



Supportive Strategies and Empirical Research on Housing Policies for the Improvement of the Living Environment of Special Needs Groups under the Social Security Framework

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ABSTRACT

Due to the continuous increase of housing prices in recent years, many special groups of low and middle income do not have enough financial ability to pay for the high housing prices, and the problem of living environment is becoming more and more prominent. Based on the utility function in economic theory, this paper constructs a utility function model under the constraints of household budget income and price, and determines the income line of housing security households. The distributional efficiency of the implementation of the guaranteed housing policy is estimated through both in-kind rent allocation and rent subsidy. Based on the empirical distribution characteristics and public opinion surveys, a rational distribution model for the current stage of sheltered housing is proposed. Taking Singapore's guaranteed housing policy as a case study, combining empirical evidence and simulation experiments, the effect of improving the living environment of special needs groups under the framework of social security is explored. The results show that: using a 10% allocation ratio of subsidised housing (5% each for affordable housing and public rental housing), the vacancy rate of public rental housing shows an oscillating state in the period of 7~16. In the period from 16 to 20, it shows a gradual increase. Therefore, this guaranteed housing policy should be gradually adjusted or cancelled around period 16.

Keywords: utility function, income line, in-kind rent allocation, rental subsidy, sheltered housing policy

1. Introduction

Housing is one of the indispensable basic needs in urban society, and housing policy has an important impact on the development of urban society. Reasonable housing policy can promote the prosperity of urban economy and social stability, and improve the quality of life of the people [1-3]. The global urbanisation process in recent decades shows that the continuous expansion of many cities and the

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increasing population have led to a large demand for residential areas. Housing policies have played a great role in promoting the development of urbanisation [4-6]. Under the guidance of housing policies, urbanisation has proceeded smoothly and social and economic development has accelerated as a result, while at the same time continuing to affect the living conditions of special needs groups, especially in the context of social security-based approaches [7-9].

Firstly, there is the economic dimension. At the economic level, housing policy is crucial to the lives of special needs groups. Housing policies can affect housing prices, housing supply and demand, and property market stability. Secondly, at the social level [10-12]. Housing policy also has a profound impact on the life of special needs groups. Housing policy can affect the social status of urban residents, family status and other aspects. Finally, there is the ecological dimension. Housing policy has an impact on the living environment, ecological environment and other aspects of special needs groups [13-15]. In the context of social security, appropriate housing policies can improve the living environment of special needs groups. In some cities, the government will focus on renovating old-style neighbourhoods, increasing green space, public facilities, etc., so as to make the living environment of special needs groups more livable [16-19].

The study utilizes the economic concept of housing affordability to determine the housing security income line from the perspective of residential expenditures. The basic principle of housing payment ability is measured by function, and the relevant variables affecting the determination of the housing security income line are sorted out. Based on the perspective of policy formulation, the income line for housing security is set as the boundary of housing security policy, which provides a theoretical basis for the formulation of security housing policy. Based on the principle of "small clusters, large mixed housing", the rational distribution model of guaranteed housing is proposed, taking into account the economics of urban land and the law of differential land rent. Finally, taking Singapore's "constant yield" guaranteed housing policy as a case study, the effect of the guaranteed housing policy on the improvement of the living environment of special-needs groups is explored under the framework of social security through the research mode of combining empirical evidence and simulation experiments.

2. Guaranteed housing policies for special needs groups

As China's housing prices continue to rise, in order to solve the problem of insufficient housing affordability for the lower-middle-income group, China has taken measures such as affordable housing and price-restricted housing, respectively. At the same time, the safeguard policy of low-cost housing was proposed. However, on the basis of the gradual development of urbanisation, the inadequacy of the population covered by the previously implemented guaranteed housing has become more and more obvious. Migrant workers, newly graduated college students, and disabled persons who have lost their ability to work do not have the financial means to pay for the high cost of housing, and although the State has implemented a policy of guaranteed housing, it has not been well implemented, and the problem of the living environment of this special-needs group is becoming more and more apparent.

2.1. Measurement of the Housing Security Income Line

2.1.1. Analysis of the economics of the sheltered housing model. The housing security model refers to the Government's provision of guaranteed housing for low- and middle-income groups with special needs, thereby bringing about aggregate and structural changes in the property of the families covered [20]. As the price of the guaranteed housing is lower than the price of commercial housing for ordinary families, this difference is equivalent to the government's 'transfer payments', forming the 'housing security benefits' for low-income families.

According to Marshall's theory of consumer surplus in economics, the housing benefit is the difference between the market price and the price at which a protected family buys or rents a house.

However, Marshall's consumer surplus theory only takes into account the price effect due to the lower price paid by sheltered housing households, and does not consider the income effect due to price changes. The Hicks Equivalent Variation (EV) model is an alternative approach to analysing changes in welfare that has been developed on this basis, which converts the change in utility due to a change in price into an equivalent change in utility due to a change in monetary income, by converting the change in utility into a change in income [21]. Thus, the change in the welfare of a covered household before and after entering the housing security system can be measured, in monetary terms, as shown in Figure 1. Assuming that a household's consumption mainly consists of housing expenditure and non-housing expenditure of two commodities, non-housing commodity unit price of 1, the horizontal axis H and vertical axis X in the figure represents the number of housing and non-housing consumption of these two commodities, respectively.

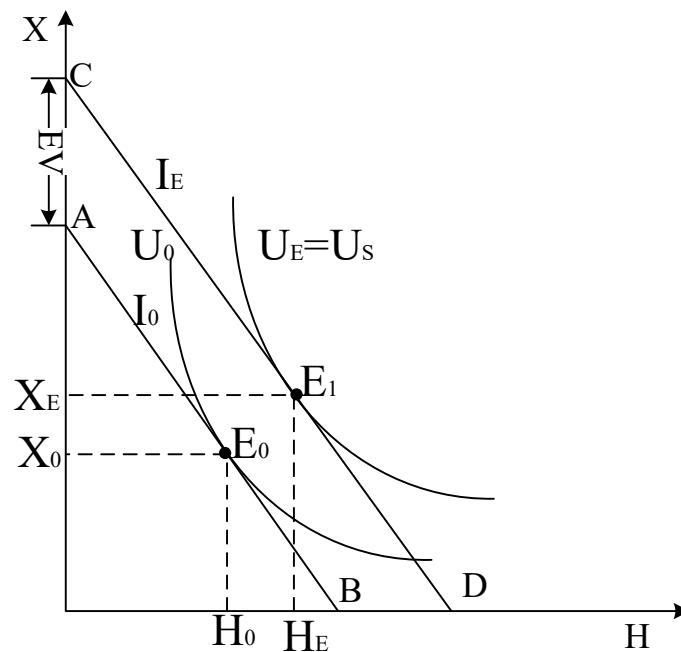


Fig. 1. Changes in income before and after entering the housing security system

The actual income level of a family with housing security is I_0 , and the budget line for family income before obtaining housing security is AB , and there:

$$I_0 = P_M * H + X \quad (1)$$

where P_M is the market price of housing, and this budget line is tangent to the undifferentiated curve U_0 at point E_0 , (H_0^*, X_0^*) . Point E_0 is an equilibrium point at which the utility of a sheltered household is maximised before it enters the sheltered housing system.

Households covered by housing enter the housing security system, the price paid for housing decreases and the price paid for non-housing remains unchanged due to access to secure housing. In order to achieve a higher level of utility, sheltered households increase the quantity of housing consumed, and the income budget line shifts to the right to AD . And there:

$$I_0 = P_s * H + X \quad (2)$$

This budget line is tangent to the undifferentiated curve U_s at E_1 point (H_s^*, X_s^*) , and point E_1 is an equilibrium point at which the utility of covered households is maximised. The increase in utility gained by the covered household as a result of a decrease in the price paid for housing, i.e., the increase in utility due to the price change, as a result of enjoying the guaranteed housing is:

$$\Delta U = U_s - U_0 \quad (3)$$

The compensation budget line is an analytical tool used to represent the hypothetical increase or decrease in monetary income to maintain the consumer's actual level of utility unchanged, inducing a compensation budget line CD parallel to AB and tangent to the undifferentiated curve U_s . Compensation budget line CD represents the level of income I_E equivalent to that which would be required to maintain the same level of utility U_s as that obtained at the subsidised price P_s if the market price of the housing were P_N . At this point, there is $I_E = P_N * H + X$. With U_E representing the level of utility after EV transformation, there is $U_E = U_s$. The change in benefits (EV) brought about by the entry of a housing security household into the housing security system can then be expressed in terms of a change in income, i.e., there is:

$$EV = I_E - I_0 \quad (4)$$

2.1.2. Modelling the Measurement of Security Housing Benefits. Based on the above analysis, the utility function model under the income and price constraints of the household budget is constructed by using the utility function. On the basis of the analysis of the undifferentiated curve of household consumption, it is possible to measure the changes in the benefits received by households with housing security. Specifically as follows:

1) Initial Consumption Portfolio of Covered Households. Under the market conditions, the price of unit housing service is P_M . According to the theory of effect maximisation, the effect function of the expenditure of urban households with an average monthly income of I_0 . Is constructed as follows:

$$\begin{aligned} & \text{Max} U(H, X) \\ & \text{s.t. } I_0 = P_M * H + X \end{aligned} \quad (5)$$

Where H and X denote the housing area and the non-housing expenditure portion of the household's basic living consumption respectively, the optimal combination of housing and non-housing consumption can be obtained (H_0^*, X_0^*) , and the maximum value of the total utility obtained by the household under the optimal consumption combination U_0^* :

$$H_0^* = H(I_0, P_M) \quad X_0^* = X(I_0, P_M) \quad (6)$$

$$U_0^* = U(H_0^*, X_0^*) = U[H(I_0, P_M), X(I_0, P_M)] = F(I_0, P_M) \quad (7)$$

2) Consumption mix of the guaranteed households when they obtain housing security. When the protected households get housing security, since the price per unit area of protected housing P_s is lower than the market price, i.e., there is $P_s < P_M$, Then the optimal consumption mix of households entering the housing security system becomes (H_s^*, X_s^*) and the maximum value of the total utility gained U_s^* can be expressed as follows:

$$H_s^* = H(I_0, P_s) \quad X_s^* = X(I_0, P_s) \quad (8)$$

$$U_s^* = U(H_s^*, X_s^*) = U[H(I_0, P_s), X(I_0, P_s)] = G(I_0, P_s) \quad (9)$$

3) Consumption mix after EV transformation. The utility level U_E of the transformed household is equal to the utility level U_s of the covered household before the transformation, and the optimal consumption mix is the tangent point E_2 of the compensated budget line CD and the no-difference curve U_E . And the optimal consumption mix (H_E^*, X_E^*) and the total utility obtained U_E^* can be expressed as follows:

$$U_E^* = U_s^* = U[H(I_0, P_s), X(I_0, P_s)] = U[H(I_E, P_M), X(I_E, P_M)] \quad (10)$$

$$H_E^* = H(I_E, P_M) X_E^* = X(I_E, P_M) \quad (11)$$

$$U_E^* = U(H_E^*, X_E^*) = U[H(I_E, P_M), X(I_E, P_M)] = M(I_E, P_M) \quad (12)$$

$$I_E = M^{-1}(U_E^*, P_M) \quad (13)$$

2.2. Secure Housing Strategy

2.2.1. Distributional efficiency of the in-kind approach to rent allocation. One of the distinctive features of in-kind rent allocation is the standardised nature of the guaranteed area, which is generally within 60m², but there are two different ways of realising this, namely, mandatory compliance with the standard and non-compulsory compliance with the standard. In the former case, housing is allocated strictly in accordance with the number of people in a low-rent target family, while in the latter case the target can choose freely.

At the time of government mandatory housing size compliance, the housing size of the security recipients is standard H_r , and the rent is P_r . At this time, the rent payment is $R = P_r \times H_r$. For the security recipients, the income is in the middle and lower brackets, and any consumption expenditures are prioritised on necessities. If the total income Y remains constant at this time and $R \leq P_h \times H_0$, there will be no change in consumption other than housing, but when the rent price is P_n , their equilibrium consumption is $E(H_r, N_r)$ and $N_r \geq N_0$.

The allocative efficiency of in-kind rent allocation at mandatory attainment is shown in Figure 2, where it can be seen that the point of tangency between U_2 and the budget line I_2 is $C(H_s, N_s)$, which has the same utility as the point E , also on U_2 . If the intercept is labelled $(Y+Y_2)/P_h$, the optimal housing consumption rises to H_r , at which point the security recipients are equivalent to receiving a cash subsidy of quantity $Y_2 = P_h H_0 - P_r H_r$. If Y_3 ($Y_3 = P_h H_r - P_r H_r$) is noted as the cost to the government of providing H_r low-cost housing, then $(Y+Y_3)/P_h$ is the intercept of the budget line I_3 where point E is located. Use Y_2/Y_3 to denote the efficiency of the use of the low-cost housing funds spent by the government.

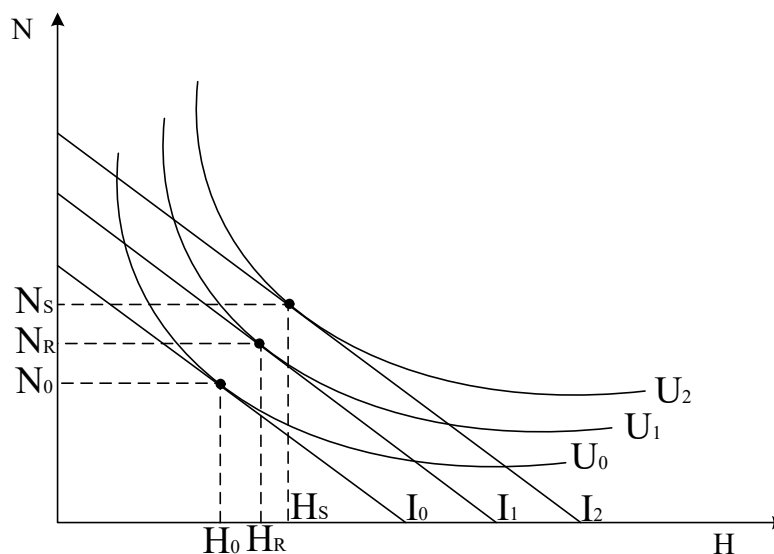


Fig. 2. Distribution efficiency of physical allocation of rent

As can be seen from $Y_3 - Y_2 > 0$, the Government's investment has been utilised at a loss and has not been fully converted into benefits for the beneficiaries of the guarantee. If rent in kind is used, the only thing that can be guaranteed is the rate of compliance with the housing area standard, and the rate of capital utilisation cannot be guaranteed to be fully utilised, if the standard of protection is met. However, if the low-cost rent can be made lower, the capital utilisation rate can be increased.

2.2.2. Allocative efficiency of the rental subsidy approach. The rental subsidy approach is weaker in controlling the consumption of security recipients and has less impact on the market. The supply structure and quantity of low-grade housing, as well as the market rental price, will not be greatly affected by it, and the only thing the Government can do is to impose restrictions on the use of the subsidy funds.

Figure 3 reflects the situation when the Government relaxes the use of subsidy funds. In this case, this corresponds to a direct increase of Y_3 in the income of the recipients of the subsidy, and their income budget line is shifted directly to the right from I_1 to I_3 , which is a 100 per cent use of the funds. However, it should also be observed that in this case, the actual area of housing consumed by the recipients of the low-cost housing subsidy often falls short of the target. Point $D(H_m, N_m)$, for example, has the highest utility, but $H_m < H_r$. Taking the point between EK as the study, the utility level of the security recipients is greater than that of the in-kind rent allocation for the same amount of money, but none of them meet the security criteria in terms of housing consumption.

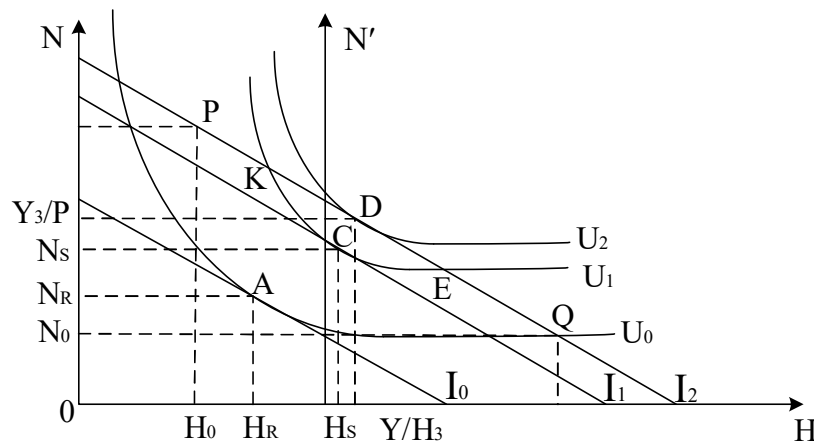


Fig. 3. Allocation efficiency of subsidies

Again, points other than EK are studied, in which case the consumer utility is lower compared to in-kind rent allocation. What is more noteworthy is that there are also two housing consumption distortions that can occur. Points Q and P in the figure clearly reflect these two conditions. In the former case, housing consumption exceeds the subsidised rate, while in the latter case it is less than before the subsidy. The former is generally due to the fact that the actual incomes of the recipients of low-cost housing are higher than what is shown, which is a form of free-riding behaviour on higher incomes, while the latter is mainly due to changes in the family.

It can be seen that the key role of subsidy Y_3 is to pay the rent, which is intended to guarantee the quantity of housing consumed. At a certain level, it should be greater than or equal to Y_3 / P_h , which is equivalent to shifting the entire vertical axis to the position N in the above diagram. At the same time, the original budget line has to be adjusted accordingly in order to ensure the correctness of the analysis. With no change in the vertical intercept, only with an increase in the horizontal intercept by Y_3 / P_h , the profitability of the funds is maximised, which not only ensures the number of housing accommodations, but is at least no worse than the policy of rent subsidies.

2.3. *Modelling the distribution of sheltered housing*

Through pondering on the concept of living space and harmonious society, “scientific development, efficiency priority and people-oriented” are the essential requirements for controlling living space differentiation in the context of a harmonious society. Research on the willingness of residents to live in protected housing shows that the “scale differentiation” method of “small cluster, large mixed housing” is more in line with the willingness of the disadvantaged class than other construction modes. This study follows the principle of “small clusters, large mixed housing” security housing distribution structure, taking into account the economics of urban land and the law of differential land rent. Based on the empirical distribution characteristics (e.g. location uniformity, different types of different evolution characteristics) and public opinion survey conclusions (e.g. small clusters, large mixed settlements, rational location choice), the rational distribution model of the current stage of the guaranteed housing is proposed as shown in Figure 4. Among them, the 1st circle is the city center area, the 2nd circle is the general area of the city, the 3rd circle is the peri-urban area, and the closed small circle is the guaranteed housing district which is distributed in a certain scale.

The specific contents are as follows:

- 1) In the urban residential land, the guaranteed housing is evenly distributed at a certain scale.
- 2) Considering the differential land rent, at this stage, in order to reduce the cost, the guaranteed housing is mainly distributed in the land price is relatively inexpensive, transportation, public construction is relatively convenient and complete. In order to avoid residential segregation, a certain proportion of sheltered housing is allocated in the center of the city. The outskirts of the city adopt the method of independent small-scale centralized development and construction, combined with supporting construction. In the middle of the city, “mixed housing” can be realized in a variety of flexible ways, such as through the tilted design of demolition and relocation policies, the improvement of dilapidated housing, the renewal of land in the old city and the allocation of housing, as well as the donation of housing, the acquisition of housing by the Government or the implementation of rent allocation.

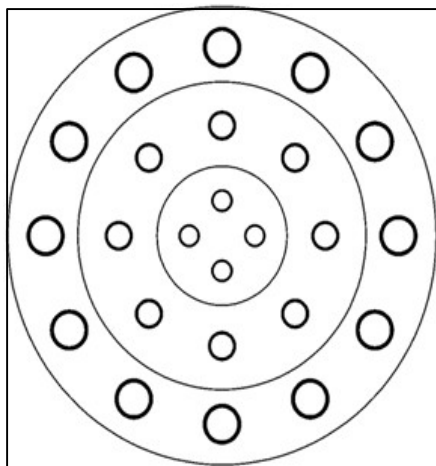


Fig. 4. Rational distribution model of social housing

- 3) The size of the protected housing neighbourhoods in the outskirts of the city can be larger than the size in the middle of the city due to the density of the road network and the cost of development.
- 4) Safeguarded housing can be mixed and arranged with low-priced general commercial housing and price-restricted commercial housing.
- 5) With the development of social economy and the further increase of the state's protection for the vulnerable groups, the proportion and scale of the development of the protected housing in the high

land price and high quality lots in the city will be increased, so as to gradually realise the better integration of the society.

3. Case studies on secure tenure policies

3.1. Overview of cases

Singapore is located 136.8 kilometres north of the equator at the southern tip of the Malay Peninsula, with a longitude of $103^{\circ}38' \sim 103^{\circ}6'$ East and a latitude of $1^{\circ}09' \sim 1^{\circ}29'$ North. It is a tropical island nation and consists of a main island and 63 surrounding islets, with the main island covering an area of 682 square kilometres, a total land area of 707.2km², and a population density of 6,781 people/km² (2008), making it one of the most densely populated regions in the world. While the economy of modern Singapore continues to grow rapidly, the Singapore government has likewise made great achievements in the social and livelihood fields, one of the most notable achievements being the effective solution to the housing problems of the Singaporean people. Although, there are various reasons for the success of public housing development in Singapore and the achievements and lessons learnt are reflected in various aspects.

However, from a more in-depth understanding of the success of Singapore's public housing development, the Singapore Government has accomplished the process of moving from a "large building" to a "permanent asset" through the development of public housing, that is, from meeting the basic housing needs of the people to the completion of the process of reshaping the wealth structure of society. The introduction and implementation of the "Home Ownership Scheme" has not only achieved the basic goal of ensuring housing for all Singaporeans. In addition, public housing in Singapore also serves as an important social welfare benefit for the redistribution of wealth among different income classes, and enables people to preserve and increase the value of the properties they own through a variety of methods. Ultimately, it provides a stable political and social bedrock for Singapore's continued economic development.

3.1.1. Special Group Needs. Since 1955, HDB has been formulating its development plans on a five-year cycle. Till 2008, HDB has built a total of 990,300 units of public housing and in 1964, the Singapore government introduced the Home Ownership Scheme (HOS), whereby the public housing units built by HDB were mainly used for rental purposes. The Home Ownership Scheme encourages public housing tenants to purchase the ownership of public housing units, thereby transforming the nature of public housing in Singapore and expanding the basic clientele of government public housing. The basic objective of the Home Ownership Scheme is to enable the majority of the special needs group to own a home. In order to achieve this goal, HDB has built a large number of public housing units based on the housing needs of the country's residents. Overall, the supply and demand for public housing in Singapore have shown essentially the same trend of change, becoming progressively smaller over time.

The results of public housing demand and HDB construction statistics are shown in Figure 5. From the public housing demand and construction statistics of HDB, Singapore's public housing policy has provided adequate housing for Singapore residents, and these "wide-ranging buildings" have ensured that the people's basic housing needs are met. In 1985, the number of housing units built exceeded the number of units demanded by residents, and in subsequent years, the number of units built has been greater than the number of units demanded by home buyers, and the ratio has remained at about 80%.

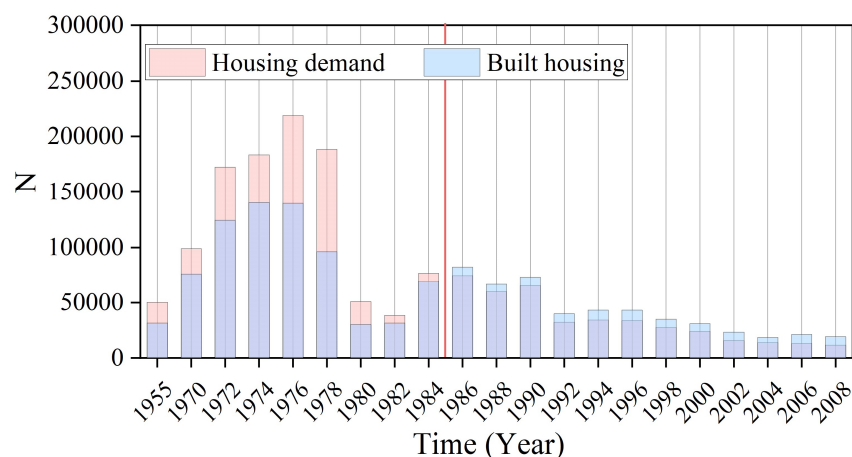


Fig. 5. Statistics on demand for public housing and HDB construction

3.1.2. Subsidising. home buyers. Singapore's Central Provident Fund (CPF) provides strong protection for Singapore's special needs groups who purchase public housing. The trend of CPF employee and employer contributions, as well as the proportion of each account, over the years is shown in Figure 6. The employer and employee contributions in 2008 were 13.24 per cent and 23.03 per cent, while the ordinary and special contributions were 4.91 per cent and 6.83 per cent, respectively. The Central Provident Fund Board (CPF Board) invests the CPF in government bonds and pays all CPF depositors an interest rate of not less than 2.5 per cent per annum, with a maximum rate of 5 per cent. Since the Central Provident Fund Board guarantees a floor of 2.5 per cent interest rate per annum, the Central Provident Fund is regarded as a risk-free, high-return investment.

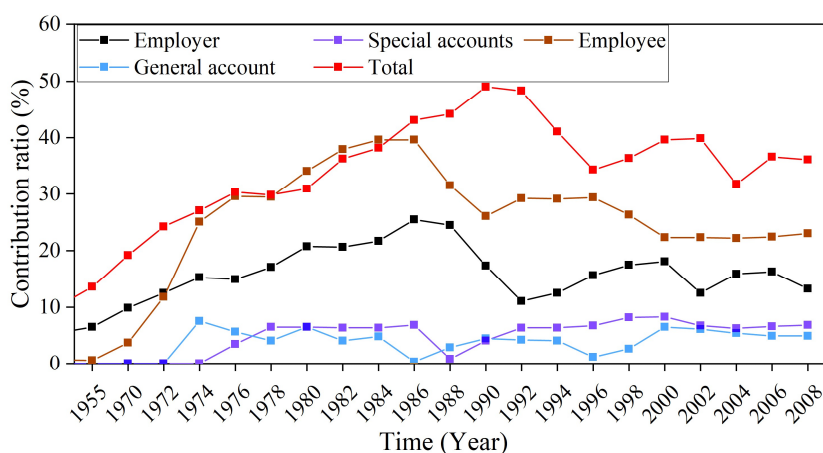


Fig. 6. Trends of CPF in Singapore by year

Apart from providing financial security to Singapore residents, the CPF also directly grants subsidies to certain specific home buyers through grant schemes. For example, families or unmarried persons who have not previously benefited from a housing subsidy and meet the relevant eligibility criteria to purchase a home. When they buy public housing, they will receive some additional financial assistance, and the current amount of the Central Provident Fund's home purchase subsidy and the target recipients of the subsidy are shown in Table 1. It can be seen that the country receives 5 levels of additional subsidies for home purchase calculated through the Housing Guarantee Income Line Determination (HGILD). The maximum subsidy reaches SGD 30,000 for residents with an average monthly household income equal to or less than SGD 1,500 over the past 2 years.

Table 1. Singapore Central Provident Fund (CPF) Additional subsidies for home purchases in 2008

Average monthly Household income over the past 2 years (SDG)	CPF Home Purchase Bonus (SDG))
1500 or less	30000
1500-3000	20000
3001-4000	15000
4001-4500	10000
4500-5000	5000

3.1.3. Control of public housing prices. HDB has always pegged the prices of HDB flats to the prevailing income levels of the residents and is committed to providing affordable HDB flats to the Singaporeans, especially to the first time buyer applicants. HDB sells its HDB flats below their actual value to ensure that 90 per cent of Singaporeans can afford at least a 3-room HDB flat and 70 per cent of Singaporeans can afford at least a 4-room HDB flat.

The sales prices of different house types in several new towns announced by HDB in 2008 are shown in Table 2, and according to the 2007 Singapore Household Census, the per capita annual income of a Singaporean household in that year was S\$38,735 (SDG). The price of a 4-bedroom public housing unit ranges from 142,500 to 265,000 SDG, which is at a minimum only about 4 times the average annual income of a Singaporean resident. Compared to the international norm of 6:1, this is a reasonable level.

Table 2. New home sales price

New town	Room 2 (SDG)	Room 3 (SDG)	Room 4 (SDG)	Room 5 (SDG)
Jurong West	-	-	160000-220000	198000-265000
Bukit Panjang	-	112000-145000	182000-234000	-
Sembawang	-	-	132000-198000	-
Yishun	78000-98000	115000-142000	181000-256000	-
Punggol	72000-85000	118000-155000	185000-265000	-
Sengkang	60000-88000	110000-145000	142500-245000	-

3.2. Secure Housing Policy

The performance standards for the Home Ownership Scheme (HOS) guaranteed housing policy proposed by Singapore are set as follows:

- 1) At the end of the period, at least 80% of households owned commercial housing, while the rest had access to affordable housing or public rental housing (i.e., they should be insured to the fullest extent possible), and the amount of mortgage loans for households purchasing affordable housing and the amount of rent paid by households renting public rental housing were less than 30% of their household incomes. The rental expenditure of families that have not yet purchased affordable housing and are renting commercial housing is less than 50% of the total fixed household income.
- 2) The housing policy is neutral, and there is no widening of the difference in assets, i.e., polarization or change in the ranking of classes as a result of the housing policy.
- 3) The waiting time for both affordable housing and public rental housing is below the maximum permissible value.

In the process of simulation experiments on the guaranteed housing policy, the input variables are set as policy variables, and the output variables are the average housing ownership and area of various types of household subjects, the total net assets at the end of the period, the vacancy rate, and the ratio of housing expenditures to incomes. The number of policy simulation prediction periods is 20 periods, and the unit is year.

3.2.1. Experiments on public housing supply. Tests T1 to T3 are simulations of the expansion of the total public housing allocation ratio from 6% to 20% for the sheltered housing policy, and T4 and T5

are simulations of the extreme scenarios of the cancellation of public rental housing and the cancellation of affordable housing. The net assets of households without housing (rigid demand type I) and with housing (rigid demand type II) are shown in Figure 7. The figure shows that the current housing policy is not neutral, leading to the formation of two distinct social classes of households with similar incomes due to whether they buy a home or not, and the gap in net worth gradually widens, with the gap between the two coming to about 1,400,000 when the time comes to 20 periods. However, the change in the supply of public housing did not have a significant effect on the gap between the rich and the poor of the same type of households, which is not in line with the usual imagination. One possible reason for this is that the smaller size of affordable housing also prevents it from being sold outright at a profit within five years, limiting the wealth growth of households that buy affordable housing. Households renting public housing rely mainly on income growth to drive asset accumulation, and housing subsidies are not sufficient to bring about a significant increase in assets.

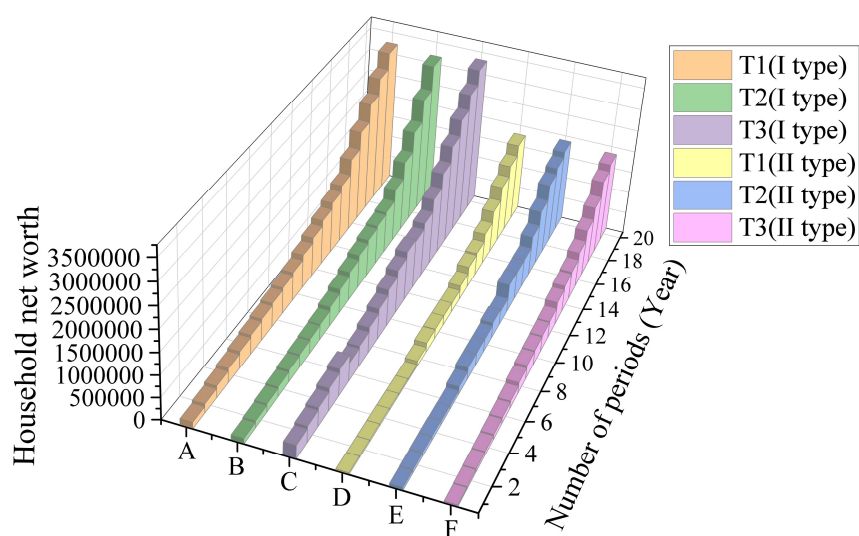


Fig. 7. Public housing supply change on the influence of the gap between rich and poor

Changes in the volume of commercial housing transactions under different public housing supply scenarios are shown in Figure 8, and the results of the safeguarded housing policy in practice are as follows:

- 1) The guaranteed housing policy caused an oscillating effect on the market in the shape of water ripples. After the cheap sale of public housing with the continued rise in house prices, the wealth accumulation effect is beginning to show, the 5th period became the first peak period of home purchase, the 18th period for the second peak period, which is quite consistent with the region's commercial housing turnover changes.
- 2) Overall, when the total proportion of new public housing is less than 10 per cent, the impact on the commercial housing market is relatively small, and there is no significant change in turnover. The larger the proportion of public housing allocation (Experiments T4 and T5), the larger the amplitude of the volume shock. The smaller the proportion (Experiment T3), the smaller the shock amplitude. The results show that intervention in the commercial housing market through public housing leads to greater volatility, and the market instead fails to self-regulate smoothly.

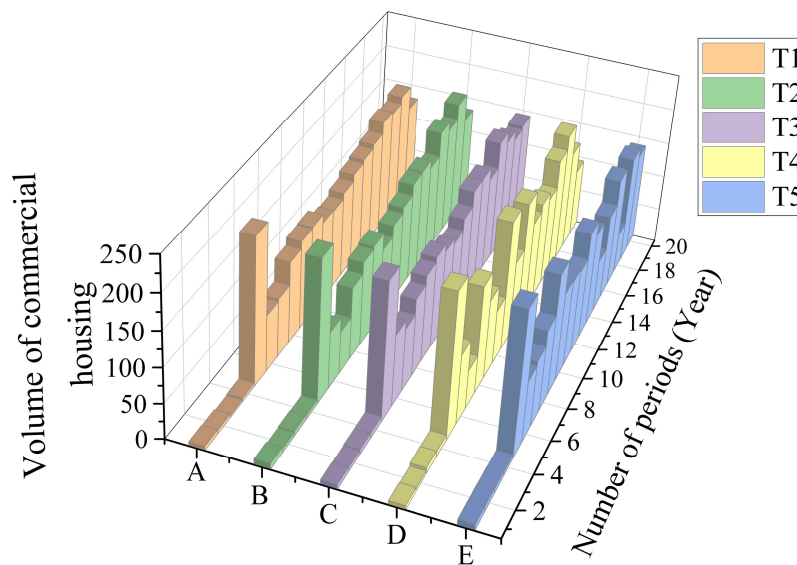


Fig. 8. The change of commercial housing turnover under different supply conditions

The change in the number of units rented out and the curve of change in the vacancy rate of public rental housing are shown in Figures 9 and 10 respectively, and it can be seen that the curve of the vacancy rate of public rental housing shows a clear U-shape, which proves that the use of stable allocation will go through the process of vacancy-renting-out-and-vacancy again. The probable reason is that public rental housing is no longer attractive given the gradual increase in the home ownership rate of local residents. The greater the supply of public rental housing, the greater the uncertainty in that market. Adopting a planning allocation ratio of less than 10 per cent would result in 7 periods, all of which show a vacancy rate of less than 10 per cent, when the policy effect of the sheltered housing policy is at its maximum. In period 7~16, the vacancy rate shows an oscillating state. And then, in the period of 16~20, it is gradually rising posture. Therefore, the guaranteed housing policy should be gradually adjusted or cancelled around the 16th period.

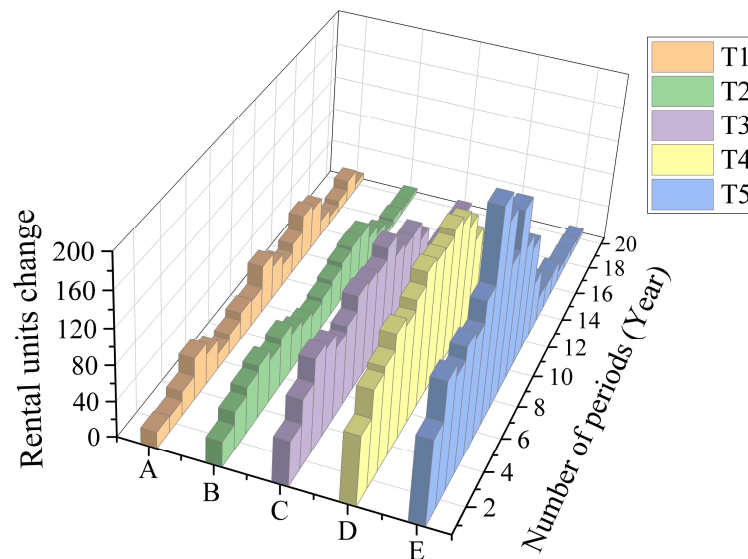


Fig. 9. Curve of public rental housing rental volume

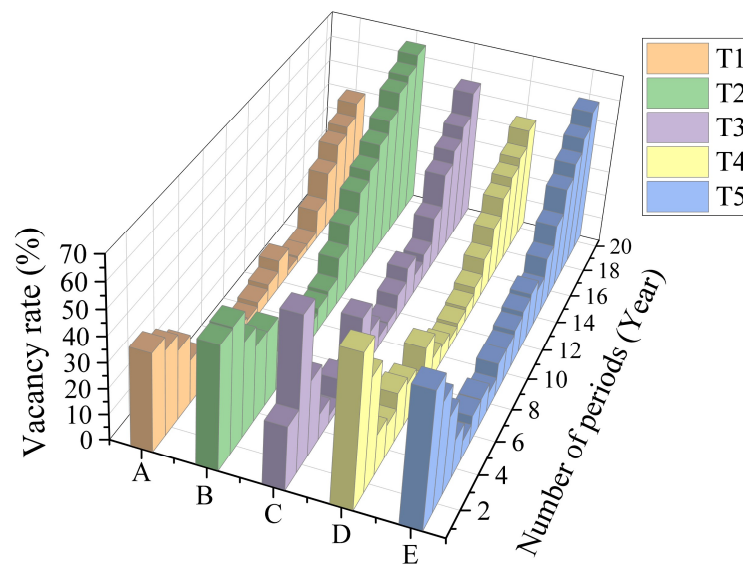


Fig. 10. Curve of public rental housing vacancy rate

The supply of public rental housing can be adjusted by lowering the allocation ratio or increasing the resale ratio to gradually reduce the supply of public rental housing. If the vacancy rate of public rental housing is to be kept from decreasing, the entry requirements for public rental housing can be lowered to allow more young ants, the elderly and non-household residents with stable jobs to enter the waiting list.

3.2.2. Experiments in price control policies. Experimenting with four control policies with completely different trends in house price movements, i.e. Fast, Medial, Slow and Stable, the trend changes are shown in Figure 11, where the vertical coordinate is the centroid house price and the horizontal coordinate is the number of policy implementation periods. It can be seen that under the Fast trend, when the house price control policy was implemented for 20 periods, the centre point house price reached 90,656, which is about 10 times higher than that of the same period in Stable.

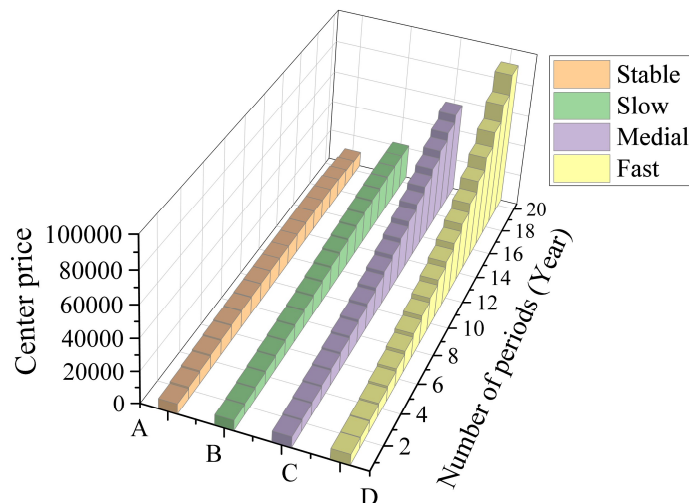


Fig. 11. Housing price change trend on policy experimental

The per capita housing area of households in housing difficulties (rigid need I) is shown in Figure 12. It can be seen that, even with the use of strict price control measures, it has not been possible to make households in the immediate need type I purchase another home or improve their housing area (the per capita area has always remained at 10-14 square metres).

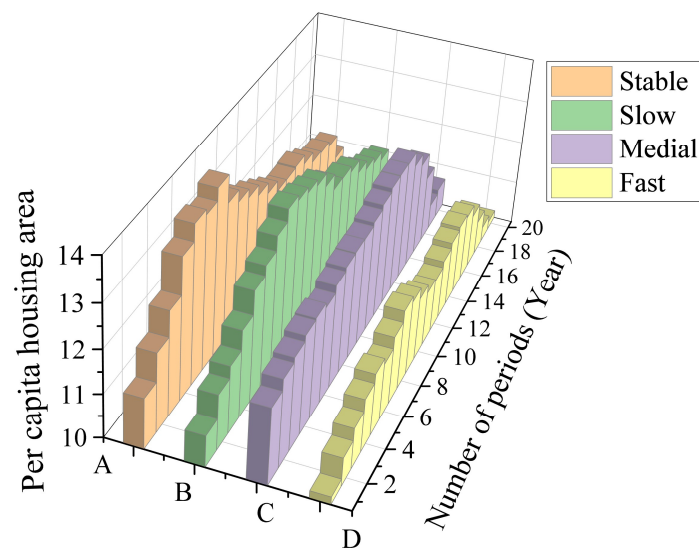


Fig. 12. The housing area per capita of Rigid I type households

One possible explanation for the above is that, as a result of the continuous rise in housing prices in recent years, housing prices have become much higher than the purchasing power of households in double-digit poverty, and the proceeds from the sale of a house, which is subject to 20 per cent of income tax, deed tax, etc., do not help much in the purchase of a larger home. This proves that relying solely on housing price control policies is ineffective in facilitating the improvement of housing space for households in housing difficulties. Assistance to such households in purchasing a home is needed, either through urban renewal, by exchanging in-situ rehousing for a larger home, or by increasing the supply of small and medium-sized homes.

4. Conclusion

Guaranteed housing refers to housing that is directly or indirectly subsidised by the government and sold or rented at a lower price in order to solve the housing problems of low-income special groups. This paper provides a determination of the income line of housing security, and optimises the policy of guaranteed housing from two perspectives, so as to achieve the effect of improving the living environment of special needs groups. Based on the study of the two rent allocation methods of in-kind rent allocation and rent subsidy, we start from two perspectives of market equilibrium theory and consumer utility theory, not only examining the market demand and supply of the two rent allocation methods, but also taking into account the cost of capital expenditure and allocative efficiency, and summarising their respective adaptive situations. The countries and regions analysed in this paper vary greatly in terms of their national conditions, population and resources, and not all of them have a housing system that is suitable for them. Instead, different systems and monitoring mechanisms need to be put in place according to their characteristics in order to improve their housing security. The study should take into account the characteristics rather than uniform standards in order to truly fulfil the role of the housing security system.

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