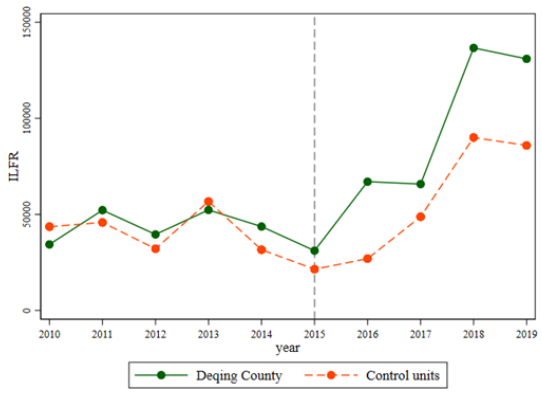

Figure 2. The trend of ILFR in Huzhou city from 2010 to 2019

Notes: the vertical line indicates the year when the trial of COCL entering into the market was implemented.

To ensure the postreform suitability of the Control group, an efficent method is to test the extent to which treatment and control group state-owned industrial land fiscal revenue trends were similar in the preroform period. Inspired by [13], in Figure 2, we plot the ILFR for control group and treatment groups in order to visually examine whether the lines apear to be approximately parallel in the period before and after the COCL entering into the market. This figure shows that there is generally a similar pattern prior to the COCL pilot, the two lines seperated sharply following the COCL reform. Relative to control group, the ILFR of Deqing County shows a greater increase after 2015.

Table 3 reports the key coefficient estimates from fitting equation (1). The coefficient of COCL□year is positive at the 1% level, thus indicating that the trial of COCL entering the market increase the state-owned industrial land fiscal revenue over time. Specifically, the estimated value of □1 indicates that 1% increase in COCL□ year will result in 0.702% increase in the lnLFR in the Deqing County. From Fig.2 and Table 3, it is evident that the entry of COCL into the market fails to supress land fiscal revenue, and the Hypothesis 3 is tested.

Table 3. Estimations of the effect of COCL transactions on state-owned industrial land fiscal revenue.

	lnILFR	
	(1)	(2)
COCL × year	0.409***	0.702***
	(5.50)	(3.87)
COCL	0.123	-0.332**
	(1.21)	(-2.02)
time trend	0.135*	-0.538***
	(1.81)	(-3.38)
p-value	0.00	0.00
Observations	50	50
Individual fixed effects	No	Yes
Year fixed effects	Yes	Yes
Within R^2	0.075	0.351

Notes: ***, **, *imply statistical significance at the 1%, 5%, and 10% level, respectively; The value in parentheses refers to the t-statistic value.

5.2. The mechanisms underlying change the ILFR

5.2.1. Effects of COCL reform on land transaction area

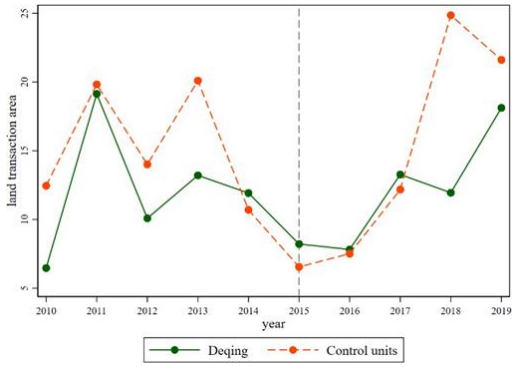

Figure 3 The trend of state-owned industrial land transaction area in Huzhou city from 2010 to 2019

Fig.3 visually reports the annual state-owned industrial land transaction area (Area) in Huzhou City, from the years before 2015 and 2015-2019, the differential trends of Area in Deqing County was not obvious, and the parallel trends assumption of the DID method is violated. In Deqing County, the transaction area of newly-added industrial- land was 54.1 hectares (36 plots), 41.8 hectares (26 plots), and 81.44 hectares (51 plots) in 2013, 2015 and 2019, respectively. Which indicates that in the case of COCL entering into the market that was implemented in towns where new-added state-owned construction land supply was not decreased. Hence, the above findings provide evidence to support hypothesis 1.

This finding is different from the conclusion of [14] and the analysis of [17]. A possible explanation of those results can be found in Table 4, which compares the average area of land parcels and transaction price between state-owned industrial land (SIL) and COCL. In the 2015-2019 period, the average area of leasing SIL parcels was 2.68 hectare, which is 4.25 times of COCL. For large-scale enterprises, they prefer large scale and contiguous land meet the requirements of industrial development [21]. COCL plots which are usually small and scattered, though COCL is cheaper than SIL, the latter is much attractive for developers. The local government establish development zones with a bunch of preferential policies (e.g., good infrastructure, tax deduction, and financial subsidy) to attract manufacturing enterprises. Local governments design and implement land use plans, they can take full advantage of their administrative power and delimit areas where land acquisition is the only legal way that rural land transferred for un-agricultural use. Therefore, given the natural conditions, government force, as well as enterprises' location preference, COCL fails to compete with SIL.

Table 4 The Land leasing information and differences between SIL and RCCCL from 2015 to 2019

	State-owned industrial land (SIL)		COCL	
	Leasing price (10^4yuan/hectare)	Leasing area (hectare/plot)	Leasing price (10^4yuan/hectare)	Leasing area (hectare/plot)
Mean	497.5	2.68	275.75	0.63
Standard deviation	[225.26]	[6.35]	[144.72]	[0.89]
Observations	324	324	160	160

5.2.2. Effects of COCL reform on land transaction price

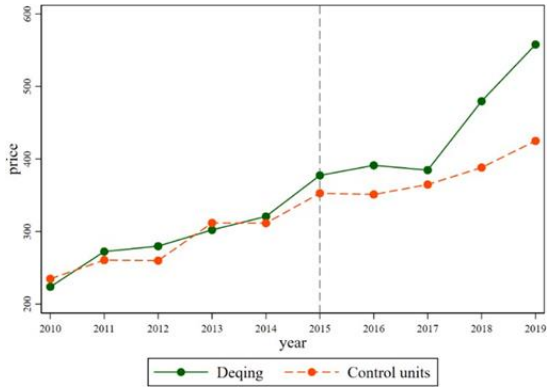

Figure 4 The trends in land transaction price: towns in Deqing County vs. the rest towns of Huzhou City.

Figure 4 plots the trends of state-owned industrial land price in towns of Deqing County and that of control units. As the figure suggests, before the passage of COCL entering the market piloted the series of land transaction price in Deqing County and the rest towns of Huzhou City were close and show roughly similar trends. Land transaction price increased in 2015, but with larger increases in towns of Deqing County than in the rest of Huzhou City, and in 2019, the land transaction price gap was 132.89 yuan.

The empirical results of model 2 and model 3 are presented in Table 5. This shows that the coefficient of COCL transactions is significantly positive at the level of 1%, thus indicating that COCL reform increases the state-owned industrial land transaction price. Specifically, the estimated value of 0.143 indicates on average the implementation of COCL pilot in Deqing County contributes to 0.143% increase of land transaction price per year. Meanwhile, for the spatial spillover effects, the land value in a focal town will

positive affected by neighboring towns. If we ignored the effects of neighboring land transaction price, the estimated contribution of COCL reform to land price will be overestimated.

Table 5 Estimations of the effect of COCL transactions on SIL price.

	Lnprice	
	Model 2_DID	Model 3_SDID
COCL × year	0.143***	0.141***
	(4.24)	(4.28)
WY	—	0.003**
		(2.32)
Individual fixed effects	Yes	Yes
Time fixed effects	Yes	Yes
R-square	0.571	0.574
N*T	350	350

Notes: ***, **, *imply statistical significance at the 1%, 5%, and 10% level, respectively. The value in parentheses refers to the t-statistic value.

Table 6 shows the presence of the mediation effect of industrial agglomeration. The column (1) of Table 7 indicates that COCL entering the land market significantly increase the numbers of firms at the level of 10%, accelerating local industrial agglomeration. A plausible reason could be that the local government supply state- owned construction land with infrastructure provision to large-scale enterprises, while the small and medium-size enterprises (SMEs) can hardly meet the entry threshold (i.e. investment intensity, output value, tax revenue, land use scale) imposed by local government [18]. The price of COCL is cheaper (as shown in Table 4) and acceptable for SMEs, thus some small factories and garages were built in COCL parcels. Meanwhile, column (3) shows that the implementation of COCL transaction per year through agglomeration effect increase state-owned industrial land transaction price by about 0.126%. Thus, the above empirical findings provide evidence support hypothesis 2.

Table 6. Estimation effects of mediation effect.

	agglomer	Lnprice	
	（1）	(2)	(3)
COCL × year	16.344*	0.143***	0.126***
	(1.72)	(4.24)	(4.25)
agglomer			0.001***
			(5.01)
p-value	0.00	0.00	0.00
Observations	350	350	350

	agglomer	Lnprice	
	（1）	(2)	(3)
Year fixed effects	Yes	Yes	Yes
Within R^2	0.479	0.571	0.571

Notes: ***, **, *imply statistical significance at the 1%, 5%, and 10% level, respectively. The value in parentheses refers to the t-statistic value.

Further, to test for the existence of mediation effect, the bias-corrected bootstrap approach [27] is chosen to test the indirect effect of industrial agglomeration on state-owned industrial land transaction price. Meanwhile, for comparison, the statistics from the Sobel (1982) method is also reported. The decomposition of the effects of COCL transactions on land transaction price, which is divided into total effect (TE), direct effect (DE), and the indirect effect (ID), is shown in Table 7. The TE of COCL transactions on land price is about 0.16, indicating that the land transaction price of SIL increased by about 16% after the implementation of COCL entering the market. The coefficient of ID is 0.031 at the significance level of 5%, it shows that ID significantly exists and industrial agglomeration indirectly improved land price by about 3.1%.

Table 7. Decomposition of effects of COCL transactions on state-owned industrial land price

Decomposition	Land price (log)				
	Bias-corrected bootstrap			Sobel test	
	Coefficient	SE	Significance	SE	Significance
Total effect	0.159		***	0.047	***
Direct effect	0.128	0.039	***	0.044	***
Indirect effect	0.031	0.016	**	0.017	*0.638

Notes: ***, **, *imply statistical significance at the 1%, 5%, and 10% level, respectively. SE represents bootstrapping standard error

Overall, our analysis of the state-owned land transactions impact of the entry of COCL into the market suggest that the policy of COCL entering the market has a significant effect on local government's industrial land fiscal revenue, because COCL transactions fuel the rural industrial development and further contribute to land value growth. However, the results reveal that China's local government still plays a dominant role in rural construction land transaction while the market force has been less significant.

5.2.3. Robustness checks

In order to check the robustness of our findings, we estimate several additional models. First, the DID method is used to estimate the effects of COCL reform on land finance, and as mentioned in section4, the underlying assumption is that the industrial land fiscal revenue along with land price in Deqing County and Control units satisfy the parallel trends assumption. Table 8 displays the testing results based on formulation (2). The column (1) tells that the estimated coefficients is not significant from 2010- 2013. Which means that in the period of 2010-2013, the difference between the IFR

of the Deqing County and Control units is like that of in 2014. Therefore, the IFR of Deqing County and Control units followed the parallel trend in the absence of COCL transaction, so did land transaction price. Thus, the DID method is appropriated to estimate the casual relationship between COCL reform and industrial land transaction.

Table 8 The parallel trends assumption of industrial land fiscal revenue and land transaction price

Variables	lnILFR	lnprice
COCL × 2010	-0.551(-1.81)	-0.0272(-0.41)
COCL × 2011	-0.181(-1.03)	0.0534(0.59)
COCL × 2012	-0.100(-1.13)	0.0590(1.14)
COCL × 2013	-0.260(-0.69)	-0.0627(-1.60)
COCL × 2015	0.047(0.22)	0.0430(1.12)
COCL × 2016	0.577**(3.43)	0.090**(2.2)
COCL × 2017	0.057(0.883)	0.026(0.62)
COCL × 2018	0.141(0.489)	0.195***(4.10)
COCL × 2019	0.130(0.533)	0.2479***(4.42)
Obs.	50	350
R^2	0.784	0.736

Notes: ***, **, *imply statistical significance at the 1%, 5%, and 10% level, respectively. The value in parentheses refers to the t-statistic value.

The industrial land fiscal revenue is replaced by the ratio of industrial land fiscal revenue (IFLR/FR) to measure the industrial land finance. We estimated the coefficient of transaction which are shown in Table 9. The estimators of interaction term are statistically significantly greater than zero from at the 1% level. It indicates that the importance of industrial land fiscal revenue in local public fiscal income has been increased due to COCL reform.

Table 9 Trend break estimations of the effect of COCL transactions on state-owned industrial land fiscal revenue

	IFLR/FR	
	(1)	(2)
Policy × time trend	8.366***	10.592***
	(3.22)	(2.74)
Policy	-5.372**	-9.144**
	(-2.23)	(-2.41)
time trend	-9.23***	-3.998
	(-3.55)	(-1.64)
p-value	0.00	0.00
Observations	50	50
Individual fixed effects	No	Yes
Year fixed effects	Yes	Yes
Within R^2	0.2323	0.3841

Notes: ***, **, *imply statistical significance at the 1%, 5%, and 10% level, respectively. The value in parentheses refers to the t-statistic value.

Third, we estimate models in which we assume fasely that the reform took place in different years before prior to 2015, using data from the period before the trial of COCL entering into the market implementation. Specifically, for each of the year between 2010 and 2014, we re-estimate Table 3 anf Table 5 assuming a placebo time for the COCL reform and create a distribution of the results from thr replications. We examined and displayed the estimator of interaction terms in Table 10, and then compare them with that of Table 3 and Table 5, respectively. We find that the placebo tests produce results which are close to zero and are relatively far away from the estimated effects in Table 3 and Table 5. Only the estimators in 2014 are statistically significantly different from zero at the 5 percent level. This indicats that the results we obatin in Table 3 and Table 5 do not result by chance.

Table 10 Placebo test results: randomly selected years between 2011 and 2014.

Variables	*COCL *2011*	*COCL *2012*	*COCL *2013*	*COCL *2014*	*COCL*year*
lnSILR	0.580*	0.365	0.237	0.453	0.702***
	(1.75)	(1.49)	(0.82)	(2.49)	(3.87)
lnPrice	0.109**	0.061	0.050	0.050	0.143***
	(2.23)	(1.03)	(1.12)	(2.39)	(4.24)

Notes: ***, **, *imply statistical significance at the 1%, 5%, and 10% level, respectively. The value in parentheses refers to the t-statistic value.

6. CONCLUSION AND DISCUSSION

There are two basic means of land resource allocation, including the government and the market. In China, the government monopoly land resources allocation between agricultural and nonagricultural sectors. This paper has illustrated the factors driving stakeholders' decision-making on construction land market, thus enriching both theoretical and empirical literatures on the effects of construction land market reform on state-owned industrial land transactions. This paper analyzed the changes of state- owned industrial land transactions in China spanning 2010 to 2019 using a unique and comprehensive database of urban land transactions. Our main estimates from DID models compare outcomes of Deqing County to other Counties(districts) in Huzhou City, during different time intervals. Our results show that: (1) The COCL reform had a significant positive impact on industrial land fiscal revenue. During the implementation period (2015-2019), we find a steady rise in industrial land fiscal revenue, with the average effect after implementation began showing 0.702 increased by the policy. (2) Exploring the mechanism of impact, we find that the COCL reform failed to affect industrial land transaction scale, whereas it significantly increased the transaction price of state-owned industrial land through industrial agglomeration. Our finding is consistent with

[11], that is the rural construction land marketization has not hindered administrative expropriation, which continues unabated, meanwhile it has opened up new market-based avenues of land supply and spurred innovative ways of combining the two.

The findings of this paper yield several policy implications:

First, there are considerable differences in the parcel scale and transaction price between SIL and COCL, the results suggest that COCL fails to compete with SIL. Meanwhile, the users of state-owned construction land can use their certificates to mortgage loans and support their business operations, while the mortgages are not allowed for COCL under the Land Administration Law. Even with the mediation by local governments, the loan size is much smaller than loans that van be obtained using state-owned construction land as collateral [14]. To establish a unified urban-rural construction land market, the COCL should be equipped with complete property rights to guarantee and optimize the profits of land owners and developers.

Second, local government monopoly the in the process of COCL entering into the market, the government force still plays the driving role, whereas the collective economy organizations are the gamers who had to obey the laws designed by local government. In this case, the overlapping functions induce local governments to maximize economic interests and ignore the benefits of rural land owners. Therefore, on one hand, local government should transform from a leading role to coordinating and supporting role. On the other hand, the performance assessment of local officials should not only in terms of fiscal revenue and GDP increase but also adopt incentive regulation policies, such as based on the outcome of integrated development between the urban and rural areas.

Finally, based on the results of our research, the COCL transaction should be encouraged across China which will contributes to industrial developments and economy increase in rural areas.

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REFERENCES

[1] T. Moreda, “Large-scale land acquisitions, state authority and indigenous local communities: insights from Ethiopia,” Third World Q., vol. 38, no. 3, pp. 698– 716, 2017, doi 10.1080/01436597.2016.1191941, 2017.

[2] and P. M. J. Dell’Angelo, P. D’Odorico, M. C. Rulli, “The Tragedy of the Grabbed Commons: Coercion and Dispossession in the Global Land Rush,” World Dev., vol. 92, pp. 1–12, 2017, doi 10.1016/j.worlddev.2016.11.005, 2017.

[3] and X. Z. W. Han, X. Zhang, “Land use regulation and urban land value: Evidence from China,” L. use policy, vol. 92, no. Novemb. 2019, p. 104432, 2020, doi 10.1016/j.landusepol.2019.104432, 2019.

[4] and V. F. B. N. Mabe, S. Nashiru, E. Mummuni, “The nexus between land acquisition and household livelihoods in the Northern region of Ghana,” L. use policy, vol. 85, no. February, pp. 357–367, 2019, doi 10.1016/j.landusepol.2019.03.043, 2019.

[5] and R. W. C. He, Z. Huang, “Land use change and economic growth in urban China: A structural equation analysis,” Urban Stud., vol. 51, no. 13, pp. 2880–2898, 2014, doi 10.1177/0042098013513649, 2014.

[6] Y. Fang and A. Pal, “Drivers of urban sprawl in urbanizing China – a political ecology analysis,” Environ. Urban., vol. 28, no. 2, pp. 599–616, 2016, doi 10.1177/0956247816647344., 2016.

[7] R. Wang and R. Tan, “Efficiency and distribution of rural construction land marketization in contemporary China,” China Econ. Rev., vol. 60, no. Sept. 2017, p. 101223, 2020, doi 10.1016/j.chieco.2018.09.004, 2017.

[8] N. Xu, “What gave rise to China’s land finance?,” L. use policy, vol. 87, no. May, p. 104015, 2019, doi 10.1016/j.landusepol.2019.05.034, 2019.

[9] and T. Z. D. Wang, C. Ren, “Understanding the impact of land finance on industrial structure change in China: Insights from a spatial econometric analysis,” L. use policy, vol. 103, no. February, p. 105323, 2021, doi 10.1016/j.landusepol.2021.105323, 2021.

[10] and L. Y. Q. Yanbo, J. Guanghui, T. Yaya, Shang Ran, W. Shuwen, “Urban - Rural construction land Transition(URCLT) in Shandong Province of China: Features measurement and mechanism exploration,” Habitat Int., vol. 86, no. February, pp. 101–115, 2019, doi 10.1016/j.habitatint.2019.03.006, 2019.

[11] J. Andreas and S. Zhan, “Hukou and land: market

reform and rural displacement in China," J. Peasant Stud., vol. 43, no. 4, pp. 798–827, 2016, doi 10.1080/03066150.2015.1078317, 2016.

[12] and M. qi G. X. hai Lu, X. Jiang, "How land transfer marketization influence on green total factor productivity from the approach of industrial structure? Evidence from China," L. use policy, vol. 95, no. 1037, p. 104610, 2020, doi 10.1016/j.landusepol.2020.104610, 2020.

[13] and K. S. B. Y. A. Antwi, A. S. Moriya, "Effects of federal policy to insure young adults: Evidence from the 2010 affordable care act's dependent-coverage mandate," Am. Econ. J. Econ. Policy, vol. 5, no. 4, pp. 1–28, 2013, doi 10.1257/pol.5.4.1, 2013.

[14] and N. H. R. Tan, R. Wang, "Liberalizing rural-to-urban construction land transfers in China: Distribution effects," China Econ. Rev., vol. 60, no. Novemb. 2017, pp. 1–12, 2020, doi 10.1016/j.chieco.2018.01.001, 2020.

[15] and L. L. L. Yan, K. Hong, K. Chen, H. Li, "Benefit distribution of collectively-owned operating construction land entering the market in rural China: A multiple principal–agent theory-based analysis," Habitat Int., vol. 109, no. February, p. 102328, 2021, doi 10.1016/j.habitatint.2021.102328, 2021.

[16] and G. Z. W. Jin, C. Zhou, "Characteristics of state-owned construction land supply in Chinese cities by development stage and industry," L. use policy, vol. 96, no. March, p. 104630, 2020, doi 10.1016/j.landusepol.2020.104630., 2020.

[17] and H. W. Y. Wang, W. Li, J. Xiong, Y. Li, "Effect of land expropriation on land-lost farmers' health: Empirical evidence from rural China," Int. J. Environ. Res. Public Heal. vol. 16, no. 16, 2019, doi 10.3390/ijerph16162934., 2019.

[18] and P. Bin X. Xie, A. Zhang, L. Wen, "How horizontal integration affects transaction costs of rural collective construction land market? An empirical analysis in Nanhai District, Guangdong Province, China," L. use policy, vol. 82, no. Novemb. 2018, pp. 138–146, 2019, doi 10.1016/j.landusepol.2018.11.029., 2018.

[19] S. W. L. and T. M. Ben, "Impact of government and industrial agglomeration on industrial land prices: A Taiwanese case study," Habitat Int., vol. 33, no. 4, pp. 412–418, 2009, doi 10.1016/j.habitatint.2009.01.001, 2009.

[20] L. Alden Wily, "Looking back to see forward: The legal niceties of land theft in land rushes," J. Peasant Stud., vol. 39, no. 3–4, pp. 751–775, 2012, doi 10.1080/03066150.2012.674033, 2017.

[21] and Y. L. Y. Zhou, X. Li, "Rural land system reforms in China: History, issues, measures and prospects," L. use policy, vol. 91, no. Oct. 2019, p. 104330, 2020, doi 10.1016/j.landusepol.2019.104330, 2019.

[22] and Y. D. W. L. Zhang, W. Yue, Y. Liu, P. Fan, "Suburban industrial land development in transitional China: Spatial restructuring and determinants," Cities, vol. 78, no. January, pp. 96–107, 2018, doi 10.1016/j.cities.2018.02.001, 2018.

[23] and Y. S. W. Qun, L. Yongle, "The incentives of China's urban land finance," L. use policy, vol. 42, pp. 432–442, 2015, doi 10.1016/j.landusepol.2014.08.015, 2014.

[24] and W. X. Yuan, Y. D. Wei, "Land marketization, fiscal decentralization, and the dynamics of urban land prices in transitional China," L. use policy, vol. 89, no. January, p. 104208, 2019, doi 10.1016/j.landusepol.2019.104208, 2019.

[25] P. A. Puhani, "The treatment effect, the cross difference, and the interaction term in nonlinear 'difference-in-differences' models," Econ. Lett., vol. 115, no. 1, pp. 85–87, 2012, doi 10.1016/j.econlet.2011.11.025, 2012.

[26] M. Kolak and L. Anselin, "A Spatial Perspective on the Econometrics of Program Evaluation," Int. Reg. Sci. Rev., vol. 43, no. 1–2, pp. 128–153, 2020, doi 10.1177/0160017619869781, 2020.

[27] A. B. T. and D. P. Mackinnon, "Mediated Effect," Organ. Res. Methods, no. 1979, pp. 241–269, 2008., 2008.