

The Impact of Peer Effects on Housing Construction in Rural China

Tianqing Zheng, Kaiyun Wang, and Jiake Xie

Abstract—In rural China, a house built by oneself is not only a sign of wealth, but also a symbol of social status. Many families go into debt to build houses that exceed their wealth and one of the major reasons is the influence of peer effects. This paper studies the effects of houses already built by others on the newly constructed houses in the same village, and then analyze the comparison effect prevailing in rural China. Few existing studies have investigated rural housing construction in different parts of China, and to the best of our knowledge, we are the first to analyze it at the household level and examine the relationship between peer effects and rural housing construction. This paper also adopts the instrumental variable method to solve the endogeneity problem. We find that the area of houses built is significantly affected by the area of houses built by others in the same village in rural China. When the construction cost of nearby houses increases 1 yuan, the cost of newly built house increases by almost 1 yuan. The impact is similar on the area of housing construction: when the area of nearby houses increases 1 m², the area of newly built houses increases 0.99 m². This study provides important insights for the society to correctly guide rural people to reasonably plan the cost of housing construction and reduce unnecessary burdens like excess housing debts.

Index Terms—Peer effects, housing construction cost, housing area, rural China.

I. INTRODUCTION

In China, rural people's behaviors of keeping up with the joneses is very serious. When someone becomes rich, they would often show off in order to prove their financial strength. Showing off would cause others' jealousy, which leads to comparison [1]-[5]. Housing, as the major asset of rural people, is an important standard for rural people to show their actual wealth power. As the income of rural people increases, the countryside set off a building boom: when rural people build more houses, or their houses have more floors than their neighbors, or occupy more lands, or are better decorated [6], the housing owners would feel that their social status have been elevated to some degree [7]-[9]. Under the influence of this thinking, even some rural people have to renovate their houses even though they are burdened with huge debts.

Under the appearance of house-building competition, rural people struggle for "the face" problem and social status. N. Wang [10] used qualitative research to analyze that rural people's house-building behaviors show the conventional

concept of "the face" [11], [12] in the way of economic measurement of new values while performing traditional behaviors. For rural people, building houses is a good way to store property [13]. Housing area, structure, decoration [14]-[16] are the main aspect of rural people's housing comparison.

Some studies [17] show that rural housing construction is affected by the herd mentality in China. From the perspective of farmers and urban residents [18], the rural housing boom is actually the social comparison behavior of villagers to show their superiority and competitiveness [19], [20], which is a social comparison process of extreme and particularity. This abnormal comparison [21] has a direct negative impact on the villagers' sense of happiness, harmonious neighborhood relationships and emotional and psychological aspects [22]-[25].

According to the above theoretical and empirical research evidence, there is a close relationship between the housing construction of rural people in China and the comparative behavior among rural people. However, almost all of these studies have focused on rural areas in one part of China, and few have studied rural house-building in different parts of China, possibly because the data involved in rural areas across the country are too large and complex to process. In addition, the existing literature mostly explores the factors of rural housing construction through the studies of rural people's competitive behaviors. To our knowledge, there are no studies that analyze housing construction at the household level, peer effects or the relationship between social norms and rural housing construction. Therefore, it is of great necessity to study the relationship between housing construction problems, peer effects and rural housing construction from the household level.

The main purpose of this paper is to study the impact of the houses already built by others in the same village on the construction of one's own house, and then analyze the comparison effect prevailing in rural China. To answer these questions, more than 30,000 survey data from Chinese Family Panel Studies (CFPS) surveys in rural China from 2010 to 2018 is included in this study. Ordinary least squares and instrumental variable method are used to solve the problem of the endogeneity of peer effects. The answers to these questions have important policy and practical significance for analyzing the influence of houses built by others on the construction of one's own houses in rural China. This study also adds to the limited literature on the influence of peer effects on the prevalent comparative effect of rural people.

Based on the sample of 34,445 people from 25 provinces and regions in China, this study examined the influence of peer effects on the construction of houses already built in the

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same rural area and housing construction cost. The results show that the cost of houses built is significantly affected by the cost of houses built by people in the same village in rural China. When the construction cost of nearby houses increases 1 yuan, the cost of newly built house increases by almost 1 yuan. The result of the housing area is similar, and there are very strong peer effects. When the area of nearby houses increases 1 m², the area of newly built house increases by almost 1 m². Even after accounting for region, survey year, family income, family size, and housing debts, the results for housing construction cost and housing area are very similar to the above data. When the area of nearby houses increases 1m², the area of newly built houses increases 0.9902 m².

In the next section, we present our research methodology and empirical models to examine the impact of houses already built by rural peers on their own housing construction. Section III shows the sources of the data and provides a descriptive analysis of key variables. Our estimated results and discussion are in Section IV. The last part summarizes the whole paper.

II. DATA

The study of the data in this paper from Chinese Family Panel Studies (CFPS), is applied on the Chinese social science research center of Peking University, aims to reflect the changes of Chinese society, economy, population, education, and health by tracking and collecting data at three levels, namely individual, family, and community, and to

provide data for academic research and policy decision-making. CFPS focuses on the economic and non-economic well-being of the Chinese population, as well as a variety of research topics including economic activity, educational outcomes, family relationships, and family dynamics, population migration, and health. It is a national, large-scale, multidisciplinary social tracking project.

CFPS samples in the country in 2010, covering 25 provinces/ municipalities/ autonomous regions (Province: Hebei, Shanxi, Liaoning, Jilin, Heilongjiang, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Sichuan, Guizhou, Yunnan, Shanxi, Gansu province; Municipality: Beijing, Tianjin, Shanghai, Chongqing Municipality; Autonomous Region: Guangxi Zhuang Autonomous Region), with a target sample size of 16,000 households, including all the family members in the sample households. A follow-up survey was conducted annually. There are four main types of CFPS questionnaire, including community questionnaire, family questionnaire, adult questionnaire, and children questionnaire. On this basis, CFPS has developed many types of questionnaires for different family members, such as long questionnaire, short questionnaire, representative answer questionnaire and telephone interview questionnaire. In the study, we will analyze the data from Chinese Family Panel Studies (CFPS) 2010 to 2018 in terms of household income and housing construction in rural China.

TABLE I: SUMMARY STATISTICS OF KEY VARIABLES

Variable	Obs.	Mean	Std. Dev.	Min.	Max
Dependent Variable					
Housing Area (m ²)	13,877	133.23	98.32	1	3000
Housing Construction Cost	27,681	48473.76	146796.30	0	8000000
Independent Variable					
Survey Year	34,445	2013.95	2.83	2010	2018
Family Size	34,445	4.03	1.94	1	26
Family Income	32,730	43084.93	124467.70	1	11400000
Housing Age	5,850	16.38	12.06	0	90
Housing Debts	27,375	12159.92	485602.10	0	80000000
The Area of Other Houses	915	116.68	101.72	8	990

Data Source: Chinese Family Panel Studies 2010, 2012, 2014, 2016, and 2018

Table I summarizes the definitions and statistics of all the other variables in the empirical analysis. The dependent variables are housing area and housing construction cost. The sample number of housing area was 13877, with a mean of 133.2299, a standard deviation of 98.31939, and a maximum of 3000. The sample number of housing construction cost is 27681, with a mean value of 48473.76, a standard deviation of 146796.3 and a maximum value of 8000000. Independent variables include Survey Year, Family Size, Family Income, Housing Age, Housing Debts are over budget and The Area of Other Houses is over budget. The number of housing districts in the sample is 34,445, and its average survey year is about 2014, with the largest survey year being 2018. In the same 34,445 samples, the average household had almost four family members, and the maximum number of family members reached 26. The average income sample of families is 32,730, and the average income of families is 43,084.93 yuan, and the maximum income of families can reach 11400000 yuan. The average age of the 5,850 houses in the

sample was about 16 years, with the longest house reaching 90 years. Based on 27,375 mortgage samples, the average housing debts is 12,159.92 yuan, with the highest amount of housing debts reaching 80000000 yuan. There are 915 samples of the area of other houses, whose average area is 116.6831m², and the maximum area of other houses reaches 990 m².

III. METHODOLOGY

Based on previous studies on peer effects, this study explores the impact of peer effects on the housing construction within the village from two aspects of housing area and housing construction cost. When building a new house in rural China, the decision of such construction is influenced by many factors, including housing area, family size, family income, family property, housing construction cost, housing debts, etc. However, housing construction cost and housing area are the two factors that might be affected by

the peer effects or social norm within the village. Therefore, this study would evaluate peer effects in terms of housing area and housing construction cost, namely, empirically studying the impact of the average housing area and average cost of housing construction that have been built by people in the same village on their own housing construction. The instrumental variable used in our paper is the age of the housing. Housing age is highly correlated with our dependent variable. In rural areas of China, the older the housing construction, the lower the cost of housing construction and the smaller the size of housing construction.

As a possible interaction between the construction of one's own house and the construction of houses already built in the same village, there is a potential endogenous problem that arises when we directly assess the impact of houses already built in the countryside on the results of the construction of houses built by others in the countryside. However, using a simple OLS regression model might be problematic due to endogeneity. Even if we control survey year and regional fixed effects, some omitted variables may still drive the decisions of the housing construction within the same village. To address the potential simultaneity bias and endogeneity problems, we use the instrumental variable (IV) approach to solve the endogenous problem in our paper. We suggest using housing age as an instrumental variable (IV) for peer house-building performance. Intuitively, while the proposed IVs should have a significant impact on the building of peer houses, they are unlikely to have a direct impact on outcomes. Therefore, we conclude hypothesis that the proposed IV value is valid for controlling endogeneity in the analysis.

A. OLS

This paper mainly adopts the following OLS model for analysis:

$$Y_{(ict)} = \beta_0 + \beta_1 \text{PeerEffect}_{(ict)} + \beta_2 X_{(ict)} + \beta_3 Y_{(c)} + \beta_4 \delta_{(t)} + \varepsilon_{(ict)} \quad (1)$$

$Y_{(ict)}$ refers to the dependent variable (housing construction cost or housing area) in household I in region c at time t . $\text{PeerEffect}_{(ict)}$ refers to the independent variable (family income, family size or housing debts) in household I in region c at time t .

Family income is the basis of building houses. With the amount of the money, rural people could have the capacity to build satisfying houses. Therefore, family income should be taken into consideration. Family size would affect the size of the house, which should be considered. When the funds to build houses are insufficient, people tend to borrow money for the house, which affects the construction of houses to some extent. $X_{(ict)}$ are the control variables which might influence the dependent variable (housing construction cost or housing area).

In order to avoid endogeneity problem, we use an instrumental variable, housing age, to test whether a similar result can be obtained after the addition of instrumental variables. $Y_{(c)}$ is the regional fixed effects in region c . Due to the various special regional background, people in different regions holds different attitudes towards housing debts. In order to avoid being affected by a geographical location factor, county fixed effects were considered. $\delta_{(t)}$ is the survey year fixed effects at time t . The change of the economy would impact the change of the housing construction cost in some

extent every year, therefore, the survey year is worth considering.

In addition, β_1 is the coefficient of interest. The magnitude shows the effect of changing $\text{PeerEffect}_{(ict)}$, by one-unit on $Y_{(ict)}$, when $X_{(ict)}$, $Y_{(c)}$...remain unchanged.

B. 2SLS

Based on the model mentioned earlier, PeerEffects in (1) is an endogenous variable. Direct use of OLS methods in Model (1) results in estimate bias. Therefore, a two-stage least squares (2SLS) method with IV was further used in this study. So, in the first stage, PeerEffects is further expressed as:

$$\text{PeerEffects} = \alpha_0 + \alpha_1 X_{(ict)} + \alpha_2 Y_{(c)} + \alpha_3 \delta_{(t)} + \varepsilon_{(ict)} \quad (2)$$

$X_{(ict)}$ are the control variables which might influence the independent variable (PeerEffects). $Y_{(c)}$ is the regional fixed effects in region c . $\delta_{(t)}$ is the survey year fixed effects at time t . $\beta_0, \beta_1, \beta_2, \dots$ are the parameters to be estimated, and $\varepsilon_{(ict)}$ is the error term. The coefficient reflects the peer effects of people in the same village who have already built houses on the result of housing construction.

Finally, in order to verify the robustness of the estimated results, the stepwise regression method was adopted for the estimation of (1). After 2SLS estimation of the equation, OLS model is also validated.

IV. RESULTS

A. Housing Construction Cost

In Table II, in the first regression, the dependent variable is housing construction cost, and the interested independent variable is the mean value of other households' housing construction costs. The purpose of adding mean housing construction cost is to judge whether the average housing construction cost of other people in rural China would have a certain influence on the housing construction cost of our own houses, or whether the higher the housing construction cost of others in rural China, or whether rural people tend to spend more money on housing construction. According to the results, the cost of houses already built by others in rural China affects the cost of our own houses built. When the construction cost of nearby houses increases 1 yuan, the cost of newly built house increases by almost 1 yuan.

In rural China, the cost of housing construction built by oneself and fellow villagers is influenced by a number of common factors. In wealthier areas, people's income levels are higher, which means they have more money to build their houses, therefore, the cost of the housing construction they build is higher; in some areas, families of rural people mainly live in groups, and several generations live in the same house. In order to meet the living demand of such a large family, the area of houses should be relatively large, thus the cost of housing construction built is also high; if the majority of people in a village area eager to build a better house, but the cost of housing construction far exceeds the amount of money they own, they would tend to have borrowed much money, namely, huge housing debts in order to build a house that is not inferior to that of their fellow villagers. In the second regression, dependent variable is housing construction cost, while independent variables are Family

Income, Family Size and Housing Debts. The purpose of adding three independent variables into the regression is to judge the influence of Family Income, Family Size, Housing Debt and other people's housing construction cost on our housing construction when we control the Family Income, Family Size, Housing Debt and other people's Housing Construction Cost. Whether or not the higher the income level of other rural families, the larger the family size, and the higher the housing debts, we tend to spend more on housing construction. The results show that housing debts and housing debts affect the cost of housing construction built in rural China. When the construction cost of nearby houses increases 1 yuan, the cost of newly built house increases by almost 1.0187 yuan. In fact, this is the internal competition of building houses in rural China. The houses built by others are of high cost, and the houses built by oneself are of higher cost, which indicates a kind of competitive behavior in rural China.

However, our regression results may be inadequate, for there may be other overlooked factors that also affect the cost of housing construction. The time it takes to build a house is worth considering. The older the house was built, the cheaper it was to build it at that time, and the lower the cost of the housing construction. With the development of economy, inflation has affected the cost of housing construction, making the cost of housing construction continuously increase. Every year it costs more to build a house than it did the year before. Therefore, we control a survey year fixed effect in the third regression, aiming to compare whether the average housing construction cost of others in rural areas in the same year would have a certain influence on the cost of housing construction built by ourselves by controlling this variable. According to the results, we found that the data obtained were very close to the previous results. When the construction cost of nearby houses increases 1 yuan, the cost of newly built house increases by almost 1.0127 yuan.

In addition to the effects of family income, family size,

housing debt, and survey year, there are other factors that we have not considered that may affect the value of rural home construction, but the effect is generally regional. For example, in a village, there are more migrant workers who bring plenty of wealth earned by migrant workers back to the countryside to build houses. Therefore, the general housing construction cost in this village is relatively high. In the fourth regression, county fixed effects were added in order to avoid being affected by a geographical location factor. We get the same result as before. When the construction cost of nearby houses increases 1 yuan, the cost of newly built house increases by almost 1.0265 yuan.

Although we have considered a great many control variables and peer effects, it is still possible that there are some variables that we have omitted and have not observed. These variables would have an impact on the housing construction cost of both our housing construction and the houses of the surrounding people, which would lead to the problem of endogeneity. Therefore, in order to avoid this endogeneity problem, we use an instrumental variable (IV) to test whether a similar result can be obtained after the addition of instrumental variables, and whether strong peer effects still exist. The instrumental variable we used was to use an average building housing age as the average housing construction cost of the people around it. The older the house is, the less money it took to build it, the cheaper it was to build it, the older the house is, the older the house is, the lower the cost of the housing construction; new houses built in recent years cost much money in absolute terms to build, cost much to build, are younger, newer, and are worth much. We use one year of the housing construction owned by people in the same village as instrumental variable to test the results using two-stage least square method (2SLS). It was found that using the instrumental variable method to test the results was similar to OLS. When the construction cost of nearby houses increases 1 yuan, the cost of newly built house increases by almost 1.0639 yuan.

TABLE II: SUMMARY STATISTICS OF KEY VARIABLES

Dependent Variable: Housing Construction Cost	(1)	(2)	(3)	(4)	(5)
			OLS		IV
					Mean Housing Age
Mean Housing Construction Cost	1*** (0.0081)	1.0187*** (0.0086)	1.0127*** (0.0104)	1.0265*** (0.0143)	1.0639*** (0.0477)
Family Income		4605.081*** (496.6751)	4879.942** (552.6089)	0.0258*** (0.0056)	0.0722*** (0.0170)
Family Size		1785.95*** (402.4265)	1699.696** (406.1434)	3150.712*** (426.2128)	3793.873** (1273.734)
Housing Debts		0.0004* (0.0015)	0.0005* (0.0015)	0.0004* (0.0015)	0.4934*** (0.1336)
Survey Year Fixed Effects	N	N	Y	Y	Y
County Fixed Effects	N	N	N	Y	Y
Number of Observations	27,681	25,916	25,916	25,916	6,803

Note: ***, **, and * represents the significance level at 1%, 5%, and 10%, respectively; the absolute t-value calculated using robust standard errors is reported in parentheses.

B. Area of Housing Construction

Affected by several factors, the cost of self-built houses in rural China would be affected by the peer effects of housing construction by people around. Other people in the same

village are building higher quality housing construction, higher cost of housing construction, better housing construction, they would tend to build their new housing construction with much more higher cost and better quality.

Due to the limitation of data, we cannot measure the costs of housing construction of other people, but only measure the impact of the area of our own housing construction built by the area of houses built by our peers.

In Table III, in the first regression, the dependent variable is housing area, and the independent variable controlled is mean housing area. According to the results, the area of houses already built by others in rural China would affect the area of houses built by ourselves. When the construction area of nearby houses increases 1 m², the area of newly built house increases by almost 1 m². In the second regression, three independent variables, Family Income, Family Size, and Housing Debts, were added to show that housing debts increased by 1 m², the area of our own houses will increase by 0.9600 m². Considering the time factor, the survey year fixed effect was controlled in the third regression, and similar

results were obtained. When the construction area of nearby houses increases 1 yuan, the area of newly built house increases by almost 0.9617 m². In the fourth regression, in order to avoid being affected by a factor of geographical location, we added county fixed effects, and we got the same result as before: the area of houses already built by others in rural areas increased by 1m², and the area of our own houses would increase by 0.9710 m².

In order to avoid endogeneity problems caused by variables that were not considered, we used a number of years of houses owned by people in the same village as instrumental variables to test results of two-stage least square method. The result is similar to OLS. Almost the same result. When the area of nearby houses increases 1 m², the area of newly built houses increases 0.9639 m².

TABLE III: THE IMPACT OF HOUSING AREA ON RURAL HOUSING CONSTRUCTION PERFORMANCE

Dependent Variable: Housing Area	(1)	(2)	(3)	(4)	(5)
	OLS			IV	
					Mean Housing Age
Mean Housing Area	1*** (0.0151)	0.9600*** (0.0152)	0.9617*** (0.0153)	0.9710*** (0.0475)	0.9639*** (0.1859)
Family Income		4.9646*** (0.4358)	5.0287*** (0.4408)	0.0001*** (0.000008)	0.00004*** (0.000008)
Family Size		5.0865*** (0.4141)	5.0661*** (0.4146)	7.2310*** (0.4417)	7.6789*** (0.6010)
Housing Debts		0.00002* (0.00003)	0.00002* (0.00003)	0.00003* (0.00003)	0.0002** (0.00006)
Survey Year Fixed Effects	N	N	Y	Y	Y
County Fixed Effects	N	N	N	Y	Y
Number of Observations	13,877	12,784	12,784	12,784	6,807

Note: ***, **, and * represents the significance level at 1%, 5%, and 10%, respectively; the absolute t-value calculated using robust standard errors is reported in parentheses.

C. Robustness Check

To further ensure the reliability of our main findings in this study, we performed a robustness test using alternative specifications. Firstly, considering the area of other houses in rural China, it may affect the increase area of other housing construction planned to built. Assuming that the peer effects do exist and are significant, we should see more obvious peer effects in families with multiple houses, thus we regard the

area of multiple houses as another dependent variable, and consider the influencing factors of family income, family size, housing debts, survey year, and region. The results confirm the validity of the data. As shown in Table IV, the results confirm the validity of the data. When the area of other houses already built by others in the countryside increases by 1m², the area of other houses built by ourselves will increase by 0.9902 m².

TABLE IV: ROBUSTNESS CHECK

Variables		
	The Area of Other Houses	Log (Housing Construction Cost)
Mean Area of Other Houses	0.9902*** (0.1073)	
Log (Housing Construction Cost)		0.6631*** (0.0317)
Family Income	-0.000007* (0.00001)	0.0000006*** (0.0000006)
Family Size	3.7077 ** (1.7580)	0.0899*** (0.0043)
Housing Debts	0.00009* (0.0001)	0.00000002* (0.00000001)
Survey Year Fixed Effects	Y	Y
County Fixed Effects	Y	Y
Number of Observations	839	23,748

Note: ***, **, and * represents the significance level at 1%, 5%, and 10%, respectively; the absolute t-value calculated using robust standard errors is reported in parentheses.

The figures vary widely for some factors are taken into account to influence the cost of housing construction. In order to compress the data size, so that the data are more obvious, we log the cost of housing construction. Based on 23,748 samples, we tested the data using Log (Housing Construction Cost) for the second time and obtained a value of 0.6631. This suggests that the cost of houses already built by others in the countryside always has a significant effect on the cost of their own houses built, confirming the robustness of our main findings.

V. CONCLUSION

The problem of building houses in rural areas has always been an important indicator of Chinese rural people's comparison behavior. Based on a sample of 34,445 people from 25 provinces and regions in China, this study examined the influence of peer effects on the construction of houses already built in the same rural area and the housing construction cost. The results show that in rural China, the cost of housing construction people build is affected by the cost of housing construction already built by people in the same village. When the construction cost of nearby houses increases 1 yuan, the cost of newly built house increases by almost 1 yuan. The result of the housing area is similar, and there are very strong peer effects. When the area of nearby houses increases 1 m², the area of newly built house increases by almost 1 m². Even after accounting for region, survey year, family income, family size, and housing debts, the results for housing construction cost and housing area are very similar to the above data. When the area of nearby houses increases 1 m², the area of newly built houses increases 0.99 m².

Due to the heterogeneity of peer effects in rural housing construction under different circumstances, this study fills a gap in the study of peer effects from the regional and family aspects of rural housing construction in China. The significant peer effects indicates that the increase in the area and cost of the housing construction already built by others in rural areas would continuously promote the increase in the area and cost of the housing construction built by oneself, and further increase the area and cost of the housing construction built by others. To some extent, it shows that the behaviors of comparing with the joneses in Chinese rural areas is becoming more and more serious.

The results of this study are of great practical significance to the countryside, the country and all sectors of society. The rural population is an important part of Chinese population. It provides an important labor force for the country and social development and makes an important contribution to Chinese agricultural modernization. To pay attention to the comparison behaviors of rural people is not only to be responsible for these rural people through correct ideological guidance and behavioral constraints, which means at the social level correctly guide rural people to plan the housing construction cost reasonably, reduce the bad habits, including huge borrowing can flow to promote rural capital accumulation and social stability has the vital role. Therefore, it is of great necessity to take effective measures to guide the rural people in various regions of China to form a correct sense of building housing construction, reduce the behaviors of keeping up with the joneses, so as to form a good

atmosphere of peer communication in the countryside.

However, there are some caveat: First, a large part of the data in Chinese Family Panel Studies does not provide the actual situation of households in rural China, due to individual households' attention to privacy or lack of understanding of the actual situation of households. Second, even after controlling for a large number of rural household characteristics, we cannot exclude the impact of other related factors on building housing construction in rural China.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Tianqing Zheng conducted the research; Tianqing Zheng, Kaiyun Wang and Jiake Xie analyzed the data together; Tianqing Zheng wrote the paper; Kaiyun Wang and Jiake Xie gave their opinions according to the article; all authors had approved the final version.

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