Farmland Regulation, Structural Change and Agricultural Development: Evidence from Chongqing Land Coupon Reform

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Abstract

This study explores the effect of relaxing farmland regulation on structural change and agriculture development using land reform in Chongqing. Conversion of farmland to urban land is strictly constrained by national construction land quota in China. In 2008, Chongqing invented Land Coupon System, which creates a market for farmers and firms to trade newly created construction land quota. Farmers obtain land coupons by reclaiming their rural housing to farmland and real estate firms need to purchase land coupons before bidding for a parcel of urban land to develop. I collect comprehensive transaction records of land coupons from Chongqing country land exchange. Preliminary results imply that counties supply land coupons more experience faster structural change, measured by reduction of agriculture employment share. Furthermore, reclaiming rural housing to farmland foster grain output by increasing agricultural sown area.

1 Introduction

Urban expansion has put pressure on the preservation of farmland in many countries. Government typically sets strict land-use policy to protect agricultural land from the erosion of urban activities. In China, preserving farmland is a national policy, which is called Farmland Red Line Policy. It aims to preserve at least 1.8 billion mu (around 120 million hectares) of farmland nationally and it requires each county maintaining certain amount of farmland (Yu, 2019). The maximum size of farmland allowed to convert to urban land is subject to urban construction quota, which is decided by central government and allocated to each province. Later, provincial government allocates quotas to each city, then city government allocates quotas to each county. Fang et al. (2023) find urban land construction quota is skewed to west and central regions, which is not consistent with the economic development nor migration pattern. Rapid urbanization is accompanied by massive migration. The number of migrant workers has increased from about 110 million in 2000 to approximately 300 million in 2015 (Hao et al., 2020). The migration pattern is unilateral, from rural to urban and inland to coastal regions. When farmers move to the city, there is no formal market for them to sell idle rural housing nor farmland. Thus, they actually have rural land and need to purchase or rent housing in urban areas. In addition, per capita rural residential land area is twice as much as urban. For example, the average urban constructed land per capita in 2015 is 149m2, while rural residential land area per capita is 300m2 (The State Council, 2017) . As a result, land is not efficiently used across sectors as large amount of rural housing is idle or abandoned and urban land is in shortage. In 2008, Chongqing established the first Rural Land Exchange Market and invented Land coupon System, allowing farmers to convert rural housing to farmland. The reduction of rural construction land and the creation of farmland is documented as land coupon. Real estate firms are required to purchase land coupons before bidding for urban land to develop. Land coupon essentially creates a market for farmers and firms to exchange quotas for urban construction land development. After the reform, the amount of urban land can be developed consists of two part, the first one is assigned by

central government and the second one is newly created by farmers reclaiming rural housing. In this paper, I investigate how the relaxation of farmland regulation affect structural change and agricultural productivity using Chongqing Land Coupon system. In China, farmers are endowed with a parcel of rural land to build up rural housing. However, rural land is owned by the rural collectives and farmers only enjoy the right to use it. Without the reform, there is little pecuniary incentives for farmers to abandon the assigned rural land for housing even if many of them already or plan to work and live in the city. As a result, large amount of rural land is not efficiently used. Land Coupon reform encourage farmers to reclaim idle rural housing into farmland and get reimbursed, which encourage farmers to move out of rural regions and fosters structural change. In 2021, the average compensation is 63,428 RMB which is 3.5 folds of per capita rural disposable income in Chongqing. Meanwhile, conversion of idle rural housing into farmland increase agricultural sown area and grain output. As a result, it could promote agricultural labor productivity by increasing farmland and reducing agricultural workers.

Literature Review. This paper is related to the literature of land-use regulations and aggregate welfare. Hsieh and Moretti (2019) study the impact of housing supply constraints in the Unites States on labor reallocation and aggregate economic growth. Bird and Venables (2020) compare traditional land tenure system which doesn't allow land being transferred easily and freehold tenure system and find the traditional land system hinders manufacturing expansion. Henderson et al. (2022) explore how political manipulation of land markets to finance infrastructure and capital market in China. My proposal is most closely related to Yu (2019), which also study Farmland Red Line Policy. However, we focus on different questions. Yu estimated the causal impact of the Farmland Red Line Policy on local GDP and population growth. This paper focuses on the land coupon reform, which allows farmers to re-cultivate and urban land quota trading.

Another strand of literature study land reform and agricultural productivity, especially in developing countries. Chari et al. (2021) study rural land-leasing reform and agricultural

productivity in China, Adamopoulos and Restuccia (2020) find land holding ceiling lowers agricultural productivity and distort labor occupation choice and technology adoption in Philippines. Bu and Liao (2022) found secure land property rights boost entrepreneurship in rural China. However, they only focus on agricultural sector, ignoring the connection between agricultural sectors and non-agricultural sectors. I want to explore how the land coupon system affect structural change, which emphasizes how rural workers switch to non-agricultural workers.

The reminder of the proposed paper is structured as follows. Section 2 provides institutional background about Farmland Red Line Policy, and the Chongqing Land coupon Reform. Section 3 describes data and summarizes characteristics of land coupon transaction. Section 4 reports primary empirical findings that Chongqing Land coupon Reform causes structural change and improvement of agricultural productivity. Section 5 concludes the paper.

2 Institutional Background

2.1 Chongqing Land Reform

Land allocation and farmland preservation. In China, urban land is owned by government, rural land is owned by rural collectives (Household Responsibility System). Rural land shall not be converted into urban construction land unless the state expropriates it. In each year, the maximum size of urban land can be developed is called the urban construction land quota. The central government decides aggregate urban land construction quota and allocates to different provinces, then the provincial government allocates construction land to each prefecture, and so on. City officials decide the zoning policy for each land parcel.

Partly due to the 1997 Asian financial crisis and concern for food security, Chinese central government claimed protection for farmland protection for cultivated land as stated in the Land Administration Law of 1998. In 2006, the Eleventh Five-Year-Planning put forward with Farmland Red Line Policy, which aimed to preserving at least 1.8 billion mu (around 1.2 million square kilometers) of farmland. Appendix Figure A1 plots national farmland area size from 1996 to 2022. Before Farmland Red Line Policy, the farmland size steadily decreases and approaches to 1.8 billion mu. After 2008, farmland increases and maintains at around 2 billion mu in the early 2010s and then decreases to 1.9 billion mu in 2018.

The Policy requires whenever one unit of farmland is converted to urban land, an equal amount of unused land should also be converted to farmland within the same county, which may cause land misallocation across sectors and regions. Factor reallocation is crucial for aggregate efficiency. However, in China land reallocation doesn't accommodate changes in demographics. Land is misallocated across sector since per capita rural residential land area is twice as much as urban. For example, the average urban land per capita in 2015 is 149m2, while rural residential land area per capita is 300m2. When farmers move to cities, they can't sell idle rural housing nor farmland. Thus, they actually have rural land and need to purchase or rent housing in urban areas. Meanwhile, urban land construction quota is not

consistent with economic development nor migration pattern. Appendix Figure A2 plots GDP per capita and urban construction quota per capita, respectively, which shows urban construction quota is mainly allocated to less developed province.

In the past 5 years, the government has been implementing land reform to mitigate misallocation. First, they relaxed farmland balance at the provincial level and considered a national platform. In 2017, cross-province farmland balance was allowed. In 2020, the central government proposed establishing a unified construction land market for urban and rural areas and a fair and reasonable land value-added distribution system for the marketization of rural collective land. In this paper, I will focus on a specific land reform called Chongqing Land coupon Reform.

Chongqing Land Coupon Reform. Chongqing Land coupon system has been implemented since 2008. It was created to protect farmland and to mitigate constraint of urban construction land use quota. In 2007, the total amount of rural workers in Chongqing reached to 7.5 million people, among which 4 million rural workers migrate to other provinces and 3.5 million work in urban areas within Chongqing. For those migrant rural workers, they actually live and work in the city. However, there is almost no reasonable way to sell their rural housing and get compensated. The large share of rural workers creates excess demand for urban construction land meanwhile the rural construction land is wasted and can't convert to other type of land, which puts pressure on farmland protection as there is a lower bound requirement for farmland. To solve the situation, Chongqing government create a land reform called Land coupon Reform.

2.2 Transaction Process of Land Coupon

Land coupon Reform encourages farmers voluntarily to reclaim idle and abandoned rural construction land to farmland. With increased farmland, there is more urban land can be developed under Farm Land Red Line Policy, which essentially increases urban construction quota set by the central government. The excess urban construction quota created from re-

cultivating rural construction land (rural housing) to farmland can be openly traded through Chongqing Rural Land Exchange in the form of land coupons and can be used within the scope of urban planning and construction of Chongqing.

Figure 1 plots the transaction process of Land coupon. It involves three steps: creation, transaction and use of land coupon. Han and Lin (2019) provide a more detailed description of the generation, trade and use of Land coupon.

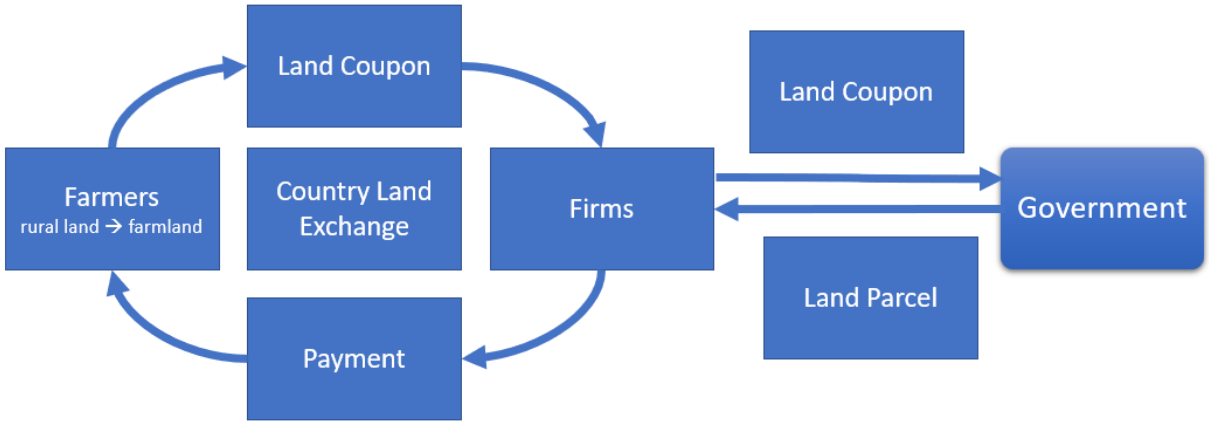


Figure 1: Land coupon Transaction Process

2.2.1 Creation of Land Coupon

Creation of land coupon requires farmers to re-cultivate rural land (rural housing) into farmland. It involves three steps: application, implementation, project acceptance. During the application process, village officials explain regulation rules of land coupon and farmers and rural collectives who want to re-cultivate their rural land (rural housing) can fill in an application form. Town officials then verify the application form and hand it over to county officials. In general, there are three types of rural land are allowed to be re-cultivated into farmland: (1) Abandoned or idle rural construction land, such as rural housing, rural land for town and village enterprises (TVEs), public facilities, school. (2) Rural residential base and surrounding rural land of farmers who got urban hukou, (elderly) farmers who move

to live with other family members. (3) Dilapidated house due to natural disaster, whole village relocation project. During the implementation phase, county-level Department of Natural Resource assign professional land surveyors to conduct site investigation, verify whether the parcel of rural land (rural housing) satisfies conditions for re-cultivation and determine the size and location of reclaimed land parcel. After land survey, town officials make re-cultivation agreement with farmers. Next, county-level Department of Natural Resource chooses land planning agency to make re-cultivation plan and submit to Chongqing Department of Natural Resource for approval. When city officials approve the re-cultivation plan, county officials issue a tender or auction notice for reclaiming the rural land parcels. Construction firms who win the auction are responsible for the safety and quality of the project. Finally, it comes to the project acceptance phase. County-level Department of Natural Resource together with officials from Department of Agriculture, Forestry and Water Affairs inspect quality and quantity of the re-cultivation project. Acceptable reclaimed farmland needs to satisfy the following conditions: effective soil thickness is above 40 cm, the share of rubble is below 15%; gradient of reclaimed farmland is below 15 degree; reclaimed land is linked with existing farmland, close to drainage; ridge of farmland is solid. If the project is acceptable, County-level Department of Natural Resource issue a certification of Construction Land Consolidation, which records the re-cultivation project name, ownership, location, area, grade of reclaimed farmland. County-level Department of Natural Resource then submit certificates to city officials for approval. City officials arranges l technician to inspect 5% to 10% projects randomly. It the results are satisfactory, then Chongqing Department of Natural Resource assign certification number to the certificate. When rural construction land is converted to farmland, the total amount of farmland increases, which increase the potential amount of urban construction land, in other words, increase the urban construction quota. The additional created urban land construction quota from rural land re-cultivation is called land coupon.

2.2.2 Transaction of Land Coupon

Transaction of land coupon only takes place in Chongqing Rural Land Exchange. The transaction includes six steps: application for selling land coupon, make announcement of supplying land coupon, application for purchasing land coupon, conduct transaction, confirm transaction and settle payment. Owners of the certificate of re-cultivation project can apply for selling land coupon through Chongqing Rural Land Exchange. Then Chongqing Rural Land Exchange make announcement of arranging land coupon transaction on its website and newspapers about the amount of land coupon. Purchasers apply for buying land coupon and submit security deposit. If the total number of supplied land coupon exceeds the total number of wanted land coupon, then the transaction takes the form of auction. Otherwise, it takes the tender form. For auction, purchaser with higher bid wins. For tender, all participants get the land coupon. To protect farmers' benefit, government set a minimum price for the land coupon. Appendix A3 plots the transaction price and the minimum price of land coupon by session. After the transaction, Chongqing Rural Land Exchange issue confirmation letter to purchasers. Purchasers are supposed to settle payment within 30 days. Then purchasers receive certificate of land coupon. Within 5 days after receiving payment, Chongqing Rural Land Exchange make announcement of the transaction results, which include transaction time, area, total payment, average price of land coupon. Since land coupon is essentially a transaction of urban land construction quota, for purchasers it doesn't matter where is the original location of re-cultivated land. And all suppliers of land coupon within the same session receive the same price of land coupon. Chongqing Rural Land Exchange also announces the compensation plan for suppliers. The suppliers of the re-cultivated land parcel get 85% of the land coupon payment after deduct reclamation cost (55 Yuan/ m^2) and the rural collectives get the rest 15% of net land coupon payment.

2.2.3 Use of Land Coupon

Purchasers of land coupon are allowed to bid for the construction of certain parcel. And the area of bidden land parcel can't excess the amount of land coupon that firms hold. Firms are also allowed to resell land coupon through Chongqing Rural Land Exchange after holding two years and haven't used the total amount. From 2012 to 2017, there are 13 reselling records. After land coupon reform, the total amount of urban land construction quota consists two part, the first one is the national assigned quota, and the second one is the additional created quota through land coupon, i.e., re-cultivation of rural construction land into farmland. The first type of quota is free and the second one requires purchasing land coupon. Without doubt, all firms want to get the quota for free. To solve the problem, Chongqing government decides when firms bid for residential and commercial land need purchasing land coupon. For industrial land, firms don't need to buy land coupon.

2.3 Summary

In sum, Land Coupon system essentially creates a market to generate and trade urban land quota. The last step is the use of land coupon. One unit of land coupon allows one unit of farmland to be developed into urban land in other places within Chongqing, which is a virtual transfer of land use right across space. In this way, the total amount of farmland in Chongqing can be maintained, while rural residential land will decrease and more urban land can be developed.

If we compare the change in rural population and rural residential land pattern in Chongqing with China, we can easily see the rural residential land is consistent with demographics as shown in the figure A2. Meanwhile, Chongqing did a great job maintaining farmland compared to other municipalities from figure A3.

3 Data and Summary Statistics

3.1 Data

The main data used in this paper is Chongqing Land Coupon Transaction (2008-2022), which is publicly available on the website of Chongqing Country Land Exchange. It documents land coupon transaction volume, value in each session. It also reveals information of both purchasing firms and farmers, such as name, location of the reclaimed rural construction land, compensation plan between farmers and rural collectives.

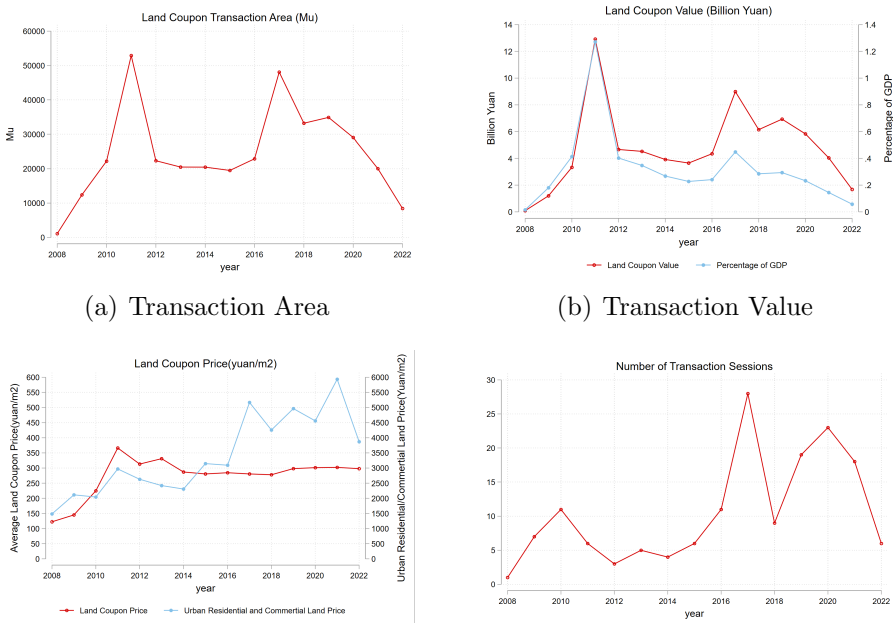
The main outcome variables include GDP and employment share in primary, secondary and tertiary sector at county level. GDP data comes from Chongqing Bureau of Statistics and County Statistics Yearbook. Employment data is from Population Census. I also obtained agricultural input and output from County Statistics Yearbook.

Potential data for future research. So far, the analysis is conducted at county level. If I want to explore the reform at town level or village level, then I can use satellite images to proxy for agricultural development. I also plan to use Agricultural Fixed Point Survey Data to calculate agricultural productivity. There are 11 villages in Chongqing included in the Fixed Point Survey and 4 of them have participated in Land Coupon sales. This paper mainly explores how land coupon system affect farmers. In my future research, I also want to investigate the impact on urban land market. For this purpose, I can use Land China data (2000-2022) to construct urban land price index following He et al., (2022). Land China reports detailed information about urban land transaction.

3.2 Chongqing Land Coupon Transaction Summary Statistics

Land Coupon Transaction. Figure 2 shows basic information about land coupon transaction. Figure 2(a) plots transaction area from 2008 to 2022. By the end of 2022, the total amount of land coupon reached the total amount of traded land coupon is around 3.68 million mu, which is about 0.3% of Chongqing administrative area. Figure 2(b) plots transaction

value; by the end of 2022, the total transaction value is more than 72 Billion Yuan. On average, it accounts for 0.3% of GDP in Chongqing. Figure 2(c) shows average price of land coupon. Its recent price is quite stable, around 300 yuan per square meters, which is less than 10% of average urban residential or commercial land price in Chongqing. Figure 2(d) demonstrates the number of transaction sessions for each year. Appendix Figure A4 plots transaction statistics by session.



(a) Transaction Area (b) Transaction Value

(c) Average Price (d) Number of Sessions

Figure 2: Chongqing Land Coupon Transaction

Variations of land coupon supply across counties. Figure 3 shows the accumulated land coupon supply from 2008 to 2022 across different counties in Chongqing. Appendix Figure A5 shows land coupon supply across counties in each year. There are 7 counties that have never supplied any land coupon, i.e. reclaim rural residential land to farmland, which I refer them as the control group in my empirical analysis.

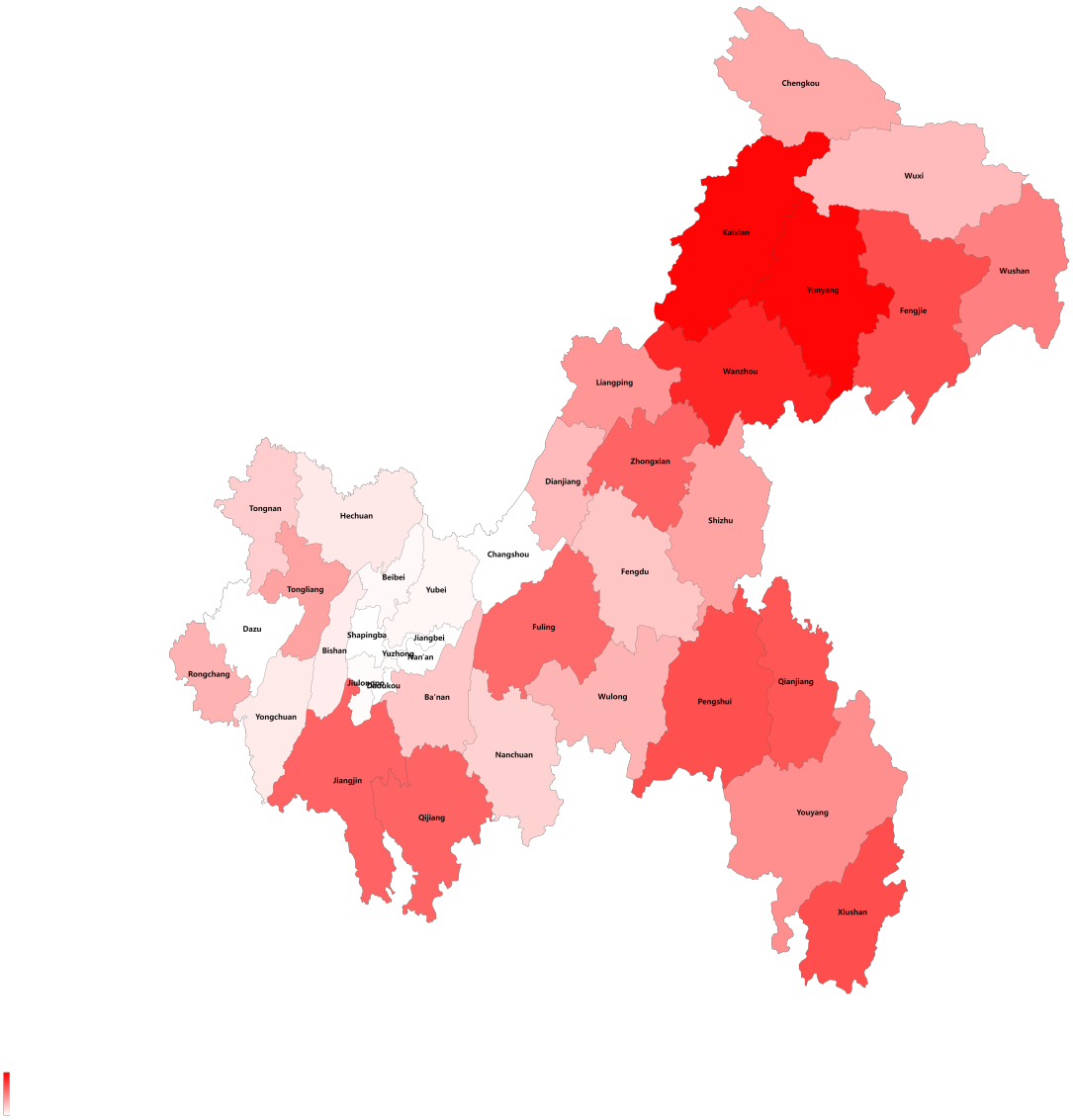


Figure 3: Accumulated Land coupon Supply 2008-2022

To explore which factors may explain the variations of land coupon supply, I regress the accumulated land coupon supply on some geographic factors and economic factors as shown in Table 1. Counties that has higher slope, far from Chongqing city center, with bigger administrative area and sown area tend to supply more land coupon. While counties have higher GDP per capita is less likely to supply. In summary, those supplying counties are poor and remote regions.

Table 1: Factors driving variations in Land Coupon Supply

	(1) lmu	(2) lmu	(3) lmu	(4) lmu	(5) lmu	(6) lmu
lslope	1.576***					0.267
	[0.491]					[0.791]
ldistance		0.869***				0.278
		[0.179]				[0.273]
larea			1.472***			0.305
			[0.227]			[0.716]
lgdppc				-1.410***		-0.222
				[0.306]		[0.474]
lsown					1.339***	0.815*
					[0.241]	[0.442]
r2	0.261	0.449	0.591	0.422	0.514	0.690
N	31	31	31	31	31	31

Note: Dependent variable is ln(accumulated land coupon supply) at county level from 2008 to 2022. There are 38 counties in Chongqing, 7 of them didn't supply land coupons. Independent variables are average slope, distance to Chongqing center, administrative area, GDP per capita, sown area (all take logs).

Suppliers of land coupons. Using farmers' compensation data in 2021, I find that on average the reclaimed rural housing is 302.8 m^2 and the reimbursement is 63,428 RMB, which is not a small amount given that per capita disposable income of rural residents in Chongqing in 2021 is 18,100 RMB. Among all reclaimed farmers, only 15% of them is female, which suggests female may hold less properties in rural China. Appendix Figure A7 also plots the birth year distribution of land coupon sellers.

4 Preliminary Results

I expect that after the reform, counties with larger supply of land coupon (within Chongqing) will experience larger decline of rural population ratio, higher out migration rate and higher agricultural productivity growth. Similarly, the results will hold if we compare Chongqing counties located in the province boundaries with counties nearby but belong to other provinces. We can think the first case as intensive margin and the second one as extensive margin. When farmers re-cultivate rural housing into farmland and being compensated, then can choose either move to the city or stay in the village. If they move, then naturally, the share of agricultural population decrease. Meanwhile, it is highly likely they will lease the contracted farmland from Household Responsibility System (HRS) to farmers that stay in the village. For farmers that re-cultivate rural housing but still live in the village, they can use the compensation to contract more farmland, adopt machines or better technologies to improve agricultural productivity. In addition, the local collectives get 15% payment of each transaction of land coupon, they can use the money to improve road quality and reduce transportation cost. Furthermore, the land coupon reform essentially increases the supply of farmland, relax the farmland red line constraint. As a consequence, more urban land can be developed, which tends to reduce price for urban land and housing, which also encourages farmers migrate to the city. In the following subsections, I just display the simple results or the research plan. More rigorous empirical analysis is in progress.

4.1 Economic Development

To explore the effects of land coupon supply on the local economic development, I run the following DID regression.

$$ln(y_{it}) = \beta Land * Post08 + \alpha_i + \gamma_t + \mu_{it} \tag{1}$$

The dependent variables include GDP by sector and GDP per capita. Land is a dummy variable, which equals to one if county i has ever participated in land coupon sales, i.e. conversion of rural construction land into farmland. Post08 is a dummy variable, which equals to zero for year before 2008. α_i and γ_t are the county and year fixed effect. Table 2 displays the regression results without controlling for confounding factors. It shows that after land coupon reform, counties actively participated in reclaiming rural housing tend to experience larger increase in GDP in agricultural sector and manufacturing sector, GDP per capita. But no significant effect on service sector.

Table 2: Impact of Land Coupon Sales on Local Economic Development

	(1)	(2)	(3)	(4)
	ln(Primary Sector GDP)	ln(Secondary Sector GDP)	ln(Tertiary Sector GDP)	ln(GDP per capita)
Land *Post08	0.569***	0.546**	-0.134	0.267**
	[0.180]	[0.208]	[0.122]	[0.120]
CountyFE	Y	Y	Y	Y
YearFE	Y	Y	Y	Y
Cluster	County	County	County	County
N	771	786	786	722

Note: This table reports the impact of land coupon sales on local economic development. Sample period is from 2000 to 2020. Land is a dummy variable, which equals to one if county i has ever participated in land coupon sales, i.e. conversion of rural construction land into farmland during the sample period. Post08 is a dummy variable, which equals to zero for years before 2008. Robust standard errors in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

4.2 Structural Change

Table 3 reports the effect on structural change, measured by sector share in value added. The results show that land coupon reform reduce agricultural share in value added, increase secondary sector share, lower tertiary sector share. It implies land coupon supply accelerates structural change. The first two is indicators of structural change, but the third column seems counter-intuitive at first. But I can explain it like, control group are actually primary buyers of land coupons (who locate in main city areas and have larger demand to develop urban land). Since only development to residential land/industrial urban land requires land coupons, this reform will promote service sector in buying counties, which may dominate the effect of change in primary sector. The coefficients mean, compared to control group, treatment group experience 6.3% larger reduction in agricultural GDP share, 16% increase in secondary sector GDP share, 9% decrease in service sector GDP share.

Table 3: Impact of Land Coupon Supply on Structural Change

	(1)	(2)	(3)
	GDP share$_{Primary}$	GDP share$_{Secondary}$	GDP share$_{Tertiary}$
Coupon *Post08	-0.063***	0.160***	-0.090*
	[0.016]	[0.057]	[0.046]
CountyFE	Y	Y	Y
YearFE	Y	Y	Y
Cluster	County	County	County
N	771	786	786

Note: Dependent variables are sector share in value added. Sample period is from 2000 to 2020. Coupon is a dummy variable, which equals to one if county i has ever supplied land coupon by reclaiming rural residential land to farmland. Post08 is a dummy variable, which equals to zero for years before 2008.

In addition, Figure 4 plots the change of primary, secondary and tertiary industry employment share from 2010 to 2020 against the accumulated land coupon normalized by the administrative area across 38 counties within Chongqing. It shows that counties that supply more land coupons experienced a larger decrease of agricultural employment share, and an increase of secondary employment share. The correlation between land coupon supply and change of tertiary employment share is less obvious. Given that Figure 4 shows agricultural employment actually decreases, meanwhile Table 1 shows an increase of GDP in agriculture, which implies labor productivity in agriculture increase due to land coupon reform.

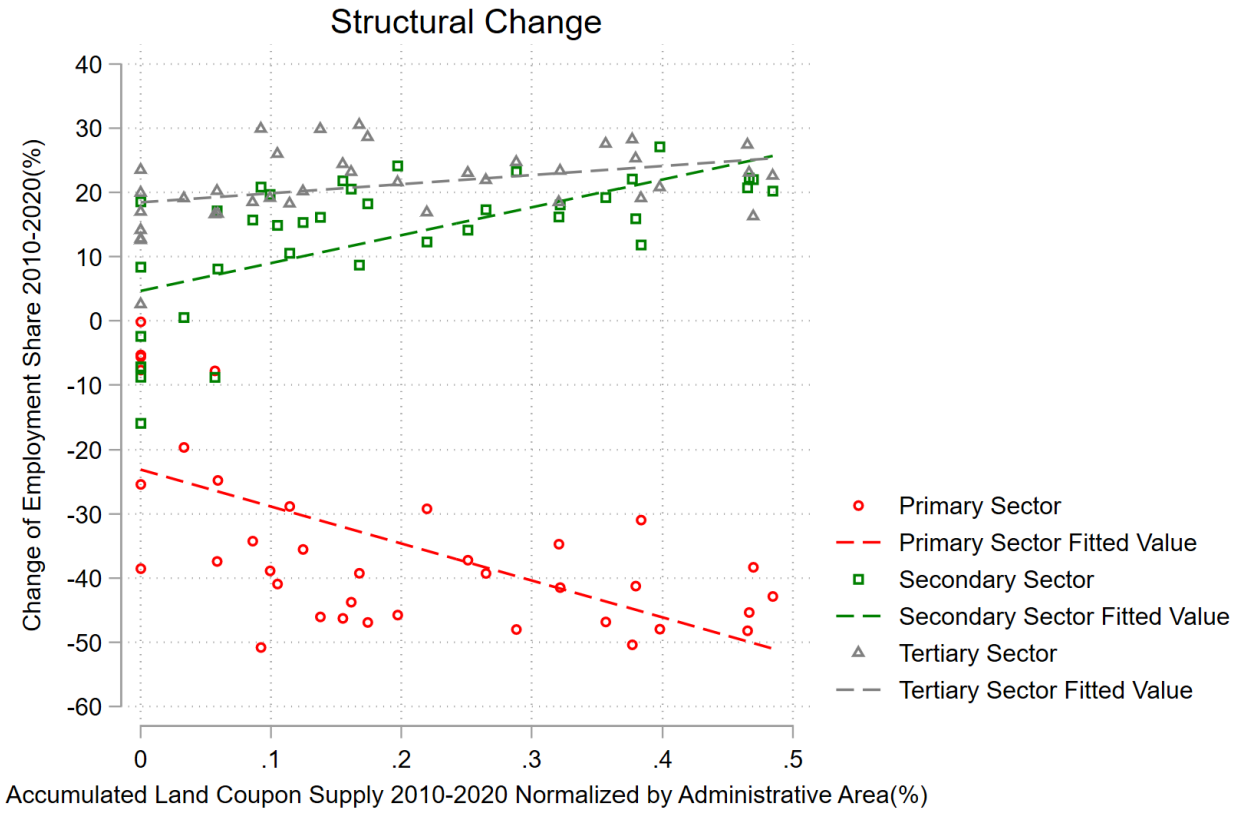


Figure 4: Relationship between Change of Employment Share and Land Coupon Supply

4.3 Agriculture Output and Input

Land coupon reform causes agricultural development. Naturally, one would like to know which factors is the driving force. Table 4 shows that after the reform, grain output increases more in counties that participated in rural housing reclamation. And the positive effect is more likely coming from more input of land, i.e., expansion of agricultural sown area. There is only limited evidence revealing that after the reform, counties sell land coupon also adopt more agricultural machines.

Table 4: Impact of Land Coupon Sales on Agricultural Input and Output

	(1)	(2)	(3)
	ln(Grain Output)	ln(Sown Area)	ln(Ag. Machine Power)
Land *Post08	1.131***	0.901***	0.327
	[0.392]	[0.228]	[0.207]
CountyFE	Y	Y	Y
YearFE	Y	Y	Y
Cluster	County	County	County
N	777	712	572

Note: This table reports the impact of land coupon sales on agricultural input and output. Sample period is from 2000 to 2020. Land is a dummy variable, which equals to one if county i has ever participated in land coupon sales, i.e. conversion of rural construction land into farmland during the sample period. Post08 is a dummy variable, which equals to zero for years before 2008. Robust standard errors in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

4.4 Robustness

The results in previous sections imply that participating in land coupon sales can significantly promote agricultural development, mainly through increasing of agricultural sown area. In this section, I conduct one robustness check. Instead of focusing on the extensive margin, I re-run the previous regressions using the intensity of land coupon sales in each county.

$$ln(y_{it}) = \beta share * Post08 + \alpha_i + \gamma_t + \mu_{it} \tag{2}$$

The sale intensity is defined as the share of accumulated land coupon sales from 2008 to 2020 in administrative areas. The results are reported in Table 5-7, which shows similar pattern as in Table 2-4.

Table 5: Robustness: Impact of Land Coupon on Local Economic Development

	(1) ln(GDP$_{Primary}$)	(2) ln(GDP$_{Secondary}$)	(3) ln(GDP$_{Tertiary}$)	(4) ln(GDP per capita))
share *Post08	1.043***	0.967**	-0.273	0.684***
	[0.313]	[0.384]	[0.276]	[0.207]
CountyFE	Y	Y	Y	Y
YearFE	Y	Y	Y	Y
Cluster	County	County	County	County
N	771	786	786	722

Note: This table reports results of robustness check using land coupon sales intensity. Land coupon intensity is defined as the share of accumulated land coupon sales from 2008 to 2020 to total administrative area. Sample period is from 2000 to 2020. Post08 is a dummy variable, which equals to zero for years before 2008.

Table 6: Robustness: Impact of Land Coupon Supply on Structural Change

	(1) GDP share$_{Primary}$	(2) GDP share$_{Secondary}$	(3) GDP share$_{Tertiary}$
share *Post08	-0.124***	0.314***	-0.174**
	[0.040]	[0.102]	[0.084]
CountyFE	Y	Y	Y
YearFE	Y	Y	Y
Cluster	County	County	County
N	771	786	786

Note: This table reports results of robustness check using land coupon sales intensity. Land coupon intensity is defined as the share of accumulated land coupon sales from 2008 to 2020 to total administrative area. Sample period is from 2000 to 2020. Post08 is a dummy variable, which equals to zero for years before 2008.

Table 7: Robustness: Impact of Land Coupon Supply on Agricultural Development

	(1) ln(grain output)	(2) ln(sown area)	(3) ln(ag machine power)
share *Post08	1.874***	1.476***	-0.256
	[0.635]	[0.449]	[0.568]
CountyFE	Y	Y	Y
YearFE	Y	Y	Y
Cluster	County	County	County
N	777	712	572

Note: This table reports results of robustness check using land coupon sales intensity. Land coupon intensity is defined as the share of accumulated land coupon sales from 2008 to 2020 to total administrative area. Sample period is from 2000 to 2020. Post08 is a dummy variable, which equals to zero for years before 2008.

4.5 Parallel Trend Test

Figure 5 shows the parallel trend test for primary sector GDP. By defining a group of dummy variables to indicate period before and after the reform and interact with treatment status, and normalize the period before 1 as reference group. We can observe the dynamic effect of land coupon supply. For GDP in primary sector, it seems there is no pre-trend. The parallel trend for other dependent variables are shown in Appendix. In general, they show a good parallel trend.

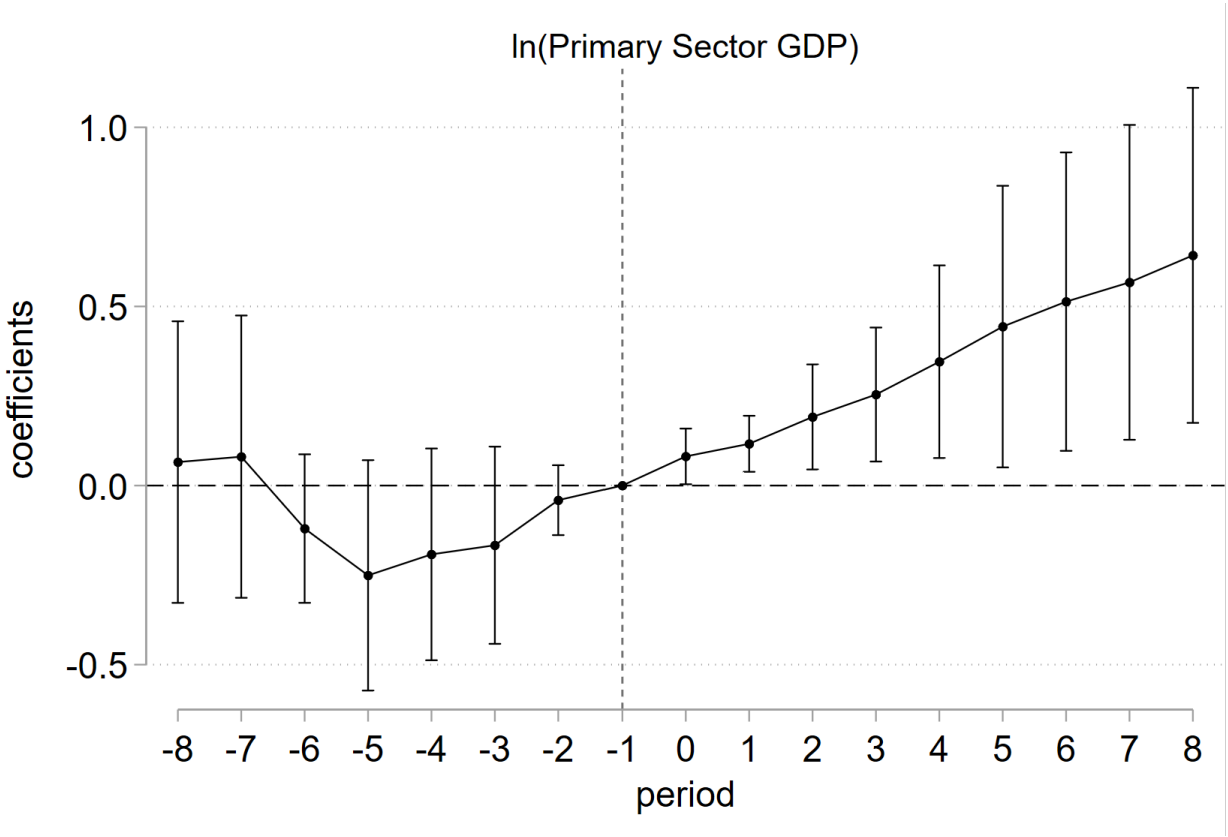


Figure 5: Parallel trend test

5 Conclusion

This paper uses Chongqing Land Coupon reform to study the impact of relaxing land-use regulation on structural change and agriculture development. Land Coupon System is essentially a transaction of newly created land construction quota between farmers and real estate firms. Farmland Red Line Policy requires each region maintaining certain amount of farmland, which sets upper bound for urban land development. When farmers reclaim their rural housing into farmland, the total amount of farmland within a region increases. As a result, more urban land can be developed. Before the reform, there is almost no pecuniary incentive for farmers to transform rural housing. Land coupon reform promotes structural change as it encourages farmers to reclaim rural housing and leave rural areas. Meanwhile, grain output and agricultural productivity are enhanced as sown area increases. Firms also benefit from land coupon system as it creates more urban construction quota and potential migrant workers. To evaluate the aggregate effects of land coupon system or simulate the scenario if a national land coupon system is implemented requires establishing a quantitative spatial model, which is left for future research.

References

Adamopoulos, Tasso, and Diego Restuccia. "Land reform and productivity: A quantitative analysis with micro data." American Economic Journal: Macroeconomics 12, no. 3 (2020): 1-39.

Bird, Julia, and Anthony J. Venables. "Land tenure and land-use in a developing city: A quantitative spatial model applied to Kampala, Uganda." Journal of Urban Economics 119 (2020): 103268.

Bu, Di, and Yin Liao. "Land property rights and rural enterprise growth: Evidence from land titling reform in China." Journal of Development Economics 157 (2022): 102853.

Chari, Amalavoyal, Elaine M. Liu, Shing-Yi Wang, and Yongxiang Wang. "Property rights, land misallocation, and agricultural efficiency in China." The Review of Economic Studies 88, no. 4 (2021): 1831-1862.

Fang, Min, Libin Han, Zibin Huang, Ming Lu, and Li Zhang. Place-based Land Policy and Spatial Misallocation: Theory and Evidence from China. Working Paper. 2023.

Han, Sun Sheng, and Wenqi Lin. "Transforming rural housing land to farmland in Chongqing, China: The land coupon approach and farmers' complaints." Land Use Policy 83 (2019): 370-378.

Hao, Tongtong, Ruiqi Sun, Trevor Tombe, and Xiaodong Zhu. "The effect of migration policy on growth, structural change, and regional inequality in China." Journal of Monetary Economics 113 (2020): 112-134.

He, Zhiguo, Scott Nelson, Yang Su, Anthony Lee Zhang, and Fudong Zhang. "Zoning for Profits: How Public Finance Shapes Land Supply in China." (2023).

Henderson, J. Vernon, Dongling Su, Qinghua Zhang, and Siqi Zheng. "Political manipulation of urban land markets: Evidence from China." Journal of Public Economics 214 (2022): 104730.

Hsieh, Chang-Tai, and Enrico Moretti. "Housing constraints and spatial misallocation." American Economic Journal: Macroeconomics 11, no. 2 (2019): 1-39.

Li, Lingyue, Zhixin Qi, Shi Xian, and Dong Yao. "Agricultural land use change in chongqing and the policy rationale behind it: A multiscale perspective." Land 10, no. 3 (2021): 275.

Jia, Junxue, Xuan Liang, and Guangrong Ma. "Political hierarchy and regional economic development: Evidence from a spatial discontinuity in China." Journal of Public Economics 194 (2021): 104352.

Saiz, Albert. "The geographic determinants of housing supply." The Quarterly Journal of Economics 125, no. 3 (2010): 1253-1296.

Yu, Yue. "Land-Use Regulation and Economic Development: Evidence from the Farmland Red Line Policy in China." Job Market Paper, Columbia University (2019).

Appendix

A Additional Figures

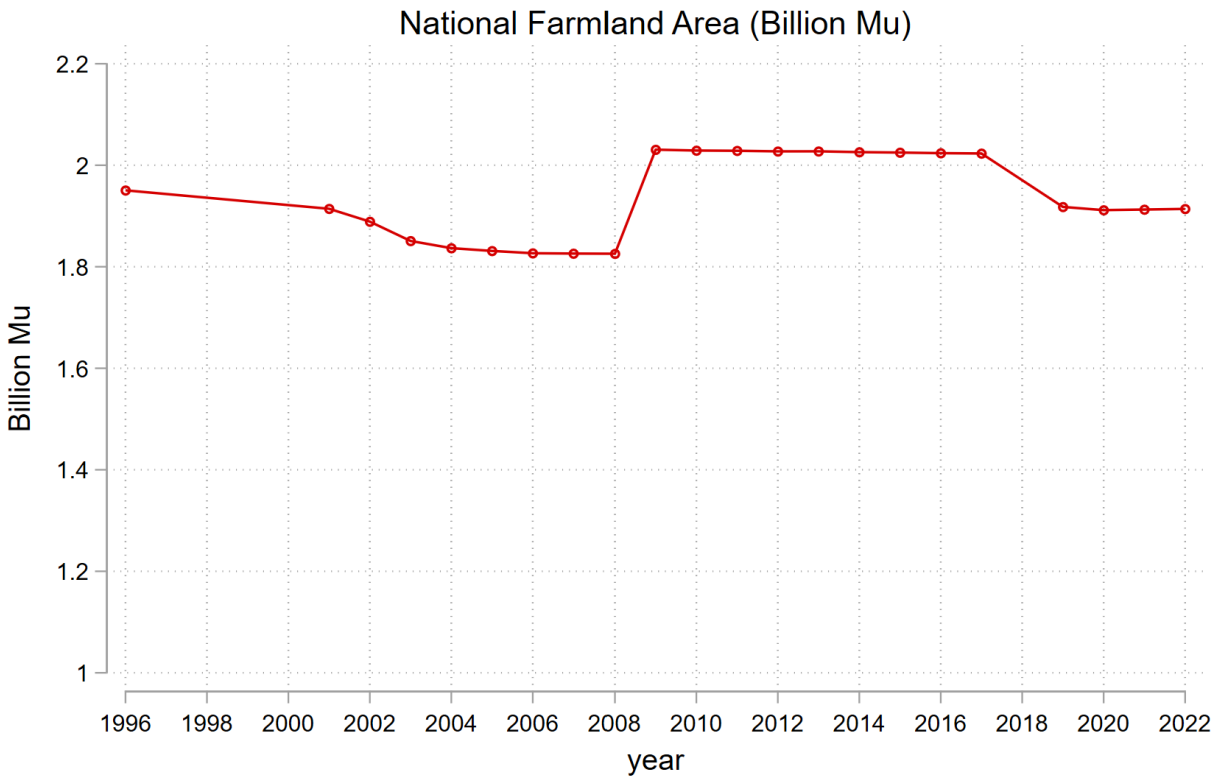
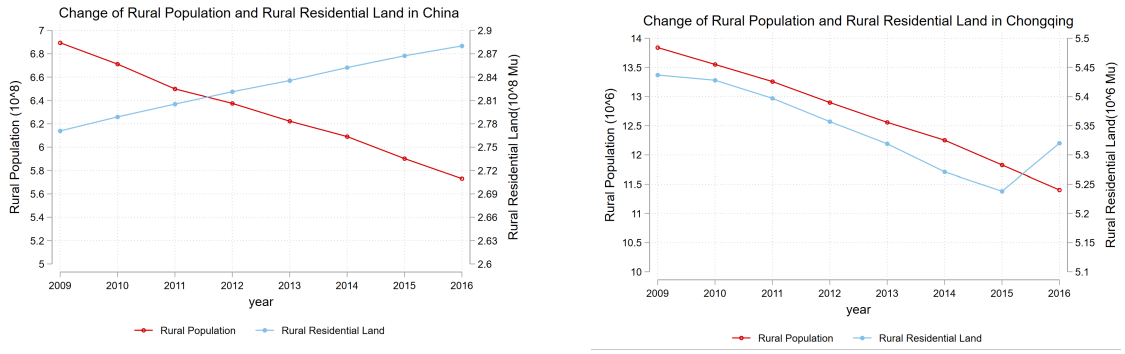


Figure A1: National Farmland Area (Billion Mu) 1996-2022



(a) China (b) Chongqing

Figure A2: Rural Population and Rural Residential Land

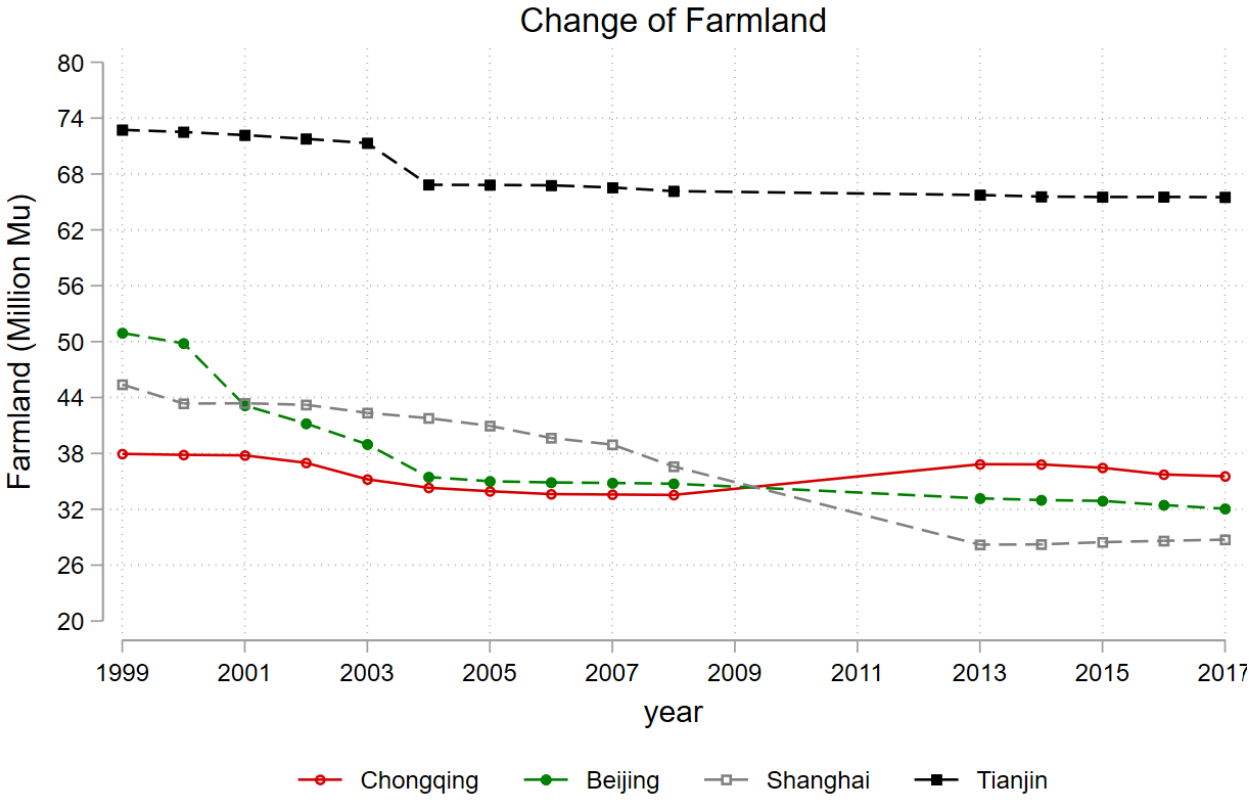
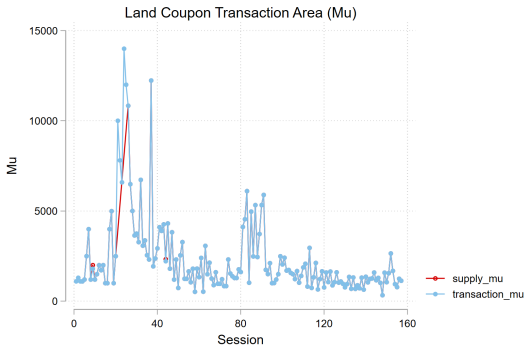
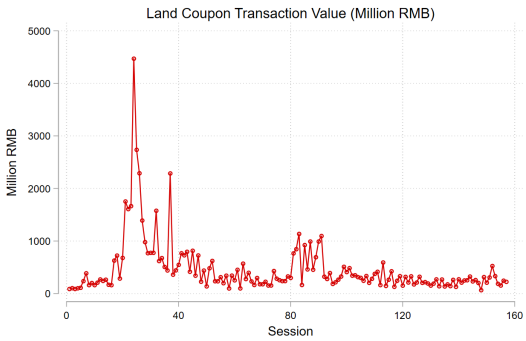


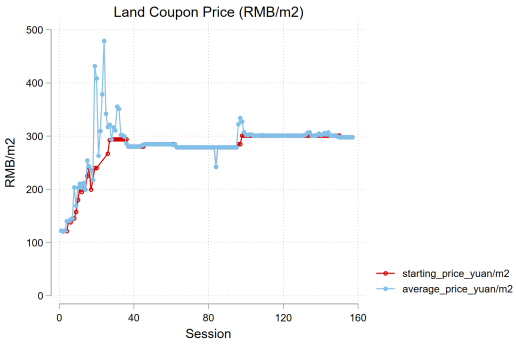
Figure A3: Change of Farmland in municipalities



(a) Transaction Area by Session



(b) Transaction Value by Session



(c) Transaction Price by Session

Figure A4: Land Coupon Transaction by Session

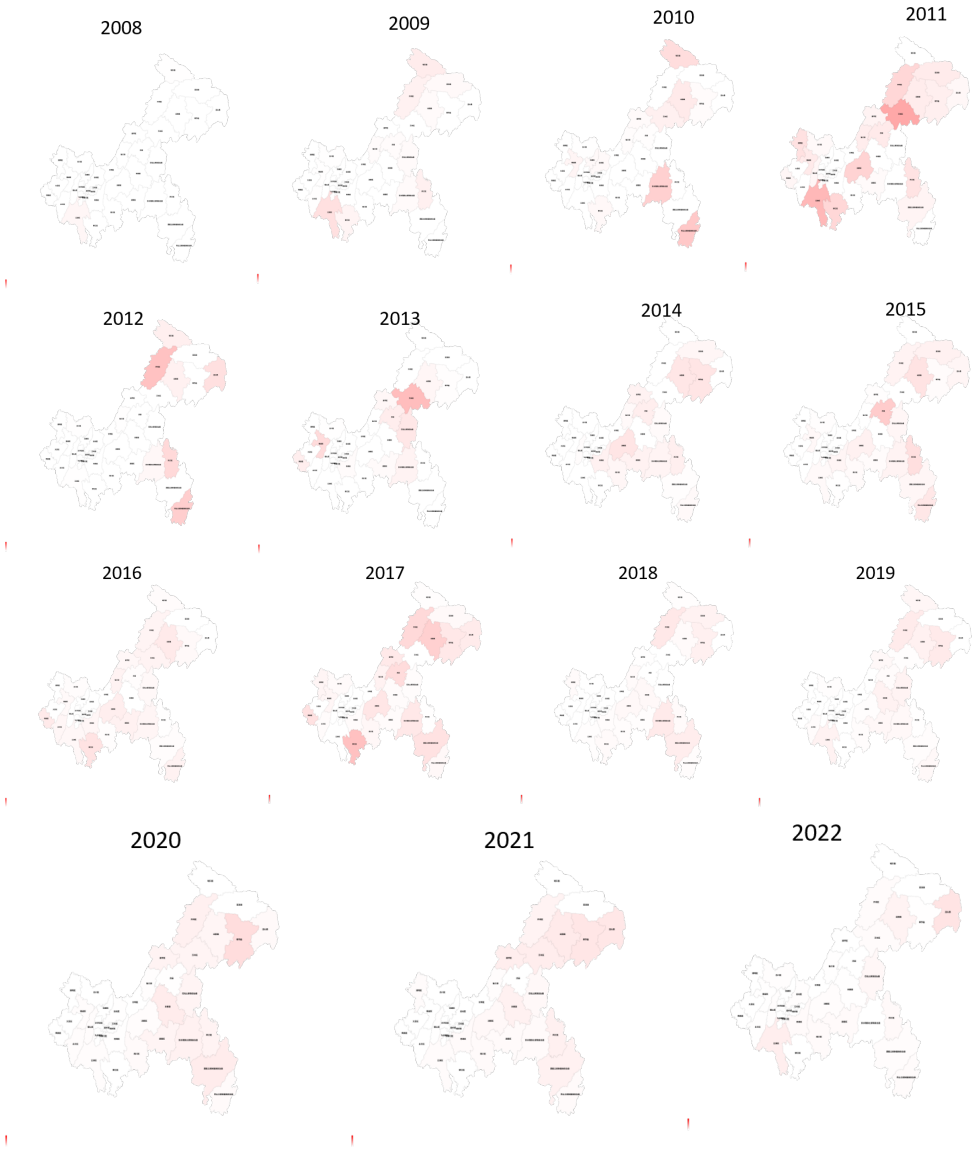


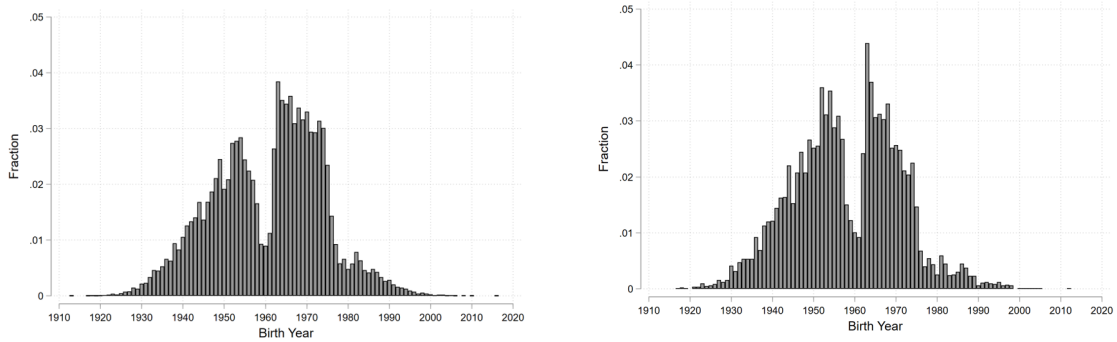
Figure A5: Supply of Land Coupon across Counties in each Year

Descriptive Statistics

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Area of reclaimed land (m2)	29,735	302.8	149.5	2	2,586
Compensation (Yuan)	29,735	63,428	31,347	418.8	543,984
Birth year	29,735	1961	13.23	1913	2016
Gender (female=1)	11,353	0.154	0.361	0	1

Note: This Table reports basic characteristics of suppliers of land coupons. Data is from 2021 compensation for land coupon sales.

Figure A6: Summary Statistics of Suppliers of Land Coupons



(a) using 2021 Payment Data (b) using 2022 Payment Data

Figure A7: Birth Year Distribution

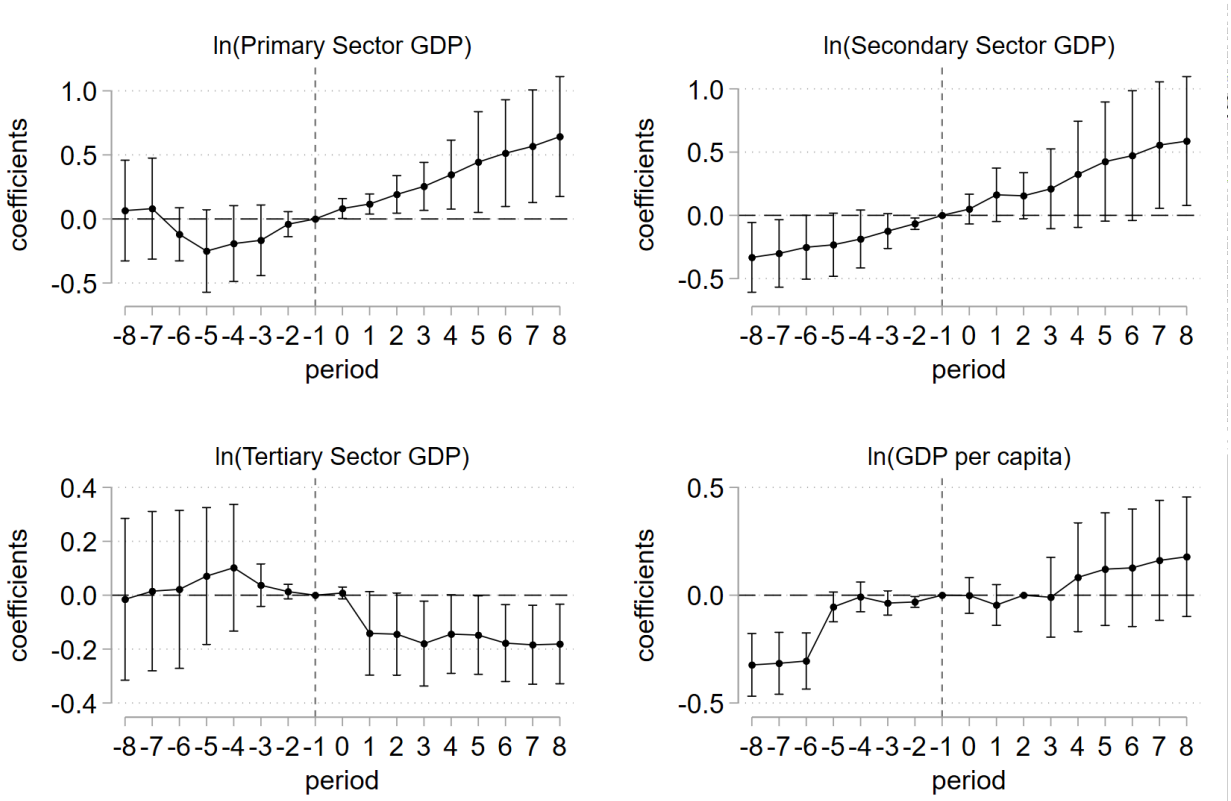


Figure A8: Parallel Trend Test for Local Economic Development

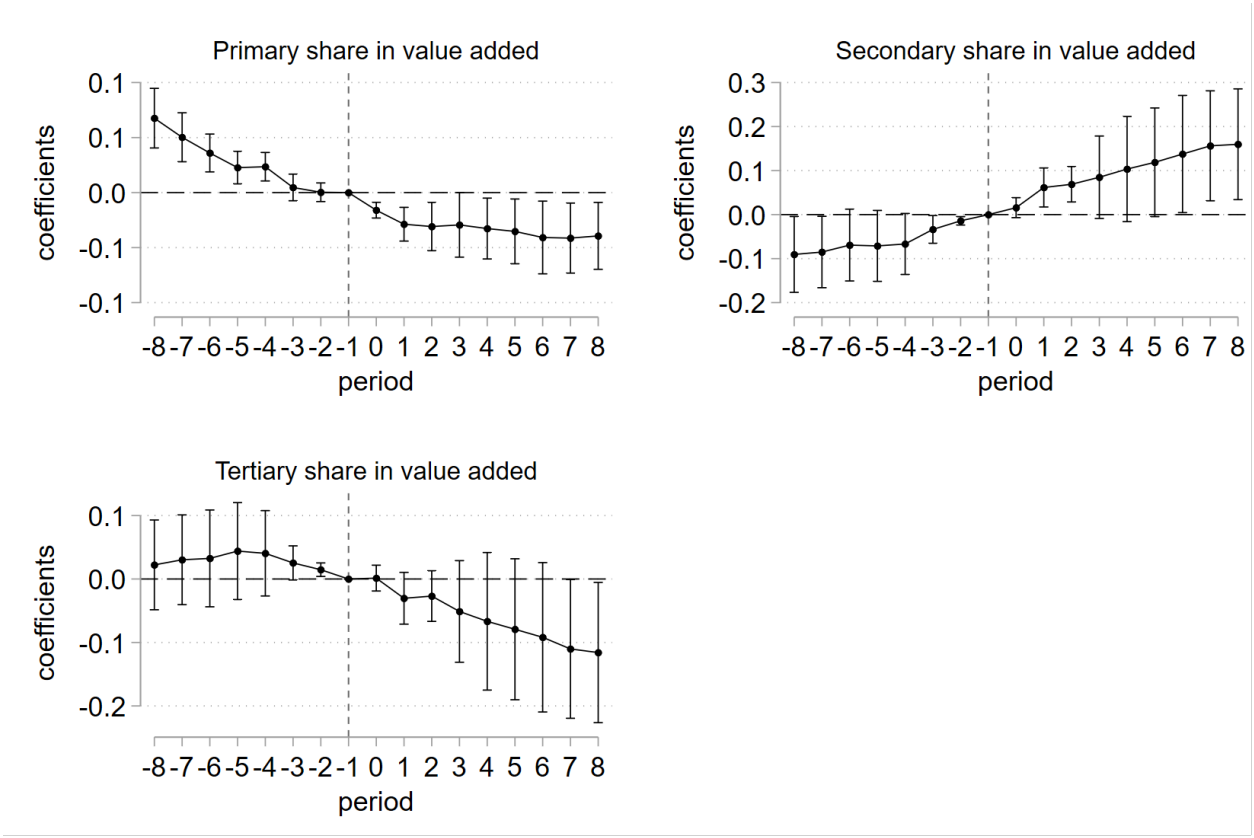


Figure A9: Parallel Trend Test for Structural Change

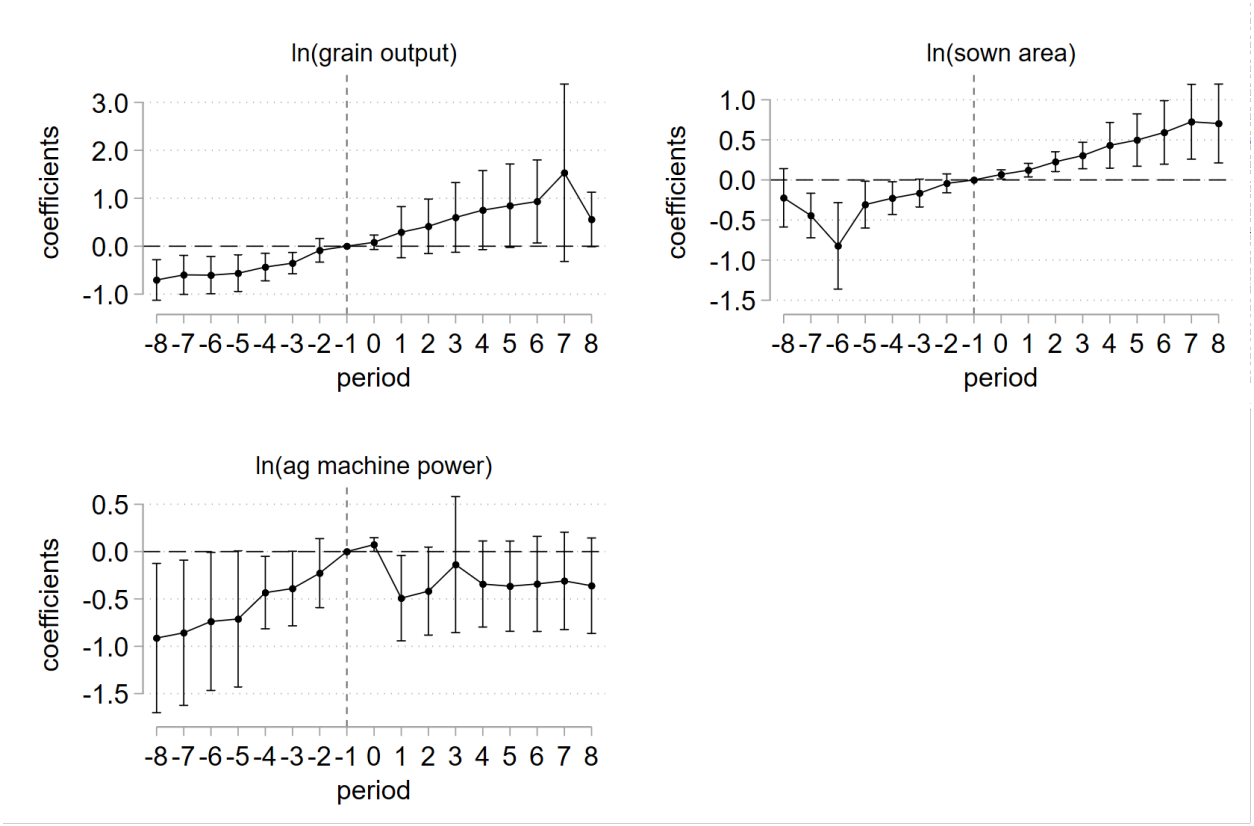


Figure A10: Parallel Trend Test for Agricultural Output