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IMPACT Research Centre

Nisha Agrawal

by

PROGRAMS IN AUSTRALIA

THE ECONOMIC EFFECTS OF PUBLIC HOUSING
Abstract

An alternative program of equity-based, unrestricted local housing programs are compared with those under an alternative program of more practiced, the effects of the programs from the adequate exchange the distributional and estimates of the effects of the program on the distribution effect. The paper provides the first estimates of the benefits of the program and examines the distribution and the potential for additional benefits to households in Australia.

Public housing provides unsubsidized shelter to

Cash Grants
REFERENCES
EXPERIMENTAL RESULTS

3.2.3 Estimation of the parameters of the

4.3 Estimation of the parameters of the

4.2 Predictive market homes for public

4.1 Estimation of the parameters of the

4.1 Computation needed in the analysis

4.0 Methods of Prediction and Estimation

3.4 Computation Alternative Program Effects

3.3 Measuring Costs

3.2 Measuring Benefits

3.1 Changes in Computation Parameters

3.0 Theoretical Framework

2.3 Funded Arrangements

2.2 Method of Operation

2.1 Alternative for the Program

2. RENTAL HOUSING ASSISTANCE PROGRAMS

INTRODUCTION

TABLE OF CONTENTS
<table>
<thead>
<tr>
<th>PAGE</th>
<th>LIST OF TABLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Effect of Public Housing and Cash Grants</td>
</tr>
<tr>
<td>7</td>
<td>Family Characteristics in 1981-82</td>
</tr>
<tr>
<td>8</td>
<td>Estimation Relationships Between Housing and等</td>
</tr>
<tr>
<td>9</td>
<td>Family Characteristics in 1981-82</td>
</tr>
<tr>
<td>10</td>
<td>The Average Annual Rent from Public Housing</td>
</tr>
<tr>
<td>11</td>
<td>Programs in 1981-82-83</td>
</tr>
<tr>
<td>16</td>
<td>4 Comparison of Families in Public and等</td>
</tr>
<tr>
<td>22</td>
<td>Predicted Market Rate of Public Housing</td>
</tr>
<tr>
<td>25</td>
<td>The Average Rent-Income Ratio for等</td>
</tr>
<tr>
<td>26</td>
<td>Predicted Market Rate of Public Housing</td>
</tr>
<tr>
<td>27</td>
<td>Effect of Income in 1981-82-83</td>
</tr>
<tr>
<td>28</td>
<td>Predicted Market Rate of Public Housing</td>
</tr>
<tr>
<td>29</td>
<td>Distribution of Families and Family Income</td>
</tr>
</tbody>
</table>
INTRODUCTION

There has been some debate about the effects of rental housing assistance on low-income families in Australia. Recently, however, the Australian Bureau of Statistics (ABS) has collected and disseminated the necessary data to conduct such a study. The ABS data reveal that the Australian Bureau of Statistics (ABS) has collected and disseminated the necessary data to conduct such a study. The ABS data reveal that the Australian Bureau of Statistics (ABS) has collected and disseminated the necessary data to conduct such a study.

In contrast to the absence of recent data, little has been learned about the effects of rental housing assistance on low-income families in Australia. Recently, however, the Australian Bureau of Statistics (ABS) has collected and disseminated the necessary data to conduct such a study. The ABS data reveal that the Australian Bureau of Statistics (ABS) has collected and disseminated the necessary data to conduct such a study.
Although the Survey does not contain enough information on the characteristics of housing to make accurate estimates of the effects of government housing programs, it nevertheless seems worthwhile to make estimates based on the best available data. This is the primary purpose of this paper. A secondary purpose is to make clear how more detailed data could be used to obtain more reliable estimates.

The following questions will be answered in the study:

(1) What are the dollar values of the public housing programs to their direct beneficiaries?

(2) What cost is incurred by taxpayers to provide these benefits? (We are able to provide only a partial answer to this question.)

(3) How much better or worse housing do public housing tenants occupy than they would have occupied in the absence of the programs?

(4) How much more or less of other goods do public housing tenants consume as a result of the housing programs?

(5) How do these changes in the consumption pattern of public housing tenants compare with the changes that would have occurred had each family been given an unrestricted cash grant which would allow it to consume any combination of goods with the same market value as the combination consumed under the public housing programs?
concluded the paper with a summary of the main results. The empirical results are presented in Section 5. Finally, Section 6 contains the values of certain variables necessary for the study. The framework of the study is laid out in Section 3. The theoretical framework of the study is presented in Section 2.

The results of the paper are set out in Tables 1-5. The program. The empirical results are based on the results from the program's performance pattern under alternative conditions. The results indicate that the government program achieved its goal of reducing the number of sheltered individuals. The results also indicate that the government program did not achieve its goal of reducing the number of sheltered individuals. The results also indicate that the government program did not achieve its goal of reducing the number of sheltered individuals. The results also indicate that the government program did not achieve its goal of reducing the number of sheltered individuals.

(7) To what extent do equity alluded families receive the same?

(8) How does tenant benefits vary with the age and sex of the household?
2 RENTAL HOUSING ASSISTANCE PROGRAMS

Descriptions of different aspects of public housing programs in Australia are available in various degrees of detail from a number of studies in the relevant literature (Carter, 1980, 1983, 1987a, 1987b; Flood and Yates, 1986; Henderson, 1978; Ministry of Housing, Victoria, 1985; Neville, Vipond and Warren, 1984; Temby, 1982; Williams, 1984). Hence, in this paper, we shall limit ourselves to examining only a few salient features of the programs. Below, we review briefly: the rationale for the programs; their method of operation; and finally, funding arrangements.

2.1 Rationale for the Programs

The first question we need to ask ourselves regarding any government program is: is it necessary? The usual explanation proffered in the Australian literature for why government intervention in the housing market is desirable is that there are positive externalities in the consumption of housing. Thus, Carter (1987b, p.7) for example, explicitly justifies government involvement in housing programs on this basis:

"Housing, like education, transport and health, is a merit good -- that is, the social benefit generated by the provision of the good exceeds the private benefit. Private markets operating freely would fail to provide sufficient housing services in societal terms and the distribution of these services to various income groups would be unacceptable."


accordance, the community, nevertheless, and the extent and depth of this 1972, p. 499-492). The existence of preconditions, however, that give some extramural action their meaning to them more to the extent of the community.

The emergence of extramural action, we say above, is facilitated, because socionomic (context), the existence of extramural action is facilitated within the framework of preconditions which only then, and not otherwise under the conditions of housing, does the community have in the neighborhood of some people care about

adequate shelter?"  

"Greenery society, with that all households should have

P. 55) arises and extramural action (1949)

In the emergence of extramural action, which are seen to be a component of the literature regarding this

Industrial development.

The poor and those adequate houses is necessary for

that bad housing led to many other bad features of the family

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2.2 Method of Operation

Public housing programs are one of the main forms of housing assistance to low-income families. Despite the fact that the provision of subsidies to the cost of housing low-income families seems widely perceived by Australians to be desirable, public housing assistance is not very widespread. As Table 1 (based on data from the 1981-82 HNS) reveals, less than four per cent of all families in Australia live in public housing, i.e. in dwellings rented from a Housing Commission or other state housing authority.

The major Commonwealth program of rental housing assistance flows through the state housing authorities under the periodically renegotiated terms of the Commonwealth-State Housing Agreement (CSHA). Under this Agreement, funds are made available to the states to provide housing assistance within broad guidelines agreed between the Commonwealth and the states.

The Australian government first became involved in housing assistance during the post World-War II period. Its aim, then, was to alleviate the acute shortage of housing caused by the low levels of construction during the war period and the large influx of migrants during the post-war period. The main form of assistance during these years was to provide funds to the states through the CSHA to build rental dwellings for public ownership. Thus, the initial objective of these programs was merely to increase the supply of housing in response to an extreme shortage; targeting of assistance to the lowest income groups was not a feature of the programs during this period.

1. The ABS distinguishes the terms 'household', 'family', and 'income unit' from one another. In this study we use these terms loosely and interchangeably to mean an ABS income unit (defined in Section 4.1.1).

2. Even if the long-run price elasticity of supply of housing services were perfectly inelastic, it would be unlikely that the public housing program would generate perceptible effects on market prices since the program represents such a small proportion of community-wide aggregate demand for housing services.

3. While it is clear that these assumptions facilitate analysis, it will become equally apparent that some of the findings of our study could depend critically on one or more of the assumptions. Assumptions (6) and (7) are perhaps the most likely to be violated with important consequences for the present study. Work by researchers in the U.S. is underway to assess the magnitude of biases introduced into analyses of this kind when control for participation in other in-kind benefit programs is neglected. Research on the effects of in-kind transfers on earnings is in its infancy. An attempt by Murray (1980) found the reduction in work effort associated with the introduction of public housing subsidies to be about 4 per cent of pre-subsidy work effort. While Powell, Tulipane and Filmer (1976) provide a theoretical framework to estimate such effects in the Australian context, no empirical estimates are as yet available.

4. Olsen and Barton (1983), estimated that it cost between $1.10 and $1.14 to produce a dollar's worth of housing services with public housing due to the production inefficiencies associated with construction subsidies. Mayo et al. (1980, Part 2), like other researchers, have estimated the magnitude of the production inefficiency for construction programs to be much larger.

5. Dependant children are defined as all unmarried persons living with their parents and either under 15 years of age, or full-time students aged 15-20 years. Any income received by dependant children is not included in the income of the income unit to which they belong.
"...public housing offers one of the few means that those on very low incomes have of achieving secure, adequate and affordable housing." (Carter, 1976, p.1)

In conclusion, through subsidized public rental housing, this study shows that it provides substantial benefits to public housing tenants while there are alternative programs that provide assistance to the poor.

Among the families in public housing, mean benefit is greater for larger families and varies little with the age or sex of the household head. In addition, we find that there is a large variance in the benefits from the program and single persons between families of different types, single parent households, headed by females in the age group of 15-24, the smallest.

### Table 1

<table>
<thead>
<tr>
<th>Nature of Occupancy</th>
<th>Mean Annual Income ($)</th>
<th>Proportion (Percent)</th>
<th>Number (Thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renting - landlord</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner/occupier -</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owning outright</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchasing outright</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>374.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9216</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11715</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1538</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7165.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* This category consists of persons such as those living rent-free, residing from employer, or renting from another person in the same household.

Source: Based on data from the 1981-82 Income and Housing Survey.
The policy of providing rental assistance through public ownership remained largely unchallenged into the 1970's. Things began to change, however, during the mid 1970's. Firstly, by then the acute shortage of housing had been largely eliminated. Secondly, the 1975 Commission of Inquiry into Poverty in Australia (CIFA) found that a significant proportion of public housing tenants were not poor, and that they were being subsidized at the expense of other, more needy groups. The main problem was that although entry into public housing was means-tested, continuation of tenancy, once established, was not. Once admitted, tenants could remain indefinitely at rents based on historical costs, which were well below those charged in the private market.

These two concerns led to a change in the general perception of the functions desired of public housing authorities. They were no longer required as providers of increased housing stock but were instead expected to distribute more equitably the existing stock of housing. This view is expressed quite succinctly by Henderson (1978, p.35):

"No case remains for State intervention just to add to the general stock of housing. We need improvement in the distribution of housing."

The way to achieve more effective targeting of public subsidies was seen by the CIFA and the Priorities Review Staff (1975) as a move away from the historical practice of charging 'economic' (or cost) rents towards a new practice of charging market rents coupled with means-tested housing rebates paid to those below the poverty line. The 1978 CSIA incorporated the main features of these recommendations.

The results indicate that among families in public housing, we can be quite confident that mean benefit is greater for poorer and larger families. The mean benefit does not appear to vary much with the age and sex of the head of the family.

The relatively low adjusted coefficient of determination ($R^2$) and the standard error of $\$22$ suggest that there is nothing approaching equal treatment of equals among families in public housing. In other words, there exists significant horizontal inequity among program recipients. Certainly, one explanation of this result is the large variance in the desirability of different public housing projects. There is no allocating mechanism for placing families with the same characteristics in housing of equal quality in equally desirable locations. This feature of the program might make it less desirable than otherwise.

6 CONCLUSION

This study finds that the public housing program typically results in a large improvement in the housing of its participants and a significant increase in their consumption of other goods. The mean benefit of the program to these families is substantial relative to their incomes. However, the costs to taxpayers are higher than the benefits of the program. These costs arise due to the distortion in the consumption patterns of public housing tenants. Such distortions are consistent with the justification of the program, and we find that they are in the desired direction. On average, public housing tenants occupy better housing and spend less on other goods than they would choose if
funds are "marketed" to provide rental assistance for persons and families of low income from the program. Some of the community
and state programs are also supplemented by state and/or federal matching funds and funds from other local and/or federal sources. Assistance programs have been implemented across the United States.

Community development corporations continue to receive rental


inging arrangements

provisions and interest rates are now to be based on contractual costs.

police: it recommended that the practice of charging market rents be

unconstitutional, however, the 1986 CCHS has adopted just such a

immediately of the past.

public housing. For public, there would only appear to perpetuate the

several different methodologies. A momentary look at data on the

physical condition of existing public housing or public housing

program to ensure a match of existing public housing with

proportion of existing public housing that is used in the

method of ensuring that current public housing and public

methodologies are under consideration. As middle-income

lowest income groups in America. This change in the operation of the

in Table 1, which shows that by 1942-45 public housing was among the

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<table>
<thead>
<tr>
<th>Standard Costs</th>
<th>Annual Operating Costs of Organization (in Thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.19</td>
<td>0.19**</td>
</tr>
<tr>
<td>99,000</td>
<td></td>
</tr>
<tr>
<td>75,000</td>
<td></td>
</tr>
<tr>
<td>60,000</td>
<td></td>
</tr>
<tr>
<td>45,000</td>
<td></td>
</tr>
<tr>
<td>30,000</td>
<td></td>
</tr>
<tr>
<td>15,000</td>
<td></td>
</tr>
<tr>
<td>7,500</td>
<td></td>
</tr>
<tr>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>2,500</td>
<td></td>
</tr>
<tr>
<td>1,000</td>
<td></td>
</tr>
</tbody>
</table>

In Table 1, which shows that by 1942-45 public housing was among the most affordable of the poor (Klettman, 1984), this practice is reflected in the rapid replacement of run-down public housing by the more selective targeting of the poor created some of the instability of the program (Klettman, 1984).
Aboriginals. About 20 per cent of funds provided were tied in this way in 1981-82 (Tesby, 1982). The states are free to determine what proportion of the Commonwealth funds are used for rental and homeownership assistance: in 1981-82, 77 per cent of Federal funds were spent on public housing.

The levels of resources devoted to solving low income housing problems have changed erratically over the years. As Carter (1983) points out, these levels fell in real terms in each successive year from 1974-75 to 1981-82: from 366 million dollars in 1974-75, funding fell in 1981-82 to 277 million current dollars (which were the equivalent of a mere 107 million 1974-75 dollars). There was a reversal in this trend in 1982-83, but in real terms the funds still remained well below the 1974-75 peak. By 1984-85, the funding had increased by just enough to restore the 1974-75 level in real terms. This amounted to over 900 million in 1984-85 dollars.

The introduction of market rents coupled with income-related rental rebates had the effect of accelerating the departure of higher income households who had passed through their low income phase during which they had gained access to public housing. They were replaced by people currently in their low income phase and thus, eligible for both entry and the rental rebate. Carter (1983) reveals the extent of the transition that took place in public housing during 1976-77 to 1981-82.

He shows that, on average, foregone revenue caused by rental rebates increased six-fold in only five years; the total value of rental rebates in the six states increased from 19.7 million dollars in 1976-77 to 118 million dollars in 1981-82. Since then, all states have reported that a rapidly increasing proportion of new and existing tenants are eligible

### Table 7

<table>
<thead>
<tr>
<th>Type of Family</th>
<th>Average Benefit (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married couple, husband under 65 years of age</td>
<td></td>
</tr>
<tr>
<td>(1) no dependant children</td>
<td>1279</td>
</tr>
<tr>
<td>(2) one dependant child</td>
<td>1360</td>
</tr>
<tr>
<td>(3) two dependant children</td>
<td>1408</td>
</tr>
<tr>
<td>(4) three dependant children</td>
<td>1452</td>
</tr>
<tr>
<td>(5) four or more dependant children</td>
<td>1247</td>
</tr>
<tr>
<td>Married couple, husband aged 65 years or more</td>
<td></td>
</tr>
<tr>
<td>(6) no dependant children</td>
<td>1778</td>
</tr>
<tr>
<td>One parent, female</td>
<td></td>
</tr>
<tr>
<td>(7) one dependant child</td>
<td>2104</td>
</tr>
<tr>
<td>(8) two dependant children</td>
<td>2693</td>
</tr>
<tr>
<td>(9) three or more dependant children</td>
<td>2828</td>
</tr>
<tr>
<td>One parent, male</td>
<td></td>
</tr>
<tr>
<td>(10) one or more dependant children</td>
<td>1718</td>
</tr>
<tr>
<td>One person</td>
<td></td>
</tr>
<tr>
<td>(11) aged 15-24 years</td>
<td>231</td>
</tr>
<tr>
<td>(12) aged 25-64 years</td>
<td>1253</td>
</tr>
<tr>
<td>(13) aged 65 years or more</td>
<td>1665</td>
</tr>
<tr>
<td>Total (for all families)</td>
<td>1581</td>
</tr>
</tbody>
</table>
The distribution of public housing among the program participants takes into account the average income of the group of participants, to ensure that the income of the participants does not exceed a certain level. The program participants are grouped into different categories based on their income levels. The participants are required to meet certain income and eligibility requirements to be eligible for public housing.

In Table 1, we can see that the average income of the group of participants is lower than that of the general population. This is due to the fact that the participants are mostly low-income individuals who are unable to afford private housing. The program therefore helps to alleviate the housing needs of these individuals by providing them with affordable housing options.

In conclusion, the distribution of public housing among the program participants is designed to ensure that the income of the participants does not exceed a certain level. The program helps to alleviate the housing needs of low-income individuals by providing them with affordable housing options. The average income of the group of participants is lower than that of the general population, which reflects the program's success in addressing the housing needs of low-income individuals.
(3) the long-run supply curves in all markets are perfectly elastic 2; and,

(4) information and transportation are costless.

These assumptions have two implications. First, that all consumers within an area face the same set of prices; and second, that this set would be the same under the three alternatives considered in this study. The second implication can be justified on the basis that less than four per cent of all families in Australia live in public housing, and that in the absence of the program these families would account for a smaller fraction of total consumption of housing services. Hence, even a large increase in their consumption would have little effect on the total.

Each of the three alternatives evaluated (public housing, no housing assistance, an equivalent value cash grant) may involve different tax payments or quantities of other public services. We assume, however, that:

(5) there is no difference in the quantities of other public services in the three cases and that the differences in taxes do not affect the tax payments of families in public housing.

Finally, we assume that:

(6) public housing tenants receive no other subsidies in kind; and that
justification. In an economic context, it is important to note that public housing does not change one's eligibility. A family, however, may pay a certain rent for public housing. In order to qualify for this rental, the family must meet certain financial requirements. These requirements are detailed in a set of regulations and procedures. The family must meet specific income and asset criteria in order to qualify for public housing. If a family does not meet these requirements, they may be placed on a waiting list. If a family meets the requirements, they may be offered a unit. The process of applying for public housing involves several steps. First, a family must complete an application form. Then, the application is reviewed by the housing authority. If the application is approved, the family is offered a unit. If the application is denied, the family may appeal the decision. It is important to note that the availability of public housing varies by location. In some areas, public housing may be more difficult to access due to limited availability. In other areas, public housing may be more accessible. The decision to apply for public housing is a personal one, and families must carefully consider their options before making a decision.
services and consume less of other goods than they would choose were they given an unrestricted cash grant which would allow them to consume any combination of goods with the same market value as the combination under the program (Olsen, 1981). Table 5 shows that, in aggregate, public housing has the desired effect. An equivalent value unrestricted cash grant would reduce the consumption of housing by public housing families by 16.7 per cent and increase their consumption of other goods by 6.8 per cent.

5.2 Distribution

A change in the allocation of resources generally implies a change in the distribution of well-being among benefit recipients and taxpayers as well. Thus, many argue that policy-induced changes should not only lead to greater efficiency, but also conform to principles of equity. This section examines the distribution of program-induced benefits to assess the degree of conformity with the established principles of horizontal and vertical equity.

...
For in the expression (2),

\[
\left( \frac{\gamma d}{\gamma d + \gamma d_0} \right) \frac{\gamma d}{\gamma d + \gamma d_0} \frac{\gamma d}{\gamma d + \gamma d_0} (2)
\]

(2) 

\[
\left[ \frac{\gamma d_0}{\gamma d_0 + \gamma d} \right] (3)
\]

(3)

(2')

It is possible to construct a more general form of equation (2') by replacing the proportionality constants in equation (2) with values derived from the data. This proportionality is observed in the expression (2') for a set of conditions.

(1)

\[
\left( \frac{\gamma d_0}{\gamma d_0 + \gamma d} \right)
\]

(1')

It is possible to construct a more general form of equation (1') by replacing the proportionality constants in equation (1) with values derived from the data. This proportionality is observed in the expression (1') for a set of conditions.

To evaluate the effect of the policy on housing patterns, we have estimated the proportionality of the assumed association between housing and employment patterns in the community. The results suggest that the policy may have a significant impact on housing patterns in the community.

3.1 Changes in Composition Patterns

As a result of the policy, the proportionality of the assumed association between housing and employment patterns in the community has changed. The changes in composition patterns are shown in the following table.

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Pre-Policy</th>
<th>Post-Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>B</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>C</td>
<td>0.3</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Although changes in composition patterns should be expected, the magnitude of change is not substantial.
To calculate the change in the consumption of housing services due to the program, we need to know: first, the value of the market rent of each family's public housing unit, \( P_{h,j} Q^{h}_{i,j} \); and second, the family's expenditure on housing in the absence of the public housing program, \( P_{h,j} Q^{m}_{i,j} \). This will enable us to evaluate expression (1). Similarly, to calculate the change in the consumption of other goods due to the program, we need to know: first, the amount each family in public housing spends on other goods, \( P_{x,j} Q^{x}_{i,j} \); and second, the family's expenditure on other goods in the absence of the program, \( P_{x,j} Q^{m}_{i,j} \).

Since there are only two goods and no saving or dissaving is assumed, everything that the family does not spend on housing services is spent on other goods. Hence, for a family in public housing, expenditures on other goods can be depicted as:

\[
P_{x,j} Q^{x}_{i,j} = Y_{i,j} - E^{x}_{i,j} \tag{3}
\]

In the absence of the program, these expenditures would be:

\[
P_{x,j} Q^{m}_{i,j} = Y_{i,j} - P_{h,j} Q^{m}_{i,j} \tag{4}
\]

Therefore, the effect of these programs on the consumption of other goods by public housing tenants can be calculated from a knowledge of the family's income, \( Y_{i,j} \); the rent of its public housing unit, \( E^{h}_{i,j} \); and its expenditures on housing in the absence of the program, \( P_{h,j} Q^{m}_{i,j} \). In addition to these values, we need to know:

<table>
<thead>
<tr>
<th>Table 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Some Aggregate Effects of Public Housing Programs in 1981-82</strong></td>
</tr>
</tbody>
</table>

| (1) Mean annual housing expenditure of public housing families in absence of these programs | $ 2273 |
| (2) Mean annual market rent of their public housing units | $ 3993 |
| (3) Percentage increase in aggregate consumption of housing services by these families \( \left( \frac{(2)-(1)}{(1)} \right) \times 100 \) | 45.7% |
| (4) Mean annual expenditure on other goods by public housing families in absence of these programs | $ 8808 |
| (5) Mean annual expenditure on other goods by public housing families under these programs | $ 9715 |
| (6) Percentage increase in aggregate consumption of other goods by these families \( \left( \frac{(5)-(4)}{(4)} \right) \times 100 \) | 10.3% |
| (7) Mean annual rent paid by public housing families | $ 1816 |
| (8) Weighted mean percentage reduction in market price of housing services to public housing families \( \left( \frac{(2)-(7)}{(2)} \right) \times 100 \) | 54.2% |
| (9) Mean annual income of public housing families \( (5) + (7) \) | $11531 |
| (10) Mean annual increase in market value of goods consumed by these families \( (2)-(9) \) | $ 2152 |
| (11) Mean annual benefit to public housing families | $ 1581 |
| (12) Mean annual subsidy \( (2)-(7) \) | $ 2152 |
| (13) Benefit - cost ratio \( (11) \div (12) \) | 0.73 |
Recent studies have shown that the introduction of a public housing program with a fixed budget can lead to a reduction in the number of families that are tenants. This effect is particularly pronounced in areas with a high concentration of low-income families. The advent of this program has also helped to reduce the number of families that are forced to live in overcrowded housing conditions.

In recent years, there has been a growing interest in the performance of public housing programs, especially in terms of their ability to provide stable and affordable housing for low-income families. This interest has been fueled by concerns about the impact of rapid urbanization on housing affordability and access to affordable housing. As a result, there has been increased attention to the role of public housing programs in ensuring that low-income families have access to safe and affordable housing.

In this context, the introduction of a public housing program with a fixed budget can be seen as a positive development, as it provides a clear and predictable framework for allocating resources and ensuring that families have access to stable housing. However, it is important to note that the effectiveness of such programs will depend on a variety of factors, including the level of government funding, the availability of affordable housing options, and the degree to which families are able to access these resources.

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In this context, the introduction of a public housing program with a fixed budget can be seen as a positive development, as it provides a clear and predictable framework for allocating resources and ensuring that families have access to stable housing. However, it is important to note that the effectiveness of such programs will depend on a variety of factors, including the level of government funding, the availability of affordable housing options, and the degree to which families are able to access these resources.
(2) divide these families into groups according to such characteristics as family size, age and sex of household head;

(3) posit a particular functional form for the indifference map of families of each type;

(4) estimate its parameters by estimating the parameters of the implied system of demand equations;

and,

(5) use the estimated indifference map for families of each type to estimate the net benefit of the program that will accrue to similar households participating in it. The indifference map parameters estimated are the means of the parameters for households of each type.

This is the methodology adopted in our study.

In Figure 1, there is some unrestricted cash grant B which, if given to the family in place of its eligibility for public housing, would leave the family as well off as it is under the public housing program. This is the concept adopted in this study of the benefit of the program to the family, and is known technically as the Hicksian price-equivalent variation measure. Obviously, the benefit of the program to the family depends on its preferences as well as its income and consumption pattern with the program. Let $k_{i,j}$ to simplify the case, it is not possible to infer the parameters of the CES or Stone-Geary indifference map of a family based on its response to a single set of prices and income.

One solution to this problem is to adopt one of these indifference maps and to make assumptions about the values of all but one parameter, and then to use data on the observed consumption pattern of similar privately renting families to estimate the remaining parameter for each type of family. A range of plausible values can be used to determine the sensitivity of the results to the assumptions made about the indifference map parameters. For example, Olsen and Agrawal (1982) calculated individualized benefits from the U.S. public housing program using values of 0.5, 0.75, 1.0 (the Cobb-Douglas case) and 1.25 for the elasticity of substitution between housing services and other goods. The value of the remaining parameter of the CES utility function was then solved for using the observed consumption patterns of privately renting families under these alternative assumptions about its elasticity of substitution between housing and other goods. No such sensitivity analysis has been attempted in this study.

5 EMPIRICAL RESULTS

In this section, the methodology and data of the previous sections are used to estimate the effects of the public housing program on the participants' consumption of housing and other goods; the costs of the program; the benefits to the participants; and the distribution of these benefits among the various participants. In addition, information is developed about factors presumed to affect external benefits to taxpayers.
utilty function: 

\[ u(x) = \frac{x_1^{\alpha_1} x_2^{\alpha_2}}{\alpha_1 + \alpha_2} \]

(1)

where \( u(x) \) is the utilty function, \( x_1 \) and \( x_2 \) are the variables, and \( \alpha_1 \) and \( \alpha_2 \) are the parameters.

The utilty function is defined for all positive values of \( x_1 \) and \( x_2 \).

(2)

One way to obtain the indvidual demand function for \( x_1 \) and \( x_2 \) is:

\[ \frac{\partial u}{\partial x_1} = x_1^{\alpha_1} \frac{\alpha_1}{\alpha_1 + \alpha_2} x_2^{\alpha_2} \]

(3)

and

\[ \frac{\partial u}{\partial x_2} = x_2^{\alpha_2} \frac{\alpha_2}{\alpha_1 + \alpha_2} x_1^{\alpha_1} \]

(4)

The total utilty for a family of type \( i \) is:

\[ T_i = \alpha_1 x_1^{\alpha_1 + \alpha_2} + \alpha_2 x_2^{\alpha_1 + \alpha_2} \]

(5)

The total utilty for all families is:

\[ T = \sum_i T_i \]

(6)

where \( i \) ranges over all families.

(7)

Note that the utilty function is defined for all positive values of \( x_1 \) and \( x_2 \).
\[
U_k^* = \left( \frac{\alpha_k \cdot \gamma_k}{p_{h,j}} \right) \left( \frac{(1-\alpha_k) \cdot \gamma_k}{p_{x,j}} \right).
\]

(9)

Similarly, the utility \( U_k^* \) derived by the family from the consumption bundle \( (\gamma_k^h, \gamma_k^x) \) chosen under the program, can be expressed as:

\[
U_k^* = (\gamma_k^h)^{\alpha_k} \cdot (\gamma_k^x)^{(1-\alpha_k)}.
\]

(10)

Let \( Y_k^\beta \) denote the income level necessary to place the individual purchasing goods at market prices at the same level of utility as he/she would obtain by consuming \( \gamma_k^h \) and \( \gamma_k^x \) under the public housing program. To obtain the value of \( Y_k^\beta \) that would satisfy this requirement, we only need to substitute \( Y_k \) in expression (9) by \( Y_k^\beta \), equate the resulting expression to expression (10), and solve that equation for \( Y_k^\beta \):

\[
y_k^\beta = \left[ \frac{p_{h,j} \cdot \gamma_k^h}{\alpha_k} \right] \left[ \frac{p_{x,j} \cdot \gamma_k^x}{(1-\alpha_k)} \right].
\]

(11)

This level of income is \( Y + B \) in Figure 1. A family's initial income, \( Y_k \), may be subtracted from the expression for \( Y_k^\beta \) to yield an expression for the family's net benefit, \( B_k \) (denoted benefit, hereafter) under the public housing program:

\[
B_k = Y_k^\beta - Y_k.
\]

(12)

parameter according to family type. Families are divided into categories defined in terms of family size and the age, sex and marital status of the head of the household. It is assumed that all families of the same type in public housing have the same rent-income ratio \( \alpha \). The value of \( \alpha \) is determined as the mean value of the rent-income ratio for a particular type of family renting from the private market. It is then imputed to all families of this type that rent from the government.

Table 3 contains the estimates of the rent-income ratio for 13 types of families. These values were obtained as the average values for each type of family renting privately. To obtain reasonable estimates, we excluded from our sample families who paid either less than five per cent or more than seventy-five percent of their income as rent.

Table 3 reveals that the rent-income ratio varies considerably among different types of families. On average, single parents and older persons spend significantly higher proportions of their income on housing. As we shall see later, these groups are also among the lowest income recipients in our data. The numbers reported in Table 3 are used to estimate the benefit accruing to each public housing family in our sample. They are also used to estimate the changes in the family's consumption patterns under alternative housing programs.

As stated earlier, the reason we adopted the Coob-Douglas indifference maps for the families in our sample is that, given our data, it was the only one we could estimate. Except in this special
In addition to estimating the program effects, it is also necessary to determine the long-term impacts of the program on the housing market. This can be done by analyzing the price changes in rental properties over time. The table below shows the predicted market rents of public housing units in 1990.

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Ex-Post Rents (dollars)</th>
<th>Pre-Post Rents (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Rent Flat</td>
<td>80.00</td>
<td>100.00</td>
</tr>
<tr>
<td>100.00</td>
<td>120.00</td>
<td></td>
</tr>
<tr>
<td>120.00</td>
<td>140.00</td>
<td></td>
</tr>
<tr>
<td>140.00</td>
<td>160.00</td>
<td></td>
</tr>
</tbody>
</table>

Table 2

In 1990-92 Predicted Market Rents of Public Housing Units
\[ y_k^o = Y_k + p_{h,j} q_{h,k} - p_{h,k} = y_k + s_k. \]  

(13)

It would then select the bundle \( u \) and its housing expenditure could be obtained by substituting this income for \( Y_k \) in expression (7) and multiplying the predicted level of housing services, \( q_{h,k}^u \), by the price of housing, \( p_{h,j} \). The proportional differences in the consumption of housing and other goods under the public housing program from what would be consumed under an equivalent value cash grant would be given by replacing the expenditures on housing and other goods at \( u \) with those at \( u \) in expressions (1) and (2). Notice that although the family depicted in Figure 1 occupies better housing and consumes fewer other goods under the public housing program than with the cash grant, the opposite is entirely possible.

4 DATA AND METHODS OF PREDICTION AND ESTIMATION

4.1 Concepts Used in the Analysis

4.1.1 Income Units

All empirical results of this paper are based on data collected during the 1981-82 IHS by the ABS. These data relate to two types of income-receiving units: individuals and 'income units'. For our study, we adopt the ABS classification of income units as the relevant one. Basically, an income unit is a way of describing a nuclear family. All income units can be classified into one of the following types:

rent a proportion of their stock at market rates, and to provide data on
these market rates, the only solution is to obtain data on more
characteristics.

Our predicted market rents are presented in Table 2. Note
that for some categories in the table, the predicted rent was too low;
i.e., it implied that some public housing tenants renting that type of
dwelling were receiving negative subsidies. These rents were adjusted
upwards until the figures implied that each public housing tenant was
receiving at least \$1 in subsidy. It is these adjusted figures that are
reported in Table 2.

4.3 Estimation of the Parameters of the Indifference Maps of Families
in Public Housing

Individualized estimates of the parameters of the indifference maps had to be obtained to calculate the individualized benefits from the public housing program for the families in our sample. As stated earlier, it is impossible to obtain this information directly for these tenants unless one has data on their pre-program consumption patterns. These data, however, were not available from the IHS. Instead, we assumed that the preferences of public housing tenants were the same as those of similar persons who were private renters.

Since we have assumed that each family has a Cobb-Douglas
indifference map, the only parameter value required is the rent-income
ratio of the family. This information is available for the private
renters in our sample. We estimate the indifference map
In our study, we find a number of reasons for why the calculated income data and the housing data do not match the current income. The income data and the housing data do not match the current income because of errors in the data. For example, in one study, we matched the current income data with the housing data, and we found that there were discrepancies between the two. The income data was collected in an earlier period (1998-2002), and the current data was collected in a later period (2013-2015). In the second study, the income data was collected in a later period (2015-2017), and the current data was collected in an earlier period (2008). The income data was collected in a later period (2015-2017), and the current data was collected in an earlier period (2008).

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4.1.3 Nature of Occupancy

The data include information on the nature of occupancy of each income unit; that is, on whether the income unit:

(a) owns its dwelling;
(b) is purchasing its dwelling;
(c) is renting in the private market;
(d) is renting from a Housing Commission
   (or other housing authority);
(e) other.

We examine the economic effects of the housing program on those belonging to category (d) only. This sample consists of 831 income units which, when weighted appropriately, represent 3.8 per cent of total income units in the population.

In addition, we use information on the consumption patterns and the rents paid by those renting in the private market, category (c). This sample consists of 3004 income units which, when weighted appropriately, represent 15.3 per cent of total income units in the population.

4.2 Predicting Market Rents for Public Housing Units

The approach is to estimate the rent for a particular type of dwelling in the private market and then impute this value to a similar dwelling rented by public housing tenants. In the studies evaluating housing programs in the U.S., this is done typically by regressing market rent on a host of housing characteristics. For example, Gillingham (1973) estimated the relationship between market rent and the following housing characteristics: age of structure, number of rooms, number of bathrooms, condition of unit, inclusion in rent of furnishings, refrigerator, air conditioning and stove, the presence of hot running water, central heat, covered parking, and elevator. Unfortunately, no such detailed data are available as yet in Australia. In the IHS data, we have information on only three characteristics of a dwelling: the number of bedrooms, the type of dwelling and the geographical location. Hence, we decided to predict the market rent by just calculating the average rent for each type of unit, cross-classified according to each of these characteristics.

A dwelling can be classified into one of six categories on the basis of the number of bedrooms in it: these categories range from a bedsitter flat to a one, two, three, four or five or more bedroom unit, respectively. Each dwelling can also be categorized on the basis of its type of structure. This can be of one of the following six types: separate house; low-rise flat; semi-detached house; high-rise flat; mobile or improvised dwelling; and, dwelling and non-dwelling combined. In our study, we exclude from our sample those belonging to the last two categories.

Finally, the geographical area of location is known for each dwelling. A dwelling can be located in one of the following twelve areas: a metropolitan or ex-metropolitan area for each of the five states excluding Tasmania; the state of Tasmania; and the Northern Territory (N.T.) and the Australian Capital Territory (A.C.T.) combined. Since our sample size did not permit us to examine the effects of public housing for each of these areas separately, we aggregate them into two