

SPATIAL DIFFERENTIATION OF LAND TRANSFER —Case Study of Shanghai, Nanjing and Taizhou in Changjiang River Delta

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ABSTRACT: The policy of land transfer has greatly influenced the macro economy of China with the commencement of another innovation of land use system. Therefore, it is urgent to put forward some rational and feasible suggestions for local government to manage the market of land transfer. Moreover, it is important in the field of study on agricultural land use change to analyze the spatial differentiation and structural specification of land transfer, which are caused by rural households' behavior. This paper selected 11 factors covering four aspects of rural households' family structure, family location, family income structure and the natural quality of land resources, all of which influence the behavior differentiation of rural households, to establish the index model indicating spatial differentiation of land transfer. Results show that the spatial differentiation of land transfer can be divided into four degrees and three categories through analyzing rural households' questionnaires from Shanghai, Nanjing and Taizhou in the Changjiang (Yangtze) River Delta. Since up to 80% of rural households belong to middle degrees, it can be concluded that the rural land market develops evenly in the study areas. And it is also indicated that the natural quality of land resources and the maximum income of rural land are most important factors influencing the spatial differentiation of land transaction. Considering different factors, the countermeasures can be carried out to enhance the spatial differentiation of land transfer so as to promote economic development and social security of rural China. All in all, both micro-factors and macro-factors influencing rural households' behavior of rural land transfer should be taken into account in order to make spatial differentiation and structural specification of rural land transfer notable.

KEY WORDS: land transfer; spatial differentiation; land transaction; Changjiang River Delta

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1 INTRODUCTION

It is one of important issues in the field of geographical science to analyze the spatial differentiation of regional phenomenon. The research on spatial differentiation can be cast back to Thunen's agricultural location theory. Afterwards, many scholars developed the theory and paid more attention to the law and forming mechanism of spatial differentiation of some phenomena including inhabitation structure, population variation, environmental elements, rural development, and so on (FUMIO and KOMEI, 2000; DANIEL and MANFRED, 2002; WU and CUI, 1999; GU, 1997; XIU and WANG, 2003; WU et al., 2002; LIU, 2002; ZHUO et al., 2002; WU et al., 2000). As an effective method of allocating regional land resources, the mode and scale for transfer of agri-

cultural land-use rights show remarkably spatial differentiation under the influence of both government's macro-management policies and rural household' micro-behavior (KUNG, 2002; HUANG et al., 2000; FANG et al., 2004). Therefore, the study on the spatial differentiation of land transfer will make great influence on many aspects such as adjustment of regional land-use structure, development of agriculture, improvement of rural households' income, harmony of rural society, and so on, especially under the background of macro socio-economic development.

It is also very significant to analyze spatial differentiation for enforcing and realizing the strategy of sustainable development, because disequilibrium of regional development will lead to appearance of spatial differentiation phenomenon. Rural households' behavior of land

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transfer plays an important role in the change of agro-land use structure and rural stability and development. Concretely, the market differentiation process of land transfer space can be illustrated by the relationship between typical macro-economy background and rural households' behavior.

In brief, there is a series of different land transfer markets in one region. And they can reflect regional land transfer structure and space directly because of their regional characteristics (HU and ZHAO, 2002; JIANG, 2004; LIU, 1999a, 1999b, 1999c; NI and LIU, 1999). The spatial structure of each land transfer market is affected by behavior of decision-makers and policies of governments' land management departments. Rural households' behavior is different because of different life cycle, life experience, social class, and so on, and such different behavior will decide the structure of land transfer effectively. Land transfer is therefore the result of such intertwined factors. The micro-factors include land use change, structure of rural households' occupation, change of families' income structure, rural households' spatial cognizance, and so forth. So the study on the spatially differentiating process of land transfer market can

be carried out from the aspect of rural households' groups. Rural households' daily decision processes make their different access to land resources. Through studying the process, the spatial differentiation mechanism of land transfer or rural households' differentiation can be explained. Reversely, by studying the inner mechanism, which forms or impedes the market differentiation of land transfer, the study on differentiation phenomenon of land transferred market will be deepened more.

As a kind of state-owned or collective-owned asset, land is a kind of special merchandise. Being land users, rural households often allocate their land among themselves, which makes small plots be transferred randomly. Thus, we can say that behavior of owners and managers, and the users of stated-owned land and collective land have great influence on the establishment and development of land transfer markets. It is shown that the inner mechanism of spatial differentiation of rural households' land is decided by government's macro-behavior (policies) of land management and rural households' micro-behavior (Fig. 1) (CHI, 2003; TAN et al., 2001; KONG et al., 2004).

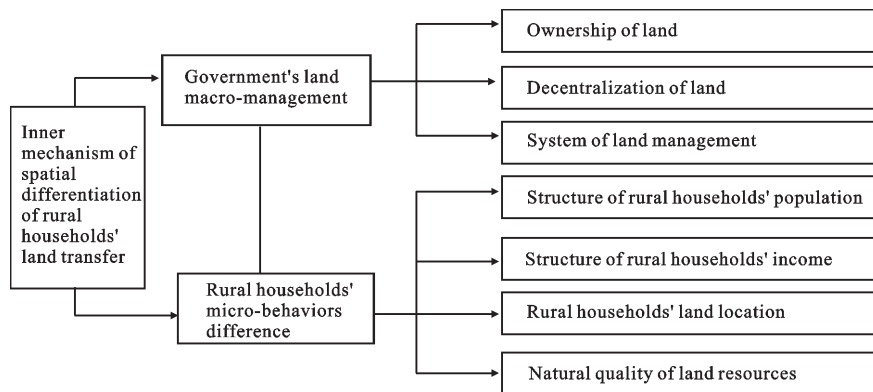


Fig. 1 Mechanism of spatial differentiation of rural households' land transfer

2 METHODOLOGY

Based on the inner mechanism of spatial differentiation of rural households' land transfer and considering the rural households' behavior theory studied by both regional economists and land economists at home and abroad, 11 factors of four categories indicating the spatial differentiation of land transfer are selected in this study (Fig. 2) (HU et al., 2005; FANG et al., 2003; TESFAYE and ADUGNA, 2004).

The first category factors can be subdivided two kinds: X_1 denotes the ratio of non-farm employment to total family population, which equals to the sum of non-farm

population and $1/6$ multiplying the sum of all part-time farm families' non-farm monthly number per year divided by total families; X_2 denotes rural households' education level: if he (or she) graduated from junior middle school or above, X_2 is equal to 1, otherwise, 0.

The second category factors can be subdivided three kinds: X_3 is farming income denoting net income of per unit area of land, which equals to the bias of the total product to the sum of land rent or land price and productive resources' price and labor's price and agro-tax; X_4 denotes the ratio of non-farm income to total family income, which equals to non-farm income divided by total family's income; X_5 denotes the Engle Coefficient, which

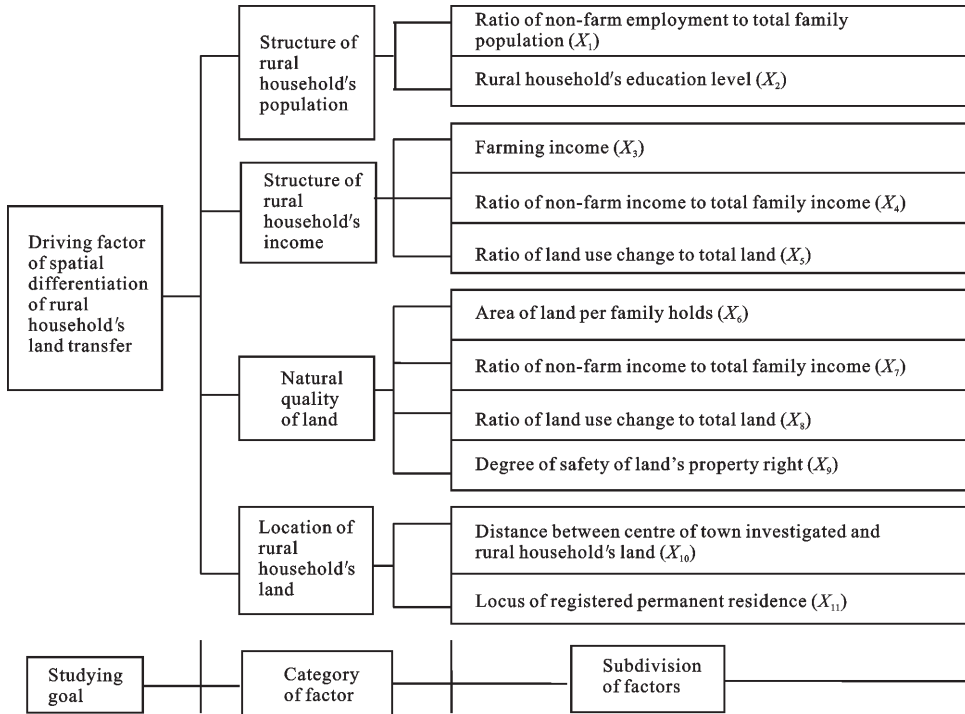


Fig. 2 Driving factor of spatial differentiation of rural household's land transfer

equals to family's consumption for food divided by total family's income.

The third category factors can be subdivided four kinds: X_6 denotes area of land per family holds, which equals to total family's area of land-contracted divided by family's population; X_7 denotes the ratio of land transferred to family's total land, which equals to the area of rural households' land transferred divided by total area of family's agro-land; X_8 denotes ratio of land use change to total land, which equals to the bias of the sum (family's current land area and land area outflow) minus land area inflow divided by the bias of land area outflow minus land area inflow; X_9 denotes the degree of safety of land's property right, which equals to 1 if land transfer is stimulated by government's policies, and 0 when land transfer is stimulated by market's request.

The fourth category factors can be subdivided two kinds: X_{10} denotes distance (km) between the centre of town investigated and rural households' land; X_{11} denotes locus of registered permanent residence, equaling to 1 for local resident, otherwise, 0.

Based on the above indexes, we can get an initial index matrix $X=(x_1, x_2, \dots, x_n)$, where, $X_i=(x_{i1}, x_{i2}, \dots, x_{in})$. Then, rural households' spatial differentiation of land transfer can be obtained through the score coefficient of main factors and contribution of variances of main factors. The score coefficient of main factors is given as follows:

$$f_i = \sum_{j=1}^n l_{ij}X_j \quad (i=1, 2, \dots, n) \tag{1}$$

Where, f_i is the score coefficient of main factor i , l_{ij} is loading vector of i th main factor to j th main index. The contributing ratio of the i th main factor is achieved by the formula (2):

$$g = \lambda_i / \sum_{i=1}^n \lambda_i \tag{2}$$

Where, λ_i is variance of i th main factor. If g denotes weight coefficient of main factor, we can get differentiation index of rural households' land transfer through the following function:

$$F = \sum_{i=1}^n g f_i \tag{3}$$

Where, F denotes the differentiation index of rural households' land transfer, it can quantify factors' coordinating degree. Those factors have great influence on the rural households' behavior of land transfer. Higher it is, better rural households' spatial coordinating degree is. Therefore, the value of F can be used to represent the law of spatial differentiation of rural households' land transfer.

3 CASE STUDY

All of the data come from the fieldwork questionnaires. The investigated areas cover 158 rural households scat-

tering in 1 district, 7 towns of Shanghai, Nanjing and Taizhou in the Changjiang River Delta (Fig. 3). The items in the questionnaires include rural households' agricultural production, living condition, income, expenditure, willing and viewpoint on land transfer, and so on. These data are first-hand stochastic sample data, which can reflect the rural households' behavior of land transfer. Among them, there are 53 rural households in Shanghai, 55 in Nanjing, 50 in Taizhou. And the contents in 137 questionnaires are legible. Based on these data, we operate the mode of spatial differentiation of rural households' land transfer. Tables 1 and 2 and figures 4 and 5 show the results.

Through analyzing these data, we can find that there are two categories of the spatial differentiation of rural households' land transfer in the investigated areas. The first is the differentiation of four main factors (R_1 - R_4) by auto-clustering. The reliability reached 60.767%, which reflects the influencing degree of main inner factors on spatial differentiation of land transfer. The four factors can be illustrated as following: R_1 reflects natural quality of land resources and ratio of non-farm income to family's total income, including X_4 , X_6 , X_7 , X_8 ; R_2 reflects rural households' property right and their location, including X_9 , X_{10} , X_{11} ; R_3 reflects structure of family's population and consumption, including X_1 , X_2 , X_5 ; R_4 reflects

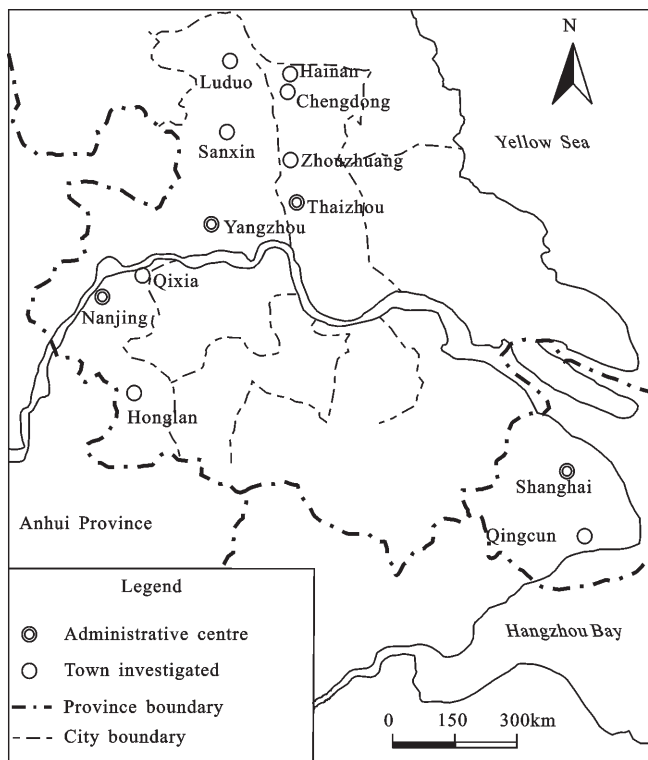


Fig. 3 Sketch of research areas for rural land transfer

Table 1 Explanation to variable

Index system	Initial eigenvalue		
	Total	Variation ratio	Cumulation percentage
X_1	2.673	24.298	24.298
X_2	1.628	14.802	39.100
X_3	1.341	12.192	51.292
X_4	1.042	9.475	60.767
X_5	0.844	7.673	68.440
X_6	0.796	7.235	75.675
X_7	0.723	6.576	82.251
X_8	0.641	5.825	88.076
X_9	0.597	5.429	93.505
X_{10}	0.453	4.116	97.621
X_{11}	0.262	2.379	100.000

farm income, including X_3 .

The second is the differentiation deduced by seven main factors (R_1 - R_7) through the method of auto-clustering. Its reliability can reach 82.251%. The second differentiation can be illustrated as following: R_1 reflects natural quality of land resources, rural households' property right and ratio of non-farm income to family's total income, including X_4 , X_6 , X_7 , X_9 ; R_2 reflects land location, including X_{10} , X_{11} ; R_3 reflects ratio of change of land use, including X_8 ; R_4 reflects farm income, including X_3 ; R_5 reflects the degree of part-time farm, including X_1 ; R_6 reflects rural households' education level, including X_2 ; R_7

Table 2 Transfer element matrix

Index	Main element										
	Four main elements				Seven main elements						
	R ₁	R ₂	R ₃	R ₄	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇
X ₁	0.182		-0.670	-0.185					0.954	-0.129	
X ₂		0.152	0.700	-0.121		0.110			-0.130	0.935	0.112
X ₃	0.172			0.854	0.118			0.912			
X ₄	0.691			0.158	0.836		-0.111			-0.123	
X ₅	0.356		0.554		0.174					0.111	0.972
X ₆	-0.769	0.228			-0.647	0.317	-0.264		-0.162		-0.180
X ₇	0.873	0.121	0.100		0.822		0.339	0.108		0.137	
X ₈	0.457	0.400	-0.224	-0.431	0.153		0.929				
X ₉	0.454	-0.458		0.371	0.466	-0.391	-0.283	0.333	0.277	0.264	
X ₁₀	-0.375	0.641		0.334	-0.400	0.636		0.352			
X ₁₁	0.100	0.779	0.173	-0.123	0.159	0.846		-0.191		0.144	

reflects rural households' consumption level, including X₅.

Based on the second kind of analysis, it can be concluded that the very important factors influencing spatial differentiation of land transfer are R₁ and R₂. Those factors include natural quality of land resources, property right of land, ratio of non-farm income to family's total income and land location. That is to say, there are mainly two kinds of key factors leading to spatial differentiation of land transfer among different rural households. One is rural households' behavior decided by rural households' pursue to maximize farm income, land institution and natural quality of land resources, the other is land location decided by system of registered permanent residence.

The differentiation index of rural households' land transfer can be divided into 4 levels(Fig. 4): 1) Level : The values are bigger than 40, including 16 rural households, accounting for 11.68% of total investigated rural households. Among them, 4 families live in Nanjing, 11 families in Shanghai, 1 in Taizhou. 2) Level : The values are between 0 and 40, including 50 rural households,

36.50% of total investigated rural households. Among them, 23 families live in Nanjing, 23 families in Shanghai, 4 in Taizhou. 3) Level : The values are within the range of -40 to 0, including 59 rural households, 43.07% of total investigated rural households. Among them, 17 families live in Nanjing, 9 families in Shanghai, 33 in Taizhou. 4) Level : The values are smaller than -40, including 12 rural households, 8.75% of total investigated rural households. Among them, 3 families live in Nanjing, 9 in Taizhou. From foregoing analysis it can be found that most of rural households belong to levels and .

As we have analyzed, the value of F denotes the differentiation index of rural households' land transfer, which can quantify all factors' coordinating degree. Higher it is, better rural households' spatial coordinating degree is. So, rural households in investigated areas can be divided into 3 types of spatial differentiation of land transfer. The first is the most harmonious—Shanghai type. The number of this type of rural households whose spatial differentiation index is over 0 is 79.07% of total rural households investigated. They belong to levels and of the

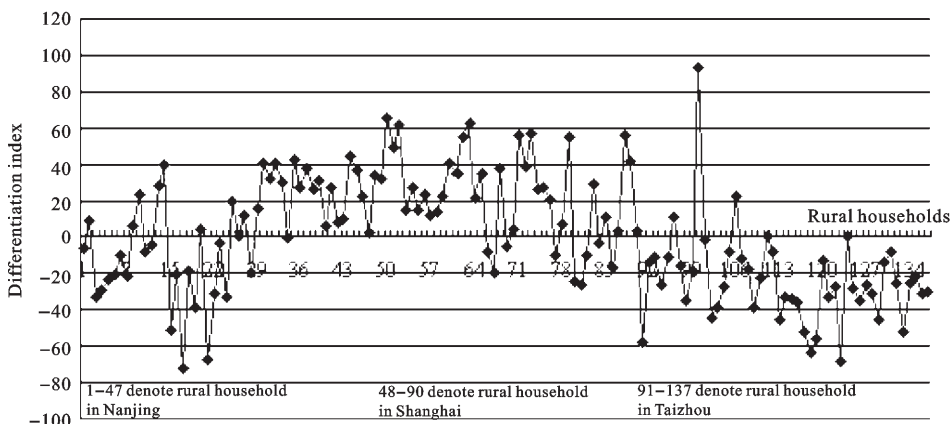


Fig. 4 Spatial differentiation of rural households' land transfer

differentiation index of rural households' land transfer. The second is harmonious—Nanjing type. The number of this type of rural households whose spatial differentiation index is under 0 is 42.55% of total rural households investigated. And the number of the type of rural households whose spatial differentiation index is over 0 is 57.45% of total rural households investigated. That is to say, 85.11% rural households belong to levels and in Nanjing. The third is less harmonious—Taizhou type. The number of this type of rural households whose spatial differentiation index is under 0 is 89.36% of total rural households investigated. They belong to levels and . It also can be seen that Nanning type is the inter-grade between Shanghai type and Taizhou type.

The inner mechanism leading different types of spatial differentiation of land transfer can be concluded as follows(Fig. 5):

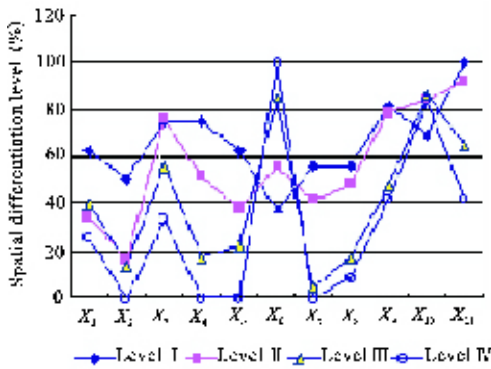


Fig. 5 Character of spatial differentiation levels of rural household's land transfer

(1) The structure of rural households' family population. One factor is the ratio of non-farm employment to total family population. The number of rural households with a ratio above 50% at levels to is respectively 62.5%, 34.69%, 40% and 25% of total rural households at the same level. The other factor is rural households' education level. The number of rural households received junior high school or above education at levels to respectively is 50%, 16.33%, 13.33% and 0 of total rural households at the same level.

(2) The structure of rural households' income. The first factor is agricultural income. The number of rural households with an income over 26.67 yuan(RMB)/ha at levels to is respectively 75%, 75.5%, 50% and 33.33% of total rural households at the same level. The second factor is the ratio of non-farm income to family's total income. The number of rural households with a ratio of 1 is respectively 75%, 52%, 16.95% and 0 of total rural households at the same level. The third factor is

the Engle Coefficient. The number of rural households with Engle Coefficient over 0.4 is respectively 62.5%, 38%, 22.03% and 0 of total rural households at the same level.

(3) The natural quality of rural households' land resources. The first factor is the area of arable-land per family. The number of rural households with an area over 0.033ha at levels to is respectively 37.5%, 56%, 84.75% and 100% of total rural households at same level. The second factor is the ratio of rural household' land area transferred to family's total land area. The number of rural households with a ratio of 1 at levels to is respectively 56.25%, 42%, 5.08% and 0 of total rural households at the same level. The third factor is ratio of land use change to rural households' total land. The number of rural households with a ratio of 1 at levels to is respectively 56.25%, 48%, 16.95% and 8.33% of total rural households at the same level. The last factor is land transfer oriented by government. Number of rural households oriented by government at levels to is respectively 81.25%, 78%, 47.46% and 41.67% of total rural households at the same level.

(4) The location of rural households' land. The first factor is the distance between rural household and ranked highway. When it is over or equal 1km, The number of rural households with a distance of 1km or more to ranked highway at levels to is respectively 68.75%, 84%, 86.44% and 83.33% of total rural households at the same level. The second factor is locus of rural households' registered permanent residence. The number of rural households with number of 1 at levels to is respectively 100% , 92% , 64.41% and 41.67% of total rural households at the of same level.

4 CONCLUSIONS

Firstly, the number of rural households in Shanghai whose differentiation index of land transfer belong to levels and is over 79.07% of total rural households investigated; that in Nanjing whose differentiation index of land transfer belong to levels and is over 85.11%; and that in Taizhou whose differentiation index of land transfer belong to levels and is over 89.36% of total rural households investigated. It can be concluded that as to rural households of Shanghai type, their spatial coordinating degree of land transfer is superior to rural households of Nanjing type, and Nanjing's is superior to Taizhou's.

The proportion of rural households ranking lowest and highest level is no more than 20%, which means

the proportion of rural households ranking in the middle level is up to 80%. Thus, it can be concluded that the spatial differentiations in investigated regions are developing in balance and rural households' behavior of land transfer is rational.

Secondly, the reliability of income of clustering analysis of factors affecting spatial differentiation can reach 60.767% and 82.251% respectively. It can be concluded that there are 2 key kinds of factors leading to spatial differentiation of land transfer among different rural households. One is rural households' behavior decided by rural households' pursuing to maximize agricultural income, land institution and natural quality of land resources; the other is land location decided by system of registered permanent residence. Therefore, it can be said that if agricultural income decided by productivity scale and technique is enhanced, the marketing level of land transfer will be improved and if the system of registered permanent residence is relaxed, the degree of spatial coordination of land transfer will be improved effectively. Correspondingly, adjustment of land use structure will be accelerated, and the development of rural society will be improved.

Thirdly, rural households ranking at high spatial differentiation level of land transfer have many characters such as higher ratio of non-farm employment population to family's total population, higher education degree, higher ratio of non-agricultural income to family's total income, higher Engle Coefficient, higher ratio of area of land transferred to total land area, higher ratio of area of land use change to total land area, and so on. From the analysis results, it can be indicated that these factors reflecting spatial differentiation inner-mechanism have great positive influence on spatial coordination of land's transfer market. As to rural households in Shanghai, they have higher education grade, higher ratio of non-farm income to family's total income and higher ratio of non-agricultural employment to family's total population. Their Engle Coefficient decided by their income and consumption will reduce more and more. Only by improving marketing level of land transfer can we enhance ratio of area of rural households' land transferred to their total land area and ratio of area of land use change to total land area so that we can get the goal of increasing spatial differentiation level of land transfer. As to rural households in Taizhou, by increasing rural households' education grade, relaxing management to policy of registered permanent residence and enriching chances of non-farm employment, the goal of increasing spatial differentiation level of land transfer can be obtained. As to rural households in Nanjing, by further ad-

justing structure of land use oriented by land marketization and increasing the ratio of non-farm income to family's total income, the goal of increasing spatial differentiation level of land transfer can be achieved. In a word, by adjusting some single factor fitting for local socio-economy background we can get the goal of increasing local coordination degree of spatial differentiation of land transfer.

Fourthly, rural households ranking in the higher spatial differentiation level have smaller area of arable land. So it can be concluded that one important reason to transfer land is land fragmentation, and an important function of land transfer is to realize land scale management.

Fifthly, the distance between land and the centre of town has not obvious influence on spatial differentiation level of land transfer. Therefore, the distance is not the factor blocking land transfer because the development of highway-net, and it is not an obvious factor coordinating spatial differentiation of land transfer.

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