

Fiscal decentralization, local government competition and farmland conversion in China: the co-integration analysis and the GMM estimation based on the inter-provincial panel data

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Abstract: Based on the Chinese provincial panel data from 1995 to 2008, using the panel co-integration method, this paper presents an empirical study on the long-term equilibrium relationship between the fiscal decentralization, the local government competition and the farmland conversion. On this basis, establishing the dynamic panel data model, using the generalized method of moments (GMM) to analyze the dynamic impact of the fiscal decentralization and the local government competition on the farmland conversion from the view of three cross-regional groups and the mainland China. The results show that there is a long-run co-integration relationship between the fiscal decentralization, the farmland conversion and the local government competition, and also there is a positive significant influence of the fiscal decentralization and the local government competition on the farmland conversion, a 1% increase in the degree of fiscal decentralization will increase the area of farmland conversion by 0.3280%. In addition, there is a significant difference of the incentive effect of local government competition on the farmland conversion in different regions. The paper ends with policy suggestions for perfecting the system of the fiscal decentralization, taxation and the division of responsibility and authority, reforming the criterion of the political achievement assessment, strengthening the management of land revenue, reducing the reliance of the local government on land finance; at the same time, the farmers' land property rights should be perfected.

Key words: farmland conversion, fiscal decentralization, panel data, China

With the rapid development of industrialization and urbanization, the scale of the farmland conversion is continuously expanding, and this raises concerns about the issues such as the urban sprawl (Wei 1993; Freeman 2001; Johnson 2001), environmental degradation in suburban areas (Wang 2004; Zhang et al. 2007a), the loss of open space (Wasilewski and Krukowski 2004) and food security (Yang and Li 2000; Tan et al. 2011). All these problems make the farmland conversion an important topic in China and many other countries in the world. In order to control the scale of the farmland conversion, the Chinese government has attempted some reforms on the land resource management since the middle of the 1980s, and has introduced several measures to preserve farmland since the 1990s, but it is still struggling with how to effectively govern the land use, develop a market system for the farmland conversion, and to control the illegal farmland conversion (Lin and Ho 2005).

With respect to the farmland conversion, the existing literature has deeply analyzed the driving mechanism, impact on food security and ecological environment, regulation and control measures. Some scholars' findings indicated that the urban expansion is associated with the foreign direct investments and the relative rates of productivity generated by land associated with agricultural and urban uses, and this also suggested that the large-scale investment in industrial development, rather than the local land users, play the major role in the farmland conversion (Seto and Kaufmann 2003). Anke and John (2007) examined the optimal choice of land conversion where values, in a social welfare function, are attached both to the consumption of a private good and the uncertain biodiversity benefits arising from the unconverted land. Deng et al. (2006) use satellite images to examine the changes of the area of cultivated land and its potential agricultural productivity in China. They found that between 1986 and 2000, China recorded

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a net increase of the cultivated land (+1.9%), which almost offset the decrease in the average potential productivity, or bio-productivity (−2.2%). Therefore, they concluded that the conversion of cultivated land has not hurt the China's national food security. Li et al. (2012) use multi-level modelling techniques to examine how the socioeconomic and policy factors at different administrative levels affect the cultivated land conversion across three time periods, 1989–1995, 1995–2000, and 2000–2005. The results show that at the county level, both the urban land rent and urban wages contribute to the total cultivated land conversion.

Actually, when pursuing economic growth, if the farmland protection has been ignored, some issues would inevitably be aroused such as the food crisis, ecological security and poverty disparity, contrarily, this will affect the sustainable development of the economy and society. The “edge ball” behaviour of the local government and the game behaviour in the gray belt remain incessant after the repeated prohibition, although Chinese government has carried out the most rigorous system for the farmland protection, for example, the land leasehold system and the construction of the development zone, induced the excessive losses of the farmland conversion. The reason for this phenomenon is, to some extent, the farmland conversion accord with the economic interest pursuit of the local government under the current institutional system arrangement (Tan et al. 2009). Actually, since the reform of the tax distribution system in 1994, the objective of the farmland conversion for the central and local government has disaccorded, and this is the reason for the emergence of the land finance. Land grant has been an important source of the local government income. In 2007, the total fee of the land grant in China has reached RMB 1200 billion, accounting for 51% of the financial revenue of the local government, and even more in some areas of China. Are there any internal relationships between the long-standing existence of all above problems and the institutional arrangement, system framework in the transitional China? The fiscal decentralization and the local government competition, as the two important characteristics of the current institutional system in China, what are the effects of the two important characteristics on the farmland conversion? And is there any regional difference regarding the effect? These are all realistic problems that must be faced in the process of solving the farmland conversion.

Answers to the above questions are critical for China to be able to formulate the appropriate policies that can ensure both food security and a high

economic growth in the coming decades, and to our knowledge, no studies have analyzed until now the joint impact of fiscal decentralization and the local government competition on the farmland conversion in the transitional China. The objective of this paper is, therefore, to examine the inherent logical relationship between the fiscal decentralization and the local government competition on the farmland conversion in the transitional China, and to analyze the regional difference. To reach this objective, with the inter-provincial panel data, firstly, we employ the method of co-integration analysis to empirically verify the long-run equilibrium relationship between the fiscal decentralization and the local government competition on farmland conversion, based on this, to establish the model of dynamic panel data, we employ the method of system generalized moment estimation to analyze the dynamic impact of the fiscal decentralization and the local government competition on the farmland conversion.

THEORETICAL ANALYSIS AND HYPOTHESIS

Although the fiscal decentralization has a positive impact on the government quality (Cheung 2008; Andreas and Oriol 2011), for example, in China, the reform of fiscal decentralization in 1994 has solved the problems caused by the system whereby local authorities take a full responsibility for their finances. At that time, the ratio of the central finance revenue to the state revenue has enhanced from 22% to 55.7%, whereas the ratio of the local fiscal revenue decreased by 30%. The fiscal decentralization has changed the distribution pattern of financial power between the central and local government, however, the administrative power has not been adjusted and the re-division, this brought about the emergence of price scissors of revenues and expenditures for the local finance.

On the one hand, the local governments face the huge gap between the revenue and expenditure of finance, but on the other hand, local governments have no tax autonomy, and also no right to issue bonds, at the same time, the share of the land grant fee between the central and local government has become the exclusive possession of the government, and developed into the fixed income of the local government (Tao et al. 2007). In order to keep the balance between the revenues and expenditures of the local finance, the local government has a stronger motivation for seeking an extra-budgetary fiscal revenue, the land grant fee has become the mainly

source for the extra-budgetary fiscal revenue of the local government. It was a common sense that the land finance is the second main source of the fiscal revenue, and its immediate impact is the fiscal decentralization. For example, from 1987 to 2004, about one third of the decline of farmland is associated with the fiscal decentralization directly or indirectly (Li and Wu 2007).

In the process of land expropriation, apart from those unfavourable environmental effects, the rapid urbanization has also brought about tremendous challenges to human society (Wang et al. 2010). One of the challenges is the government competition. The local government has a very strong competitive ability, compared with the central government, it has the advantage of information; compared with the farmer, it has the dominance of power. The local government expropriates the farmland at a lower price, and then sells it for the commercial purpose at a higher price. In this process, the local government obtains high land revenue by the price scissors, and this makes up for the fiscal deficit of the local government, therefore, the fiscal decentralization usually being considered as a system tool that stimulates the local government to farmland conversion. The higher the extent of the fiscal decentralization is, the stronger is the incentive of the farmland conversion. Due to the difference of the economic development level and the degree of the fiscal decentralization in the East, Middle and West of China, this may result in the different behaviour choice of the local government about the farmland conversion. Therefore, there may be a regional difference about the impact of the fiscal decentralization on the farmland conversion.

The fiscal decentralization and the promotion incentive of local officials are the internal mechanisms that sustain the rapid economic growth in China (Fan et al. 2011); however, the premise of the mechanism to play a role is the competition between the local governments. Logically, if the expenditure of the local government is subject to the fiscal revenue under the background of decentralization, and then there is a stronger incentive for the local government to develop economy, and to impel the local government to compete for economic growth. On the other hand, the fiscal decentralization can cause the local government competition for economic growth, mainly because maintaining the political centralization and the ability of rewards and punishments for the local officials during fiscal decentralization (Xue 2011). The standards for the local officials' selection and promotion had changed from pure political indicators into the combination with the performance of economic development.

During the competition, the most valuable resource controlled by the local government is land, so in order to acquire the huge extra-budgetary revenue, the local government shows a very high enthusiasm regarding the farmland conversion, by this way, a higher rate of the GDP growth, huge fiscal revenues and an excellent official achievement are all obtained simultaneously.

Based on the above theoretical analysis, we put forward the hypotheses as follows:

Assumption 1: There is a significant positive correlation between the fiscal decentralization, the local government competition and the farmland conversion. The higher is the degree of the fiscal decentralization, the fiercer the competition of local government gets, and then this will result in the excessive loss of the farmland conversion.

Assumption 2: The effects of fiscal decentralization and local government competition on farmland conversion are closely associated with the economic resources endowments of three regions in China, i.e., there is a regional difference in the effect of the fiscal decentralization and the local government competition on the farmland conversion.

METHODOLOGY AND DATA

Methodology and model specification

Method of the panel co-integration test

According to the above theoretical analysis, and in combination with the purpose of this paper, we established the econometric model as following:

$$\text{LnFC}_{it} = \alpha_0 + \gamma_1 \text{LnFD}_{it} + \gamma_2 \text{LnLC}_{it} + \varepsilon_{it} \quad (1)$$

where the subscripts i and t stand for the province and year index, FC is the amount of the farmland conversion, α_0 denotes the constant term, FD presents the degree of the fiscal decentralization, γ_1 and γ_2 are the coefficients to be estimated, LC is the degree of the local government competition, ε is a stochastic error term which is in general allowed to be serially correlated.

The same as for the time series data, the panel data also has the temporal continuity and non-stationarity, therefore, it is inevitable for the spurious regression, unit root and co-integration to exist in the model of the panel data. So the research idea of this paper is, in this subsection, first, to examine the stability of the panel data and the uniformity of the integrated variables, second, employing the method of

co-integration, to examine the long-run equilibrium relationship between the variables.

(1) Panel unit root test

In order to evaluate the possible long-run relationship among the three variables, we need to first establish the order of integration of the variables. It is widely recognized that the time-series unit root tests may suffer from the low power, especially with the short spanned data (Pierse and Shell 1995). Hence, we will consider a more powerful panel approach to examine the degree of non-stationarity of these variables. We have used the panel unit root tests according to Im et al. (1997) and Maddala and Wu (1999).

Until now, there was not reached the consensus about the test method of the unit root for the panel data, mainly as follows: LLC (Levin-Lin-Chu) test, Breitung test, Hadri test, IPS (Im-Pesaran-Shin) test, Fisher-ADF test and Fisher-PP test, the first three tests are based on the same roots, the next three are based on different roots. Among the six tests, other tests are based on the null hypothesis of existing unit root except the Hadri test.

In order to improve the power of the test and to avoid the deviation induced by using only one test method, we synthetically employ the approach of the IPS test, the Fisher-ADF test and the Fisher-PP test to examine the panel unit root test.

(2) Panel co-integration test

Once the existence of the panel unit root has been established, the issue arises whether there exists a long-run equilibrium relationship between the variables. Given that each variable is integrated of order one, in this subsection, we test for the panel co-integration using the Pedroni's (1999) test that allows for heterogeneity in the co-integrating vectors and the dynamics of the underlying error process across the cross-sectional units and are estimated as residuals tests.

Pedroni (1999, 2000, 2004) has proposed seven different statistics to test the panel data co-integration, that is, to examine whether the error process of the estimated equation is stationary. Out of these seven statistics, four are based on pooling, what is referred to as the "Within" dimension, and the last three are based on the "Between" dimension. Both kinds of tests focus on the null hypothesis of no co-integration. However, the distinction comes from the specification of the alternative hypothesis. For the tests based on "Within", the alternative hypothesis is $\rho_i = \rho < 1$ for all i , while concerning the last three test statistics that are based on the "Between" dimension, the alternative hypothesis is $\rho_i < 1$, for all i .

To ensure the robustness of conclusions, in this paper, we will simultaneously employ the statistics based on "Within" and "Between".

GMM estimation based on the dynamic panel data model

In order to estimate the effects of the fiscal decentralization, the local government competition on the farmland conversion, we specify the following dynamic panel data model which includes the lagged dependent variable as an explanatory variable:

$$\text{LnFC}_{it} = \alpha_0 + \gamma_0 \text{LnFC}_{it-1} + \gamma_1 \text{LnFD}_{it} + \gamma_2 \text{LnLC}_{it} + \theta_1 \text{LnPGDP}_{it} + \theta_2 \text{LnURBAN}_{it} + \mu_i + \varepsilon_{it} \quad (2)$$

where the subscripts i and t stand for the province and year index, FC is the amount of the farmland conversion, α_0 denotes the constant term, FD presents the degree of the fiscal decentralization, $\gamma_0, \gamma_1, \gamma_2, \theta_1$ and θ_2 are the coefficients to be estimated, LC is the degree of the local government competition, both PGDP and URBAN are control variables, PGDP means per capita GDP and URBAN stands for the level of urbanization respectively, ε is a stochastic error term which is in general allowed to be serially correlated. μ_i is an unobserved municipal-specific effect ($E(\mu_i) = 0$), and ε_{it} is the disturbance term.

Several econometric problems may arise from estimating Equation (2). The first problem is that the explanatory variables FD and LC are assumed to be endogenous. The second is that the time-invariant provincial characteristics (fixed effects) may be correlated with the explanatory variables. The third is that the presence of the lagged dependent variable $\text{FC}_{i,t-1}$ in the regressor gives rise to autocorrelation.

Using the pooled OLS (Ordinary Least Square) to estimate Equation (2) may yield biased and inconsistent estimates. The GMM estimator proposed by Holtz-Eakin et al. (1988) and developed by Arellano and Bond (1991) is used to solve the above problems. The Arellano and Bond (1991) GMM estimator has several characteristics. First, to solve the problem of endogeneity, it employs the lagged values of the endogenous regressors as instruments. Second, it uses first-differences to remove the fixed effects. Third, to solve the problem of autocorrelation, the lagged dependent variable is instrumented with its past values.

In this paper, we use the augmented version of the Arellano-Bond estimator, the system GMM estimator, to estimate Equation (2). The Arellano-Bond system GMM estimator uses the levels equation to obtain a system of two equations: one differenced and one

in levels. By adding the equation in levels, additional instruments can be obtained, what usually increases efficiency (Arellano and Bover 1995; Blundell and Bond 1998). The software Eviews 6.0 is employed in this paper.

Data sources

In our empirical analysis, we use the annual time series data of 30 provinces and municipalities (the data for Tibet are not available for most years) in the mainland China from 1995 to 2008. The sample includes Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Hainan, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang. Among them, Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan are located in the Eastern China and Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang in the Western China, others are located in the Central China. Chongqing was upgraded to a municipality (provincial level) in the late 1990s, and so for the purpose of consistency throughout the whole study period, it is seen as a part of the Sichuan province in this paper.

All provincial data are from various years of the China Statistical Yearbook (State Statistical Bureau 1996–2009), China Finance Yearbook (Ministry of Finance P.R. China 1996–2009), China Land Yearbook (State Land Bureau 1995–1997), and the China Land and Resources Yearbook Online (Ministry of Land and Resources P.R. China 1998–2009).

All the variables are expressed in natural logarithms so that the elasticity can be interpreted. Since all the provincial data for the above variables reported in the Chinese Statistical Yearbooks are calculated at current prices, we adjusted every provincial GDP per capita data by considering the official price index.

Variable definitions

In this paper, in order to examine the impacts of the fiscal decentralization, the local government competition on the farmland conversion and their internal relationship, several variables are specified as follows.

The amount of the farmland conversion (FC) was presented by the reduction of farmland for construction. With respect to the index of the fiscal decentralization (FD), it was computed as the ratio between the per capita fiscal expenditure of every province and the per capita gross fiscal expenditure. The index of the local government competition (LC) was gauged by the per capita foreign direct investment (FDI) according to the previous research (Zhang et al. 2007b). Other control variables, such as the index of economic development and urbanization, are presented by the per capita GDP and the ratio of non-agricultural population to the total population, respectively.

ECONOMETRIC ANALYSIS: THE COINTEGRATION TEST BASED ON THE INTER-PROVINCIAL PANEL DATA

Panel unit root tests

In the panel data analysis, the panel unit root test must be taken first in order to identify the stationary properties of the relevant variables. There exist a number of methods for the panel unit root tests to ascertain the order of integration of the variables. In this study, we choose three panel unit root tests, namely the IPS test, the Fisher-ADF test and the Fisher-PP test¹, to enhance the robustness of the results. The results are presented in Table 1.

Table 1 displays the results of the panel unit roots tests in levels as well as in first differences for all the variables. From Table 1, all tests almost unanimously indicate that all the variables are non-stationary in their levels but become stationary after taking the first difference. Therefore, we may conclude that each variable is integrated of order one, i.e. $I(1)$.

Given that the variables are integrated of the same order, it is natural that we proceed by testing for the co-integration in order to establish if a long-run equilibrium relationship among the variables exists. This is done in the next subsection.

Panel co-integration tests

Once the existence of a panel unit root has been established, the issue arises whether there exists a long-run equilibrium relationship between the variables. In order to test for the cointegration among

¹IPS, Fisher-ADF and Fisher-PP represent the panel unit root tests of Im et al. (2003), Maddala and Wu (1999), respectively. The IPS, Fisher-ADF and Fisher-PP examine the null hypothesis of non-stationarity.

Table 1. Panel unit root tests results

	Variables	Level			First difference		
		IPS test	F-ADF test	F-PP test	IPS test	F-ADF test	F-PP test
Full samples	LnFC	1.4352 (0.2537)	8.3642 (0.3457)	3.4827 (0.5026)	4.8350** (0.0153)	10.3725*** (0.0725)	4.7366*** (0.0720)
	LnFD	-7.6354 (0.1726)	2.8235 (0.6372)	4.9356 (0.3216)	-9.1564** (0.0357)	-7.3246** (0.0289)	-6.4627* (0.0023)
	LnLC	-2.7253 (0.4536)	6.7513 (0.5128)	10.3452 (0.1372)	2.3765** (0.0377)	-6.4821* (0.0048)	-11.2673* (0.0053)
Eastern provinces	LnFC	8.5624 (0.2856)	-6.8235 (0.1637)	10.2771 (0.2545)	11.3862* (0.0046)	-15.6427* (0.0072)	8.5492** (0.0384)
	LnFD	12.5673 (0.1825)	-8.9246 (0.4263)	14.3562 (0.2465)	8.4628*** (0.0825)	-12.3725* (0.0053)	-6.5238** (0.0316)
	LnLC	-5.5643 (0.1826)	9.4372 (0.5234)	12.5238 (0.2673)	-11.7265*** (0.0725)	7.8634*** (0.0618)	16.8237** (0.0426)
Central provinces	LnFC	-6.3428 (0.3526)	5.8237 (0.1095)	-10.8364 (0.2736)	12.3824* (0.0028)	18.7284** (0.0346)	9.6258** (0.0419)
	LnFD	7.5326 (0.4085)	5.6473 (0.2716)	8.5326 (0.1637)	-14.6372** (0.0382)	7.6285* (0.0027)	9.6435*** (0.0725)
	LnLC	3.5927 (0.5028)	-4.6235 (0.6137)	7.6283 (0.3548)	6.3723* (0.0043)	-8.2054** (0.0267)	5.6372** (0.0416)
Western provinces	LnFC	11.2385 (0.3761)	7.3564 (0.2084)	5.3687 (0.1327)	15.3867** (0.0387)	6.3275** (0.0427)	11.5463* (0.0019)
	LnFD	-5.3728 (0.5037)	7.0360 (0.6527)	10.8235 (0.3816)	-4.5634* (0.0028)	8.0561* (0.0076)	11.6613** (0.0418)
	LnLC	12.0672 (0.2694)	8.2716 (0.3147)	9.5162 (0.2056)	14.5516*** (0.0657)	-8.7429** (0.0416)	9.6515** (0.0185)

Probability values are in parenthesis

*, **, *** indicate rejection of the null hypothesis of no co-integration at 1%, 5%, and 10% level of significance, respectively

the variables, we employed the heterogeneous panel co-integration test proposed by Pedroni (1999, 2004). Table 2 presents the results of the panel co-integration tests.

It can be seen from Table 2 that in the whole mainland China and three regions, there are four panel

statistics ("within" dimension) reject the null hypothesis of no co-integration and only one statistic admits that in Central China, there is no co-integration between the variables, i.e. the panel ν -statistic. In the group co-integration tests, three group statistics ("between" dimension) reject the null hypothesis,

Table 2. Panel co-integration tests

Statistics	Full samples	Eastern provinces	Central provinces	Western provinces
Panel ν	-1.5728** (0.0354)	2.1536*** (0.0756)	-0.5628 (0.1238)	3.5025*** (0.0726)
Panel ρ	3.2716** (0.0266)	0.5372** (0.0372)	2.6430** (0.0436)	-8.0361** (0.0414)
Panel PP	-2.6415** (0.0405)	-4.6127* (0.0042)	4.5215** (0.0215)	2.6133** (0.0382)
Panel ADF	-4.3524* (0.0032)	-6.3725* (0.0027)	-3.7624* (0.0037)	4.8245** (0.0128)
Group ρ	1.6053*** (0.0716)	4.2618** (0.0465)	1.8979*** (0.0812)	-2.6722 (0.2147)
Group PP	5.5728** (0.0375)	5.1635** (0.0373)	5.3782** (0.0366)	5.2918*** (0.0615)
Group ADF	-6.2473* (0.0024)	3.5144** (0.0216)	-7.2615* (0.0016)	-3.6124** (0.0342)

Probability values are in parenthesis

*, **, *** indicate rejection of the null hypothesis of no co-integration at 1%, 5%, and 10% level of significance, respectively

with the exception of one in the Western China which admits it. However, the Panel ADF-statistic and the Group ADF-statistic mostly strongly reject the null of no co-integration significantly at less than 5% critical values. With the findings in the Monte Carlo simulation experiments, Pedroni (1999, 2004) showed that the panel ADF-statistic and the group ADF-statistic tests have better small-sample properties than the others, and most of the statistics support the existence of the co-integration relationship, it may be reasonable to accept the existence of co-integration relationship.

Hence we generally obtain a strong evidence of co-integration among these series. Thus, it can be predicted that the fiscal decentralization, the local government competition and the farmland conversion variables move together in the long-run. Thus, there is a steady-state relationship among the variables in the sample of 30 provinces and municipalities. The next step is to estimate this relationship.

ECONOMETRIC ANALYSIS: GMM ESTIMATION BASED ON DYNAMIC PANEL DATA MODEL

Although Pedroni's methodology allows us to test the presence of co-integration, it cannot provide an estimation of the long-run relationship. The simplest methodology, which is more suitable for the cross-sectional than for the data analysis, is the pooled OLS estimation. However, the panel data with co-integration cannot be estimated by this method, because with the panel data, obvious bias of regressors will be induced by the potential endogeneity and the serial correlation from regression variables. According to

the method mentioned in the section Methodology and data, eliminating the cross-section individual effects through the difference transformation, and selecting the White matrix as the weighted one, we employ the Two-Step SYS-GMM to estimate for the dynamic panel data model. Estimation results are displayed in Table 3.

Model estimation results

From the statistics of the regression test, it can be seen that the test results of Sargan indicate non-rejection of the null hypothesis, that excessive identification restriction is effective, the instruments selected are effective, that is, there is no correlation between the instrument variable and the error term; The AR (2) test indicates that the residual after first difference does not have the second order autocorrelation, i.e. the dynamic panel data mode is reasonable.

Analysis for full samples

Estimation results of Table 3 indicate that the coefficients of the Lagged FC (lag = 1) is positive and statistically significant at the 5% significance level, the coefficient is 0.029, showing that the persistence of farmland is an issue of concern, given the variables are expressed in natural logarithms, the coefficients can be interpreted as elasticities, i.e. a 1% increase in area of farmland conversion in prior period will increase the area in the current period by 0.1325%. This implies that the phenomenon of the farmland conversion has a biggish inertia. This also indicates that it is very necessary to choose the dynamic panel

Table 3. Estimation results of the SYS-GMM for Equation (2) (two-step)

Independent variables	Full samples	Eastern provinces	Central provinces	Western provinces
Constant	10.3605** (2.5726)	14.3370*** (1.5273)	8.5267*** (1.2927)	13.5267*** (1.4860)
LnFC_{it-1}	0.1325** (2.9718)	0.1655** (3.7139)	0.0938*** (1.8271)	0.1758** (3.4356)
LnFD_{it}	0.3280* (6.2750)	0.3860* (5.5843)	0.3429** (3.4075)	0.3127** (3.7935)
LnLC_{it}	0.2096** (3.1974)	0.1477*** (1.6346)	0.1286* (7.2815)	0.0855** (2.9467)
LnPGDP_{it}	0.1377* (7.6527)	0.0728** (3.2345)	0.1250** (3.8246)	0.0629** (3.2716)
LnURBAN_{it}	0.0794** (2.7023)	0.1157** (3.7563)	0.0872* (6.7164)	0.0985 (0.8625)
<i>P</i> -value of Sargan test	0.6513	0.5038	0.4125	0.7254
<i>P</i> -value of AR (2) test	0.5427	0.4599	0.6230	0.3285
Number of observations	420	168	126	126

t-statistics are in parenthesis

*, **, *** indicate statistical significance at the 1%, 5%, and 10% level respectively

data model which includes the lagged dependent variable as an explanatory variable.

As expected, the coefficient of the FD is positive and statistically significant, indicating that the higher the degree of the fiscal decentralization, the stronger is the incentive of farmland. The coefficient of the FD is 0.3280 with the level of statistical significance of 1%, indicating that a 1% increase in the degree of the fiscal decentralization will increase the area of the farmland conversion by 0.3280%. There is also a positive correlation between the variable of the local government competition and the farmland conversion, the coefficient is statistically significant at the 5% level. Under the administrative system which combines the economic decentralization with the political centralization, the economic indicators, such as the economic growth, tax, are generally regarded as the assessment criterion for the local officials by the central government. This stimulates the local government to obtain the rapid growth of economy and the extra-budgetary fiscal revenue. At the same time, in order to derive the advantages from the competitors, the local government inevitably grants land at a lower price, this to some extent stimulates the enthusiasm for the farmland conversion. All above verifies the hypothesis I.

Other control variables, such as the urbanization and the per capita GDP, also are positive and statistically significant at the 5% and 1% level, respectively.

Analysis for three regions

Empirical results of Table 3 show that, in three regions, the amount of the farmland conversion has positive and significant effect on the amount of the prior period. In the Eastern China, a 1% increase in the degree of the fiscal decentralization will increase the area of the farmland conversion by 0.3860%, and the coefficient is statistically significant at the 1% level; in the Central China, a 1% increase in the degree of the fiscal decentralization will increase the area of the farmland conversion by 0.3429%, and the coefficient is statistically significant at the 5% level; in the Western China, a 1% increase in the degree of the fiscal decentralization will increase the area of the farmland conversion by 0.3429%, and the coefficient is statistically significant at the 5% level. From the above results, it can be seen that there is a regional difference in the effect of the fiscal decentralization on the farmland conversion, the order is as follows: East > Central > West. This can be explained from two aspects as follows: firstly, from the viewpoint of the stage of economic development and financial

resources, there is a huge difference between the Eastern provinces and the others in China. Eastern regions in China have entered the mid-term of the industrialization; Western regions in China are at the early stage of industrialization. In the Eastern China, land market is comparatively perfect, the price of land is higher relatively compared to others regions, so it is more attractive for the local government in Eastern China to obtain the land grant fee via the procedure of "expropriation – remise". Secondly, the Middle and Western regions, especially the minority regions, can often obtain the national transfer payment income, the infrastructure investment and a special financial subsidy, together with the low price of land granting, under the system of the fiscal decentralization, the Central and Western regions have less incentive for the farmland conversion than the Eastern regions.

Due to the significant differences of regional economy, the resources endowment and the industrial structure, there is a significant difference of the incentive effect of the local government competition on the farmland conversion in different regions. From the empirical results, it can be seen that there is a positive correlation between the local government competition variable and the farmland conversion in three regions of China. The coefficients of the local government competition all pass the significance test. With respect to the importance of the effect, the order is as follows: East > Central > West. For this, the main reasons are as mentioned above.

As to other control variables, all are statistically significant at the 1% or 5% level except the variable of urbanization in the Western regions; however, there is a regional difference in the effect of control variables on the farmland conversion.

CONCLUSIONS AND POLICY IMPLICATIONS

In this paper, we have examined the relationships between the fiscal decentralization, the local government competition and the farmland conversion in China based on the panel dataset comprised of 30 provinces in the China mainland from 1995 to 2008, employing the panel unit root test, the co-integration test and the system GMM developed recently, which have the advantage of a higher power and a more robust conclusion, since the time series data may yield unreliable and inconsistent results with the short time spans of the typical datasets. Furthermore, we investigate not just the whole economy but rather three groups of provinces, the Eastern China, the Central China and the Western China provinces. To deal with

the problem of endogeneity, we employ the dynamic panel data models to estimate the dynamic effects of the fiscal decentralization, the local government competition on the farmland conversion.

The empirical results show that there is a long-run co-integration relationship between the fiscal decentralization, the farmland conversion and the local government competition, and also there is a positive significant influence of the fiscal decentralization and the local government competition on the farmland conversion, in addition, Due to the significant differences of the regional economy, resources endowment and the industrial structure, there is a significant difference of the incentive effect of the local government competition on the farmland conversion in different regions.

Based on the empirical findings above, some policy implications can be drawn from this study. First, the system of the fiscal decentralization, taxation and the division of responsibility and authority should be gradually perfected. According to the objective factors and statutory formula, in order to reflect the function of balancing the financial capacity regional difference of transfer payment, the central government should design a reasonable amount of transfer payment, and enable to abate the incentive effect of the fiscal decentralization on the farmland conversion. In addition, it is necessary to establish the stable local tax system and to re-design the administrative power division between the central and local government.

Second, it is necessary to reform the criterion of the political achievement assessment; to strengthen the supervisory control and constraints for the local government behaviour. In order to reach the above goals, it is necessary to adjust the evaluation mechanism for the officials' promotion, gradually weaken the important role of the GDP growth in the evaluation system. At the same time, the incentive target should be changed from the single dimension of economy into a multi dimension including the economy, society, culture and so on, realizing the inclusive growth. In addition, in order to restrict the behaviour of the local government, it is vital to establish the local governance mechanism that needs to strengthen the accountability for the local people, and make the horizontal supervision to become the beneficial complement for the longitudinal supervision.

Finally, strengthening the management of the land revenue, reducing the reliance of the local government on the land finance is also necessary. At the same time, the farmers' land property rights should be perfected, and this will increase the cost of the local government for the farmland conversion. As to the

fee of the land grant, the central government should be allowed to share in the land revenue with the local government, to weaken the motivation of the local government for the land revenue. A certain amount of the land revenue should be taken which would be used for the landless farmers' endowment insurance and dominated by the government of the next term. Furthermore, in the process of the farmland protection, farmers should be endowed with the complete land property rights, so it follows that, in order to obtain the huge fee of the land compensation, farmer will be the main factors of the farmland protection.

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