Changes in Farmers' Welfare from Land Requisition in the Process of Rapid Urbanization

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Abstract: The marked impact of the welfare gap on total welfare within collectives has rarely, if at all, been addressed in traditional welfare theories and in Amartya Sen's theory of welfare functioning and capabilities. With this observation as our starting point, we constructed a research framework that combined welfare functioning, the welfare gap, and welfare capability to assess and analyze changes in the welfare of farmers whose land was requisitioned in Zhejiang province. The findings of our study were as follows. (1) The total welfare functioning of farmers whose land was requisitioned increased by 11.8% as a result of improvements in economic and dwelling conditions and community surroundings. However, social security and psychological conditions deteriorated. (2) Although total welfare functioning has improved, gaps are widening in the distribution of welfare functioning among farmers who underwent land requisition. This was evidenced by the increase of the weighted Gini coefficient, which rose from 0.26 to 0.32 after land requisition. (3) As a result of the improvement in welfare capability, a judgmental bias is evident when farmers assess whether they have gained or lost welfare after land requisition. We conclude that welfare studies should focus not only on the quantitative aspects of welfare distribution, but should also pay more attention to its fairness and impartiality. This can prevent social problems posed by an oversized welfare gap. Moreover, after land requisition, the government and community should provide education and training services, and the current one-time compensation model should be replaced by a lifelong compensation model. At the same time, endowment insurance should be extended in rural areas and urban medical insurance should be progressively incorporated into the social security benefits of farmers who have undergone land requisition.

Key words: Land requisition; Welfare; Behavioral sciences; Urbanization

1 Introduction

It is important to clarify the meaning of welfare before conducting research on changes in welfare of farmers whose land has been requisitioned. Pigou is generally recognized as the initiator of welfare economics. He first expounded the concept of welfare and successfully laid the foundation of traditional welfare theories (Roosma, 2014). Traditional welfare theories can be divided into two varieties: objectivist welfare theory and subjectivist welfare theory (Fang, 2009). Objectivist welfare theory defines and calculates welfare from the perspectives of actual consumer expenditure (Heffetz, 2012), basic substances

required by every rational person (Fisher, 2000), and the quantity of resources owned by an individual (Dworkin, 1981). Clearly, objectivist welfare theory primarily focuses on calculating the quantity and quality of welfare without considering the impact of psychological conditions on total welfare. Thus, a complete profile of changes in welfare is difficult to attain using this approach (Gao, 2007). For instance, it is difficult to measure essential variables that have a marked impact on welfare such as environmental change and changes of farmers' work status through changes in income.

By contrast, subjectivist welfare theory argues that the essence of welfare is utility, viewed as a representation of preferences over some set of goods and services. As this is a subjective evaluation process, the use of utility to measure farmers' welfare changes resulting from land requisitions would distort or exaggerate the actual welfare loss (Nelson, 1992). Ordinal utility theory recognizes that the utility of different individuals cannot be compared, because utility cannot be directly measured or observed (Bell, 1987). Subjectivist welfare theory, therefore, entails utilitarian monism that ignores pluralism, which is an essential characteristic of welfare. More generally, two defects are evident in traditional welfare theory. The first is that it is static and is biased toward measuring present welfare status. It lacks the ability to capture the potential of welfare. Second, the foundation of traditional welfare theory is based on the welfare changes of individuals, making it difficult to perceive welfare gaps in collectives.

Critiquing the defects of traditional welfare theory, Amartya Sen, winner of the Nobel Prize in Economics, posited functioning and capabilities welfare theory (Robeyns, 2003). Functioning essentially consist of "being and doing." Thus, life could be conceptualized as a set of interrelated functioning. Functioning, then, are the states and activities that constitute a person's being, including the most basic elements such as being healthy, safe, and having a good job. Moreover, Sen contended that functioning were critical for developing an adequate understanding of the capability approach. He conceptualized a capability as a reflection of the freedom to achieve functioning that are valuable, and to pursue different functioning combinations (Sen, 1992). Thus, welfare can be seen to be a combination of welfare functioning and welfare capability. This combination not only considers present welfare status, but also potential and possible welfare, thus addressing the gaps in traditional welfare theory, which is only concerned about present and not potential welfare (Sen, 1993). Compared with the stasis of traditional welfare theory, Sen's welfare theory is developmental and dynamic. However, while he succeeds in overcoming the first defect of traditional welfare theory, the second defect remains.

Given these shortfalls, we attempted to construct a research framework that combined welfare functioning, the welfare gap, and welfare capability in a model that could be used to assess and analyze changes in the welfare of farmers whose land had been requisitioned for urban construction in Zhejiang province. Generally speaking, the Chinese government provides an assurance that it will improve farmers' welfare before carrying out rural land tenure reforms. For instance, in 2013, a new rural land tenure reform was promulgated at the third plenary session of the eighteenth central committee of the Communist Party of

China (CPC). To improve farmers' property incomes, which is a component of welfare, the Chinese government is trying to establish a unified construction land policy for both the urban and rural sectors. So changes in farmers' welfare can be used to assess performance of the rural land tenure reform, and, further, to improve the current policy and formulate new reforms.

2 Research Area and Data Sources

In China's rapid urbanization process, significant changes have occurred in the land use structure. A large proportion of land resources have been transferred from the agricultural sector to the nonagricultural sector, and the area of land for construction has been rapidly increasing. According to the China Statistical Yearbook, in 2012, the total area of construction land was 45,750.7 km^2, whereas in 1983 this area was only 9,072.9 km^2. The area of construction land has expanded nearly 5-fold during the past 30 years. The average annual growth rate is 5.5%, which is far beyond the average global level of 1.2% (Meyer, 2011). Large-scale and persistent land requisition has played a positive role in the process of national economic development, but has simultaneously resulted in a number of social problems such as its impacts on the welfare security of farmers whose land has been requisitioned. According to the China City Development Report (2011), the population of such farmers has increased to about 45 million, which amounts to almost the total current population of Ukraine. This figure may rise significantly to 110 million by 2020, which is almost the total current population of Japan.

Zhejiang province is located in southeast China, and is the top Chinese province without any counties in the poverty-county list of the central government. Compared with many other Chinese provinces, the development of different regions in Zhejiang is more balanced and it is has become one of the richest commercial provinces in China. According to both the China Statistical Yearbook and the Zhejiang Statistical Yearbook, a cumulative total land area of 1,006.9 km^2 was requisitioned to support urban construction in Zhejiang province between 2004 and 2012. This accounts for about 7.2% of the total requisitioned area in China. On the other hand, the national per capita agricultural acreage is 898.9 m^2, which is nearly 2.53 times larger than the area of Zhejiang province (355.6 m^2 per capita). Based on these two figures, we can make a preliminary estimate that the population of farmers whose land has been requisitioned in Zhejiang province constitutes 18.21% of China's total population. Zhejiang has thus used 1.06% of China's total territory to carry 18.21% of China's total population whose land was requisitioned. This is the reason why we chose Zhejiang as our case study.

Our study covers all prefecture-level divisions of Zhejiang province. A total of 760 questionnaires were distributed, of which 85.3% (648 questionnaires) were valid. The specific sample structure is shown in Table 1. For this study, the sample selection adhered to the following principles. First, the unit of this investigation was a family. This meant that a questionnaire was completed by a family. Second, the reason for land requisition was to support urban construction. Third, farmers under investigation, whose land was requisitioned, were resettled in a new community.

Table 1
Sample Structure

	Hangzhou	Huzhou	Jiaxing	Jinhua	Ningbo	Quzhou	Shaoxing	Taizhou	Wenzhou	Zhoushan	Lishui	TOTAL
Total Questionnaires	90	70	70	70	80	70	70	70	70	40	60	760
Valid Questionnaires	79	58	55	59	71	59	63	62	57	33	52	648
Valid Rate	87.8%	82.9%	78.6%	84.3%	88.8%	84.3%	90.0%	88.6%	81.4%	82.5%	86.7%	85.3%

3 Theories and Methods

The research framework constructed for this study consisted of three parts: estimation of welfare functioning, calculation of the welfare gap, and analysis of welfare capability. Each part was supported by relevant theories (Figure 1). The research procedure was as follows.
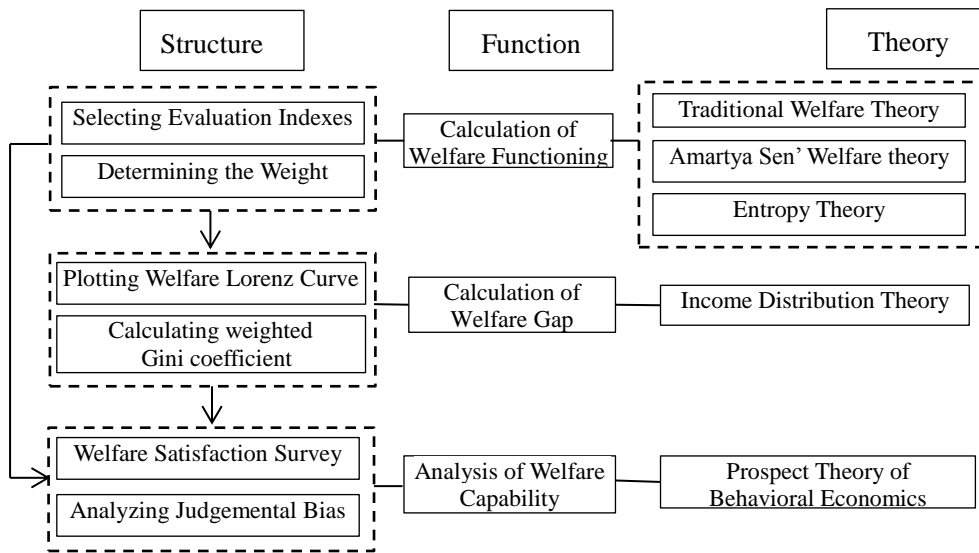
Fig. 1. Welfare Research Framework

3.1 Determination of the weight

We applied the "Entropy Method" to calculate weights according to the following steps: standardization of the data (Formula (3-1)and Formula (3-2)), calculation of proportion of index(Formula (3-3)), calculation of information entropy(Formula (3-4)), calculation of redundancy of information entropy(Formula (3-5)),and finally determination of the weight(Formula (3-6)).It is not a creative method，but really wildly used in calculating weights. We should point out that it is nearly impossible for us to calculate the weight by manual computation. So we designed a computer program and run it in the Matlab.

$$X`_{ij} = \frac{X_{ij} - \min\{X_j\}}{\max\{X_j\} - \min\{X_j\}}$$

Formula (3-1)

$$X`_{ij} = \frac{\max\{X_j\} - X_{ij}}{\max\{X_j\} - \min\{X_j\}}$$

Formula (3-2)

$$Y_{ij} = \frac{X`_{ij}}{\sum_{i=1}^{m} X`_{ij}}$$

Formula (3-3)

$$e_j = -k \sum_{i=1}^{m} (Y_{ij} \times \ln Y_{ij})$$

Formula (3-4)

$$d_j = 1 - e_j$$

Formula (3-5)

$$W_i = d_j / \sum_{j=1}^{n} d_j$$

Formula (3-6)

3.2 Calculation of Welfare Functioning

In this study, the choice of evaluation indexes was based on a comprehensive review of the pros and cons of both objectivist welfare theory and subjectivist welfare theory. We ultimately selected economic conditions, dwelling conditions, community surroundings, social security, and psychological conditions as first-grade indexes.

(1) Economic conditions are recognized as one of the most important factors influencing welfare (Kawanaka, 2014). Following non-agriculturalization of cultivated land (expropriation of land and its conversion from agriculture to non-agricultural uses), farmers are deprived of a source of sustainable income. Even those who already make a profit from non-agricultural sectors must reconsider their income sources if this occurs, let alone farmers who primarily depend on agricultural outputs for their incomes. At the same time, a change in lifestyle has brought about a shift in the consumption structure of farmers whose land has been requisitioned. Therefore, we prioritize economic income and expenditure as being among the most impacted welfare factors following land requisition. Agricultural, non-agricultural, property, and net incomes can best represent such functional activities.

(2) Dwelling condition relates to the basic function of a house, which is to protect people from inclement weather such as wind, rain, chill, and frost. In alignment with the development of society, people's living demands now exceed satisfaction of basic needs, with more value placed on aesthetic enjoyment of a house and the comfort it can provide (Taehoon, 2012). The living conditions of farmers whose houses have been expropriated are greatly undermined, whether they are resettled in interim or newly built houses. In this regard, we include the story structure of a dwelling, water and electricity supply, housing price, hygiene conditions, and per capita living space in our evaluation of changes in welfare and wellbeing.

(3) Community surroundings in our study include both the social and natural environments. In the process of rural land circulation, cultivated land is converted into construction land meant for factories, schools, and roads. This brings tremendous change to the surroundings, for example, to public security, vegetation, transportation, and infrastructure. Moreover, the natural environment is also impaired, causing damage to those natural objects that are relatively vulnerable. Thus, it is also necessary to consider the impacts of pollution in the evaluation system (Hart, 1976).

(4) Social security provided by cultivated land not only guarantees farmers a living, but also functions as a form of unemployment insurance (Hodge, 1984). This means that if a farmer loses a job in the non-agricultural sector, he can still earn a living by returning to his land. Being a member of a collective organization also enables farmers to share profits and receive the protection guaranteed by the organization.

It is still not known whether a farmer enjoys social security equivalent to that of urban residents after changing household registration from a rural area to a city. Medical care, education, and old-age security require further improvement to compensate for the resultant gaps.

(5) Psychological condition is an essential aspect of welfare and affects the way people feel about what they have (Bonnefon, 2013). During our interviews, we outlined three major factors contributing to changes in the psychological conditions of farmers, including domestic relations, living pressure, and a sense of achievement.

3.3 Calculation of the Welfare Gap

Max Lorenz developed the Lorenz curve in 1905 to represent the inequality of wealth distribution. The Gini coefficient, which was accordingly defined by the Italian economist, Corrado Gini, has subsequently been used widely in studies of income disparity. Income is closely related to welfare. For our study, we replaced income with welfare in a Lorenz curve, and calculated the Gini coefficient of welfare, which was later used to evaluate disparities in welfare before and after land requisition. Fig. 2 shows the percentage of farmers whose land was requisitioned, with the order of welfare functioning, ranging from low to high, plotted on the abscissa axis, and the percentage of their cumulative welfare plotted on the longitudinal axis. The diagonal line, OM, represents the "line of perfect equality." The area of ONPM shows the actual welfare and wellbeing of farmers, namely the Lorenz curve of welfare. The bending of the curve can be interpreted to depict the extent to which welfare capability differs. The gap can be further described using Formula (3-7) in which f(x) represents the curve ONPM, and $S_{\triangle OAM}$ represents the measure of $\triangle OAM$. The lower the value of G, the more equally welfare capability is distributed, and vice versa.

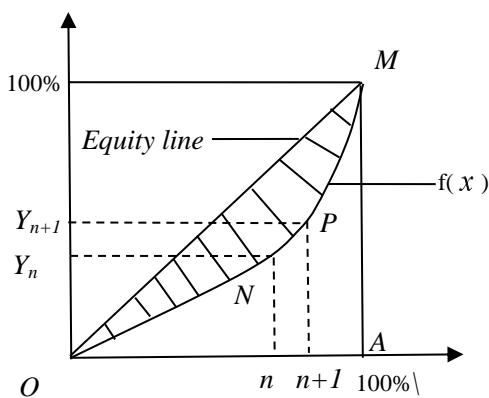$$G = 1 - \frac{\int f(x)dx}{S_{\triangle OAM}} \qquad \text{Formula (3-7)}$$

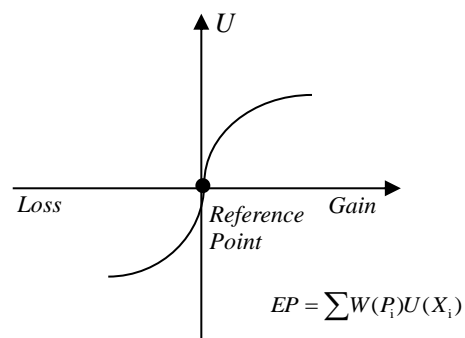**Fig. 2.** Lorenz Curve

$$EP = \sum W(P_i)U(X_i)$$

Fig. 3. Illustration of Prospect Theory

3.4 Analysis of Welfare Capability

Apart from functioning and gaps in welfare, changes in farmers' welfare capability should also be evaluated. Welfare capability covers a wide range of aspects. We introduce a new term, expected welfare prospect, to indicate a direct manifestation of this change. A person's expected prospect of the future is acknowledged to be determined, to a large extent, by his or her capability. Generally speaking, the stronger the capability is, the higher the expected prospect will be(Barberis, 2013; Harrison 2009). Similarly, we reckon that the expected prospect for welfare is a reflection of a farmer's welfare capability. For a particular farmer, the expected prospect for welfare differs as a rural resident and as a citizen. Prospect theory in behavioral economics shows that when someone is confronted with the possibility of potential gain, he or she tends to avert risks. Conversely, when facing losses, he or see engages in risk-seeking. However, there is no definitive boundary between gain and loss. A reference point is set by the individual decision-maker (Barberis, 2013). This means that when people are making decisions, they compare the expected prospect (EP) of different choices that are demonstrated by the aggregate transfection of $U(X_i)$ and $W(P_i)$. $U(X_i)$ represents the possible utility and $W(P_i)$ represents the psychological probability of the utility. $W(P_i)$ can be regarded as the psychological weight of utility, and evidently that of loss not being equal to gain (Kahneman,1979). The curve concaves in the first and third quadrant (Fig. 3). By applying this theory to our analysis of the results of our survey to assess the satisfaction of farmers whose land has been requisitioned, we were able to analyze the change in farmers' expected welfare prospect and, thereby, deduce the change of welfare capability.

4 Results and Discussion

4.1 Changes in Welfare Functioning of Farmers Whose Land was Requisitioned

The numerical values shown in Table 2 are the average values derived from the 648 farmers whose land was requisitioned. They reflect the overall change of welfare functioning of the surveyed group. The results show that after their land was expropriated, the total welfare function of farmers increased from 0.47 to 0.53. This meant that farmers gained 11.8% more welfare in the process of land requisition. This occurred mostly because of the improvement in economic conditions, dwelling conditions, and community surroundings, which showed respective increases of 34.9%, 32.6%, and 13%. However, social security conditions and psychological conditions deteriorated, showing respective decreases of 12.6% and 16.3%.

Table 2
Change in Welfare Functioning Before and After Land Requisition

Index	Weight	Before	After	Change	Index	Weight	Before	After	Change
Economic Conditions	**0.3**	**0.44**	**0.59**	**34.9%**	Pollution Level	0.21	0.55	0.32	-43.0%
Agricultural Labor Income	0.19	0.65	0.35	-46.0%	Traffic Conditions	0.23	0.41	0.70	69.0%
Non-Agricultural Labor Income	0.23	0.43	0.61	44.0%	Infrastructural Services	0.22	0.44	0.71	62.6%
Property Income	0.27	0.29	0.65	126.1%	**Social Security**	**0.22**	**0.55**	**0.48**	**-12.6%**
Net Income	0.31	0.45	0.68	49.7%	Land Security	0.21	0.73	0.27	-63.3%
Dwelling Conditions	**0.2**	**0.39**	**0.51**	**32.6%**	Medical Security	0.25	0.38	0.47	26.4%
Building Structure	0.14	0.67	0.58	-13.0%	Education security	0.17	0.48	0.61	27.2%
Water and Electricity Supply	0.16	0.32	0.62	91.0%	Unemployment Security	0.15	0.77	0.49	-36.3%
Housing value	0.24	0.32	0.57	74.9%	Pension Security	0.22	0.46	0.57	22.2%
Sanitary Condition	0.15	0.41	0.78	90.0%	**Psychological Conditions**	**0.12**	**0.53**	**0.45**	**-16.3%**
Per Capita Living Space	0.31	0.33	0.26	-22.2%	Family Relationship	0.39	0.54	0.48	-11.1%
Community Surroundings	**0.16**	**0.49**	**0.56**	**13.0%**	Life Pressure	0.3	0.45	0.31	-31.1%
Public Security	0.18	0.67	0.42	-37.4%	Sense of Achievement	0.31	0.61	0.54	-11.5%
Green Conditions	0.16	0.40	0.61	52.5%	**Total Welfare Functioning**		**0.47**	**0.53**	**11.8%**

Notes: pollution levels and life stresses are negative indexes.

4.1.1 Economic Conditions

On the whole, economic conditions of farmers whose land was requisitioned have improved, increasing by 34.9%. Of these conditions, property income, in particular, increased the most by 126.1% for two major reasons. First, the farmers whose land was requisitioned have received a significant amount of compensation. Generally, a portion of this compensation was paid to farmers in the form of a one-time monetary indemnity, while the rest was provided in the form of monthly salary-like payments through the village collectives. Second, collective economic organizations within villages invested, operated, and managed the compensation received from collectively owned land, and the profit, thereby accrued, was distributed annually to farmers as bonuses. At the same time, non-agricultural labor incomes have increased by 44% because of the increase in non-agricultural employment opportunities for farmers that have resulted from the urbanization process. Moreover, after land requisition, the amount of cultivable land available to farmers was sharply reduced, causing their incomes from agricultural work to decrease by 46%. Thus, they have to make up for this loss by entering into non-agricultural activities to earn an income.

On the other hand, the consumption structure has changed with corresponding changes in the lifestyles and habits of farmers before and after land requisition. Consumption expenditure for living, cultural activities, and entertainment have shown a marked increase. After the land requisition, instead of obtaining food through farming, farmers had to buy food from the market, which increased living costs. Improvements in infrastructure in the installing site expenditures in these aspects. Nevertheless, net incomes of the farmers whose land was requisitioned have shown an upward trend, increasing by 49.7%.

Although economic conditions have improved in the short term and the farmers whose land was requisitioned are not experiencing any economic stress, most families lack continuous and stable

non-agricultural incomes and the risks of property incomes are high. More importantly, family expenditure in all areas will rise in the foreseeable future. Therefore, the question remains whether the economic conditions of these farmers will remain positive in the long term.

4.1.2 Dwelling Conditions

The overall dwelling conditions of the farmers whose land was requisitioned have improved, increasing by 32.6%. Before land requisition, families generally owned one or more homesteads that had more than two stories. The houses mostly had civil or brick-mixed structures, very good ventilation and lighting conditions, as well as sufficient activity space, which could not be provided in the resettlement houses. Thus, building structures and the per capita living space have decreased by 13% and 22.2%, respectively. However, water and electricity supplies and sanitary conditions have improved.

The infrastructure of the resettlement houses is better than that of the original living areas because of the provision of a sufficient supply of water and electricity, which caused the index to increase by 91%. At the same time, the number of households raising livestock has reduced sharply as farmers no longer want to do agricultural work, while cleaning staff paid by the community have increased, causing the sanitary condition index to increase by 90%. Furthermore, our interviews with some of the farmers whose land was requisitioned revealed an increase in the dwelling value of 74.9% for most of the concerned farmers. On one hand, the original houses that they built on their own homesteads could not be transacted or leased, which implied a low economic value. However, the resettlement houses were mostly built on state-owned areas. They can be transacted in the market, as long as the required documents are complete and lawful, which has resulted in a remarkable increase in economic value. On the other hand, locations, which are much more central than before, have also helped to increase the housing value.

4.1.3 Community Surroundings

In general, the community surrounding index has increased by 13%. Among all of the indexes, traffic conditions have improved the most by 69%. Before land requisition occurred, farmers tended to walk or ride bikes because of the inconvenience of traffic. However, after requisition, the resettlement houses mostly have access to a good road network. Farmers could, therefore, use public transport or even private cars. Green conditions and infrastructural services have also increased by 52.5% and 62.6%, respectively.

In the past, because of less central locations and worse traffic conditions, the time cost for farmers to access infrastructural services was significant. For example, the nearest health center may then have been a 30-minute walk from a person's house. However, after requisition, not only have the sites of providers of infrastructure services become more centralized, but the kinds of services that they provide have also increased, thereby improving opportunities for farmers to obtain these services. The green conditions have also improved as households are now located more centrally. Some of the resettlement houses even have

gardens and parks. However, the local floating population has rapidly grown after the conversion of farmland to construction land, resulting in a more complex neighborhood environment. One consequence has been a decrease in the security condition index by 37.4%. Moreover, air quality, noise pollution, and damage of the natural landscape have worsened, causing the pollution level index to decrease by 43%.

4.1.4 Social Security

In general, social security conditions for farmers whose land was requisitioned have deteriorated, showing a decrease of 12.6%. Land is currently still the most reliable guarantee of a living for most Chinese farmers. However, in the process of land requisition, the development rights, live rights, and security rights of land have all been nationalized, resulting in the loss for farmers of their basic means of livelihood. The land security index has decreased by 63.3% because farmers no longer obtain food by farming. Simultaneously, the risk of non-agricultural unemployment has risen because of the decline in the land security function. Prior to land requisition, farmers had the choice of returning to farming when facing employment barriers in the city. Our computation shows that the unemployment security index has decreased by 36.3%. Regarding educational security, resettlement houses generally have kindergartens, primary schools, and middle schools, and some even have high schools in their proximity. These facilities have improved educational security for the children of farmers who underwent land requisition, leading to an increase in this index by 27.2%. In addition, the state provided farmers with pensions and medical security after their land was requisitioned. These have resulted in a huge improvement, and an increase in the pension and medical security indexes by 22.2% and 26.4%, respectively. But these insurance levels are still too low to guarantee a basic living for an elderly farmer in a city.

4.1.4 Psychological Conditions

On the whole, psychological conditions of farmers whose land was requisitioned have deteriorated, showing a decrease of 16.3%. Before land requisition, there was just one income source for a peasant household, the intra-household labor division was specific, and relationships within families were harmonious. However, after land requisition, families received a significant quantity of compensation for a short time that may have led to discord within families and divergence of their members when this was distributed. This was the main reason for the decrease in the family relationship index by 11.1%. In addition, after losing land, farmers experienced more life stress resulting from economic, cultural, environmental, and other factors. The economic stress evidently resulted from the increase in living expenditure and the risk of unemployment. Moreover, the community environment and urban cultural life were alien to the farmers. When people stay in a strange environment, they will psychologically experience repression (Sands, 2012). Therefore, life stress has increased by 31.1%, while farmers' sense of achievement decreased by 11.5%, because the reference object changed after they entered communities and cities.

4.2 Changes in the Welfare Gap of Farmers Whose Land was Requisitioned

The Lorenz curve of welfare functioning of farmers whose land was requisitioned was plotted based on the calculation of every farmer's welfare functioning (see Fig. 4). The solid line represents the Lorenz curve of welfare functioning before land requisition, and the dotted line represents the Lorenz curve of welfare functioning after land requisition. These two curves intersect at N (52% and 43%)
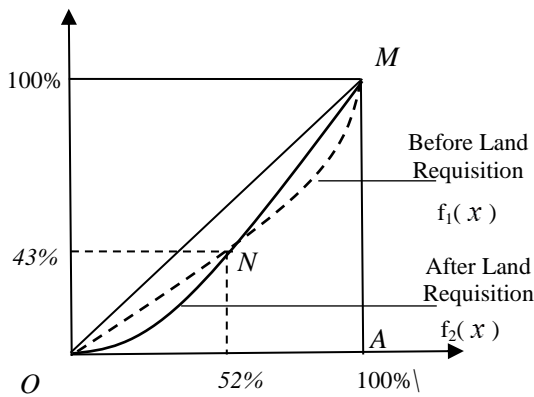
Fig. 4 . Lorenz Curve of Welfare

The Lorenz criterion was used to assess the degree of inequality of different groups. Thus, when different Lorenz curves did not intersect, the curve closer to the absolute equity line (diagonal line) depicted a lower degree of inequality and a smaller Gini coefficient. If, however, they crossed over at any point, the Lorenz criterion was no longer valid. This implied that the traditional Gini coefficient, which cannot reflect the skewness and kurtosis of the Lorenz curve, could not be used to judge the degree of inequality of different groups (Hong, 2006). Two distinct groups of farmers could be recognized before and after land requisition. This was attributed to key political, economic, and cultural changes, as well as to changes in the mentality of farmers, even though they were the same people before and after land requisition. This meant that the traditional Gini coefficient obtained before land requisition could not be compared with that obtained after land requisition. Further, we could not analyze which welfare gap of farmers was larger.

To address the above problem, we used the concept of a weighted Gini coefficient (Zhou, 2005). In formula (4-1), G^* represents a weighted Gini coefficient, G represents a traditional Gini coefficient, and G' represents a modified Gini coefficient. In formula (4-2), m denotes the skewness of the Lorenz curve and f(x) denotes the function of the Lorenz curve. The results of our calculation are shown in Table 3. If the traditional Gini coefficient, which showed a decline from 0.29 to 0.28, was used to study the change in the welfare gap, we could conclude that there was no obvious change in the welfare gap. However, this was not the case in practice. The weighted Gini coefficient increased from 0.26 to 0.32, which meant that the welfare gap had widened. According to the World Bank, a Gini coefficient that is between 0.2–0.3 represents a good

distribution. A range of 0.3–0.4 suggests a reasonable distribution, and 0.4 denotes the warning point. Therefore, it is evident that after land requisition, the welfare gap has widened from well-distributed to reasonable.

$$G^* = G \times G + (1-G)G' \qquad \text{Formula (4-1)}$$

$$G' = 1 - 2(1+m^3)\int_0^1 f(x)dx \qquad \text{Formula (4-2)}$$

Table 3. Results of Calculations of Different Kinds of Gini Coefficient

	Traditional Gini Coefficient	Modified Gini Coefficient	Weighted Gini Coefficient
Before land requisition	0.29	0.25	0.26
After land requisition	0.28	0.33	0.32
Change	−0.01	0.08	0.05

The reasons for the widening of the welfare gap were as follows. First, in the process of welfare distribution, rural cadres have a preferential right. For instance, in the allocation of resettlement houses, the dwelling conditions of rural cadres are always better than those of ordinary villagers. This has been confirmed though investigations of dwelling conditions. Second, in the process of land requisition, a small number of farmers exhibit rent-seeking behavior. For instance, the principle of homestead distribution in China is that one household can have only one homestead. However, in practice, many households have more than one homestead. To obtain more land requisition compensation, some farmers use gray methods to try and legalize these extra homesteads. Thus, a small number of farmers whose land was requisitioned may get compensation that exceeds the normal rate. Third, different people have different methods of using the compensation obtained from land requisition. Those who invest the money can gain much more profit compared with the majority of farmers who just deposit the money in the bank. In light of these three reasons, what is of concern is that the beneficiaries are mostly people in the same group, leading to a widening of the welfare gap after land requisition.

4.3 Changes in Welfare Capability of Farmers Whose Land was Requisitioned

Based on our analysis in section 4.1, it is clear that farmers' welfare functioning has improved after land requisition. However, our study of these farmers showed that about 84% of them believed that their benefits had been exploited by the government. Although the widening of the welfare gap, demonstrated in section 4.2, has evidently led to dissatisfaction, this still cannot explain why so many farmers feel that they have lost their benefits. What is the actual reason for this phenomenon? We applied prospect theory from behavioral economics to address this question.
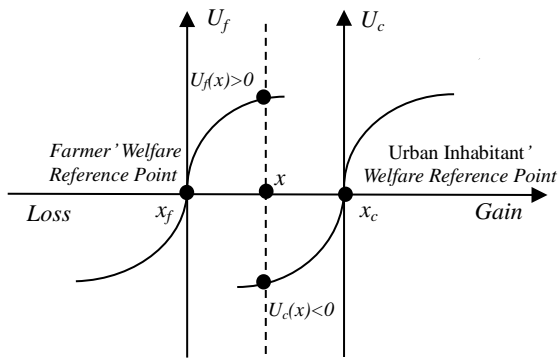
**Fig. 5 Comparison between
farmers and urban inhabitants**

First, we assumed that the expected welfare prospect of farmers is lower than that of urban inhabitants. Thus, the welfare reference point for farmers was lower than that for urban inhabitants. We further deduced that on the same abscissa axis, the farmers' reference point was on the left of the urban inhabitants' reference point. Based on this hypothesis, we plotted both the farmers' value function and the urban inhabitants' value function on the same abscissa axis (Fig. 5). When welfare was equal to x, it was higher than the farmers' welfare reference point x_f and a farmer's welfare utility $U_f(x)>0$. At this point, a farmer would perceive an improvement in welfare and feel satisfied. On the other hand, when welfare was equal to x, it was lower than the urban inhabitants' welfare reference point x_c and a citizen's welfare utility $U_c(x)<0$. At this point, a citizen would perceive a reduction in welfare and feel dissatisfied.

To turn now to the actual situation after land requisition, the farmers' welfare reference point was converted to the urban inhabitants' welfare reference point. As a result, a judgmental bias, described in prospect theory, occurred. This perfectly answers the above question as to why farmers who underwent land requisition still felt dissatisfied even though their welfare had improved. Ultimately, we can conclude that the hypothesis we put forward at the beginning of section 4.3, namely that the expected welfare prospect of farmers is lower than that of urban inhabitants, is true. We can further deduce that the welfare capability of farmers has improved after land requisition.

5 Conclusions

The research framework constructed for this study, which collectively addresses welfare functioning, the welfare gap, and welfare capability, can be well applied for estimating changes in the welfare of farmers who underwent requisition of their land.

It can be used not only to calculate welfare functioning in quantitative terms, but can also be used to deduce a change in welfare capability. What is more, it can be used to accurately measure the change in the welfare gap before and after land requisition. Through its design and application of this research framework, this study has rectified defects in traditional welfare theory, as well as in Amartya Sen' welfare theory.

Apart from its use in estimations of welfare changes of farmers whose land has been requisitioned, it can be applied more widely within other welfare studies by changing the indexes. The results of this study can be used to assess the performance of relevant land use policies.

However, there were two noteworthy limitations of this study. First, the appropriateness of the use of a weighted Gini coefficient has been queried (Zhong, 2005). Therefore, further research is required to ascertain whether using a weighted Gini coefficient is the best method for addressing the problem of the intersection of different Lorenz curves. Second, the expected welfare prospect cannot fully represent welfare capability. Further research to address these deficiencies will hopefully generate more accurate results in the future.

Despite these limitations, this study has, nevertheless, revealed valuable findings, namely that welfare functioning has increased, the welfare gap has widened, and welfare capability has improved for the investigated population of farmers. Based on our analysis of these findings, we present the following recommendations. Welfare studies should focus not only on quantitative aspects of welfare distribution, but should also pay more attention to its fairness and impartiality. This can prevent social problems posed by an oversized welfare gap. Moreover, after land requisition, the government and community should provide education and training services, and the current one-time compensation model should be replaced by a lifelong compensation model. At the same time, endowment insurance should be extended in rural areas, and urban medical insurance should be progressively incorporated within the social security benefits of farmers whose land has been requisitioned.

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