THE POSSIBILITY OF DEMAND-ORIENTED HOUSING
PROGRAMS: some lessons from a simulation exercise (*)
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rapport 84/168
December 1984

(*) I am grateful to E.O. Olsen for advice and discussion, and to Guy Carrin and L. Goossens for comments. Much of the empirical work reported in this paper was done while I was a graduate student in the department of Economics, University of Wisconsin-Madison. The financial support of C.I.M.-I.C.M. is gratefully acknowledged.
Abstract

The purpose of this paper is to design and simulate several demand-oriented housing programs. The results suggest that the proposed in-kind subsidy schemes have many desirable characteristics and are generally much more equitable than existing construction-linked public housing programs.
0. INTRODUCTION

A wide variety of housing programs has been introduced, covering both the market for rental and owner-occupied housing. The justification of these programs involves a large number of arguments, ranging from purely macro-economic considerations to social stability. The purpose of this paper is threefold, first, to rationalize housing subsidies as redistributive devices, taking into account both efficiency and equity aspects. Second, to present a set of rules that, in our view, should be satisfied by a 'desirable' housing program. Third, to simulate three alternative demand-oriented rental housing programs that are consistent with these rules.

The text is divided in two chapters: in chapter one we review explicit and implicit objectives of housing policy and investigate how effective subsidy programs are in achieving the specified goals. It will be suggested that in several cases housing subsidies are inappropriate. However, we indicate that the objective of providing decent housing to subgroups of the population (low-income families, the elderly, etc.) may yield a justification for government programs. A review of the literature on efficient redistribution suggest that subsidized housing as a device for in-kind redistribution may not only consistent with equity, but also with efficiency considerations. If we accept the premises of this
literature, a series of normative prescriptions for a 'good' housing program may be derived under some specific assumptions.

Chapter 2 deals with the design and simulation of rental housing programs. We develop three alternative demand-oriented programs: a constrained price subsidy, a housing allowance program and a combination of a price subsidy with cash grants. Both the design and the choice of parameters are such that the three systems will largely satisfy the requirements for a 'desirable' housing program. In each case we analyze the effect on consumption patterns and the benefits generated by the programs. Moreover, we evaluate the distributive implications in the sample and compare the outcomes with the results of the existing, construction-linked public housing program.
CHAPTER ONE

A NORMATIVE APPROACH TO HOUSING POLICY

0. INTRODUCTION

After a brief review of the objectives of housing policy (section 1) we provide an economic justification for in-kind transfers based on commodity-specific utility interdependencies and the efficiency criterion, see section 2. A set of normative directions that leads, in my view, to more equitable and efficient housing programs is derived in section 3, which is partly based on Olsen (1982).

1. OBJECTIVES OF HOUSING POLICY: A SUMMARY REVIEW

The main objectives of housing policy in Belgium have been summarized by e.g. Durez-Demal (1982) and De Ridder and Minon (1980, p.24). Historically, the promotion of home-ownership has been of primary importance. The underlying belief seemed to be that high levels of owner-occupied housing were somehow related to social stability and to the quality of life within the household¹. Although the hypothetical relation between home-ownership and the social environment has never seriously been studied, the judgment that a stable society is desirable and the implicit belief that this relation exists may be the main reason for the

¹ See e.g. Goossens (1980, p.1): "De veralgemening van het woningbezit zou de arbeiders de zorg voor hun eigendom bijbrengen en zou hen bovendien, gezien de bijhorende zware en langdurige financiële last, aanzetten tot meer verantwoordelijkheid in de werksituatie. Dit alles zou dan de bestaande sociale orde ten goede komen. Anderzijds werd vanuit de katholieke sociale leer in deze aangelegenheid een eigen accent gelegd. Het bezit van een eensgezinswoning werd zeer belangrijk geacht voor de ontvloeiing van het individu in gezinsverband".
focus on ownership. In essence, society may view owner-occupied housing as a merit good, a good more important than allowed for by the choices of individual families (Friedman and Weinberg (1982)).

A second objective is to provide decent housing for low-income families. It has resulted in a set of programs covering both the market for owner-occupied and rental housing. This objective is based upon the belief that the private market would not provide decent housing at prices many of these low-income families are willing to pay. Implied by this statement is the judgment that many housing units chosen by these households within the limits of their budget are not of decent quality\(^1\). If this concern for the housing consumption of the poor is sufficiently strong, it yields a justification for government programs under some additional behavioral assumptions\(^2\). Section 2 provides more details.

The third goal of housing policy has only recently attracted the attention it deserves, viz. to improve the quality of the existing housing stock through sanitation and maintenance programs. Although a shortage in quantity terms does not exist on the Belgian market, the available units widely vary as to quality and

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\(^1\) It is this value judgment that leads some authors to the conclusion that the private market is unable to solve the problems of the housing sector (Goossens (1980, p.3)). Depending on how one defines decent housing, this belief may not be unjustified. Recent simulation results by Ohls (1975) confirm the hypothesis that, under a wide variety of assumptions, low-income families will generally occupy housing units at the lowest quality levels. His filtering model of the housing market also suggests that under some circumstances no new housing will be constructed for households in the bottom tail of the income distribution. Within the framework of his model the reason is that, if many families occupy high-quality units and depreciation is slow, it may be cheaper to produce housing services for the poor out of older, existing structures. However, as long as the stock is of acceptable quality this result does not justify government construction, unless one believes that all poor families should be able to occupy new units.

\(^2\) It is crucial that society is specifically concerned about the housing conditions of the poor, not just about their general well-being. If the latter were the case income maintenance programs are obviously to be preferred over in-kind transfers.
a fraction of the housing stock may be considered inadequate, (see L. Coossens (1980,p.10)).

Previous three policy objectives are commonly used to defend existing housing programs. They appear to be acceptable and are hardly ever challenged by policy makers and professional economists. However, there are several other explicit and implicit goals of housing policy that, despite their not being listed as primary objectives, are equally important in actual policy design. The most obvious among these are macro-economic considerations. It is argued that subsidized housing will activate the construction industry and stimulate output in the economy. Moreover, due to the close relationship between the construction activity and the business cycle, housing programs are sometimes considered a powerful countercyclical device1.

These arguments appeal to many non-economists, but they are thought to be less compelling within the economics profession. First of all, the resources used in housing programs might have been used elsewhere in the economy. This includes other countercyclical programs, which might have been more effective. Indeed, there is substantial evidence suggesting the poor performance of subsidized housing as a countercyclical instrument. The main reason is the long time lag between the decision to construct new units and their actual occupancy by eligibles households. It is due to government processing of the project, site acquisition and the time involved in constructing the housing units. Consequently, unless carefully timed, new construction programs will not have the desired effects on the economy. On the contrary, poor timing may lead to reinforcement of the business cycle rather than economic stabilization. Existing evidence indicates the complexity of

1 The relation between the business cycle and the construction sector has been analyzed by e.g. Van Broekhoven et al. (1972) on the basis of Belgian data. They conclude (p.240): "In de naoorlogse periode bestaat er in België een duidelijke band tussen de algemene conjunctuurontwikkeling en de bouwconjunctuur. Deze laatste loopt in het algemeen een weinig voorop, alhoewel men niet over een vaststaand patroon kan spreken".
the relation between the cycle and residential construction, and
the difficult timing problems that have to be solved if housing
subsidies are to fulfill a prominent role in economic stabilization
(see, e.g. Ricks (1973) and Van Broekhoven et al. (1972, pp. 202-
207)).

Another problem is even more disturbing. Subsidized housing
resulting in new construction, even if appropriately timed, will
only contribute to economic stabilization and increase output
to the extent that it does not decrease the construction activity
in the private sector. Unfortunately, some scarce United States
evidence suggests that a large fraction of the increase in housing
starts due to subsidized production would have occurred in the
absence of the government programs. Using crude techniques, Swan
(1973) calculated that approximately 85% of the additional housing
under a particular new construction program would have been built
by the private sector in its absence. On the basis of an econo-
metric model, Murray (1983) more recently concludes that the sub-
stitution effect of public for private construction largely depends
on the mode of financing. He finds that subsidized starts may be
largely offset if financed through conventional mortgage markets,
but that this will not be the case if the projects are financed
via direct government borrowing. Of course, it is impossible to
evaluate the importance of these offsetting effects for Belgium
without a detailed study of this phenomenon.

Previous arguments cast doubt on the usefulness of housing
programs as instruments to stimulate and stabilize the economy.
Unless more detailed studies strongly contradict earlier con-
clusions, macro-economic considerations do not offer any con-
vincing justification for public housing programs.

It is sometimes claimed that housing subsidies lead to econo-
ic revitalisation of neighborhoods through their effect on
property values in surrounding areas. Moreover, they would reduce
the social costs of poor housing. As both neighborhood development
and reducing the quantity of inadequate housing are often listed as objectives of housing policy, it is interesting to consider the effects generated by housing programs. Although the existence of positive externalities associated with better housing in general and public housing programs in particular has often been asserted, almost no studies exist that show the empirical relevance of this hypothesis. This is unfortunate, because the externality argument provides a possible justification for government programs: from an efficiency viewpoint housing services would be underproduced in a free market system.

There is not much discussion about the fact that housing improvements have a positive effect on nearby property values. This phenomenon has been well-known among real estate specialists for a long time. It has been confirmed by detailed empirical analyses in which hedonic pricing techniques have been used to isolate the externality, see e.g. Linneman (1981). However, it has been suggested that the effect is quite small. In a detailed study, De Salvo (1974) investigated the neighborhood effect of a particular program in New York City. He found that, on average, the housing subsidies raised assessed property values within three blocks of the projects by some 5%. An even smaller increase was calculated by Nourse (1963) for a different program. Although there is no comparable evidence for Belgium, the United States evidence suggests that the impact of public housing on property values is real, but relatively unimportant.

A second externality argument is based on the belief that a strong relation exists between public housing and the social costs of crime, disease and psychological deviations, and fires. The impact of subsidized housing on these social costs and thus on neighborhood quality has not been carefully studied by economists. A few papers on the subject, mainly by non-economists, are reviewed in Weicher (1979, pp. 491-492). He concludes, based on the work of Kasl (1976) and Rothenberg (1976), that there is no evidence
of a relation between better housing and lower crime rates or better health, once the researcher controls for variables such as income, education and race. There does seem to exist a correlation between housing conditions and the financial losses due to fires. However, fires do not necessarily involve an externality.

In a survey of United States policies, Aaron (1981) lists several other explicit policy objectives. They include economic and social integration, increase the supply of housing for particular groups within society and reduce the financial burden of housing. We believe that the encouragement of social integration is less important for Belgium. It is doubtful that housing programs are the most effective tools to satisfy this objective anyway, so that on this basis alone existing assistance schemes can hardly be justified.

The idea that housing programs should increase the supply of units designed according to the needs of subgroups of the population, such as the elderly or the handicapped, is again based on the belief that the market would fail to provide appropriate units. Although there is no empirical evidence to confirm or reject this hypothesis, we believe small-scale programs tailored to the needs of these people can be justified.

Finally, reducing the financial burden of housing is viewed by many economists as an inappropriate goal of policy. The observation that poor people spend a larger fraction of their income on housing than richer households and trends in the proportion of income devoted to housing over time do not allow any strong conclusions. 'Trends in the fraction of income spent on housing would show how the pursuit of economic well-being proceeded as

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1 Moreover, it should be stressed that the mere fact that better housing improves health, reduces crime or fire losses is not sufficient to justify subsidized housing. The existence of an externality is crucial: 'From the standpoint of housing policy, the more important question is not whether housing affects health but whether it affects the neighbors' health' (Weicher, p.492).
incomes rose and relative commodity prices changed, but changes in the financial burden of housing are not, in themselves, good or bad' (Aaron (1981, p.73)). Moreover, it is interesting to note that if reducing the financial burden of housing is a major policy objective, a subsidy that has no effect at all on housing consumption is meeting the goal. Consequently, a general income maintenance program would be much more effective than large-scale housing subsidies.

2. A JUSTIFICATION FOR HOUSING PROGRAMS

The discussion in the previous section indicated that only a few objectives of housing policy can be invoked to justify government programs. In some cases, the objectives themselves were highly desirable, but it was doubtful whether housing programs could substantially contribute to their attainment (e.g. stabilization of the construction sector, promoting economic integration, etc.). Furthermore, there is insufficient evidence in the literature that shows tangible externalities generated by housing programs to be important enough so as to make them policy relevant.

We believe that the ultimate basis for justifying housing subsidies must be ethics. For this reason, the most acceptable goal of housing policy is probably to provide better housing to low-income families\(^1\). If this objective is indeed of primary importance it reflects a concern of society for the well-being of those families in general and for their housing consumption in particular. As a consequence, housing programs might be interpreted as in-kind redistributive devices that can be justified by feelings of justice prevalent within society\(^2\).

\(^1\) Of course, promoting homeownership is largely based on norms within society as well, but it cannot justify programs on the rental housing market.

\(^2\) We are not saying that the existence of these feelings is sufficient to justify all existing forms of assistance on the housing market. Obviously, the political power of all involved groups is crucial in shaping the programs to their actual form.
Not denying the importance of judgment, i.e. ethics, in questions of income redistribution, the welfare economics literature has developed an additional justification for redistribution from the rich to the poor. It has been shown that, under some assumptions on human behavior, money and in-kind transfers may not only be justified from an equity viewpoint, but they are also consistent with efficiency considerations. The purpose of this section is to review, very briefly and in an informal way, the main ingredients of this literature and to provide a rationale for in-kind transfers based on the ethical foundations of the efficiency criterion in economics\(^1\). The development of the literature on efficient redistribution illustrates recent concern in the economics profession that equity and efficiency cannot totally be separated. Moreover, it suggests that once certain types of utility interdependencies - which may well be one of the main sources of feelings of social justice - are incorporated, redistribution and efficiency may be consistent despite the different ethical foundation on which they are based\(^2\).

\(^1\) It is now widely recognized that welfare economics is normative and based on a dual ethical principle: the foundations of efficiency are the premises of the Pareto criterion, whereas equity is ultimately based on judgments about how to compare one person's utility with another's. The usual approach has been to completely separate efficiency and equity questions.

\(^2\) There is some disagreement in the literature as to whether deriving prescriptions for redistribution from an efficiency criterion is at all desirable. Mishan (1972) e.g. claims that, since welfare economics and equity questions are ethical in nature, considerations of externalities which are based on utility interdependence should not be invoked to determine the distribution of income. Consequently, distribution should still be conceived as a separate aspect of welfare. As noted by Hochman and Rodgers (1974), at least part of his remarks are due to an apparent misinterpretation. They point out that the theory of efficient redistribution is not concerned with determining the optimal income distribution, which is indeed impossible. Moreover, they agree that distributional questions deserve separate treatment from efficiency questions and that the theory is not intended to 'empty the contents of the distributive aspect into a purely allocative container' (Mishan (1972, p.971)). Rather, the purpose is to show that under some assumptions 'there is no conflict between the changes required to achieve Pareto optimality and principles of equity' (Hochman and Rodgers (1974, p.753)). The whole argument seems to hinge upon the question as to whether psychic externalities (as distinguished from tangible externalities that impinge directly on consumption or production, see Mishan (1969)) should play a role in economic policy. For more information on this discussion, see the references cited above.
The general idea of this literature (see, e.g. Hochman and Rodgers (1969, 1974), Polinsky (1971), Von Fürstenberg and Mueller (1971)) is that utility interdependencies exist such that redistribution yields benefits to donors as well as recipients. Although there are other possibilities, see e.g. Brennan and Walsh (1977, p. 987), it may be the case that the rich have altruistic feelings towards the poor so that redistribution generates psychic externalities¹.

The mere fact that people value increased well-being for others does not imply that redistribution is always necessary for efficiency, because they may not value it sufficiently high in order to compensate for the loss in well-being due to the transfer of resources. In their seminal article, Hochman and Rodgers (1969) develop an argument for transfers based on the more restrictive assumption that the externality effects are Pareto-relevant and sufficiently strong so as to cause the utility possibilities frontier to be upward sloping over at least a range². In that case, redistribution is Pareto-desirable, i.e. required for efficiency³. Moreover, transfers should be cash, not in-kind. This is obvious because under the stated conditions both the recipient and the donor will be better off with a grant than with an in-kind transfer of the same value.

¹ It should be admitted that not only benevolent feelings exist within society. The impact of envy on efficient redistribution is investigated by Brennan (1973).

² An externality is Pareto-relevant if it 'can be shown to be removed at a net positive benefit for society' (Dahlman (1979, p.145)). The terminology is due to Buchanan and Stubblebine (1962).

³ The argument for redistribution through government programs is that many people care for the well-being of the same person, see Hochman and Rodgers (1974, p.753). If this were not the case private transfers would probably be made resulting in an efficient allocation.
Originating in the work of Buchanan (1968) and Olsen (1971) other types of utility interdependence have been investigated. See e.g. Browning (1975), Daly and Giertz (1976) and Brennan and Walsh (1977). Two different cases may be distinguished: first, suppose donors (D) care about recipients (R) but are not indifferent as to how the latter allocate their income, including any transfers received. Second, suppose donors in addition to previous concern also care for the well-being of recipients in general. In the first case, a simple example of a donor's utility function would be

$$u_D = u_D(x_D^1, \ldots, x_D^n, x_R^r)$$

where: $r =$ the commodity of which the recipients' consumption is of special concern to the donor. A simple example of a utility function in the second case would be

$$u_D = u_D(x_D^1, \ldots, x_D^n, x_R^r, u_R)$$

These types of commodity-specific utility interdependence may e.g. occur if donors care about recipients but do not consider them to be the best judges of their own welfare, a feeling known in the literature as paternalistic altruism {Olsen (1981), Browning (1981)}.

For both cases it has been shown that in-kind transfers are consistent with efficiency considerations in that they can be used to achieve an efficient allocation, see e.g. Brennan and Walsh (1977). This is not surprising, given donor's concern for the recipients' consumption of particular commodities1. Moreover,

1 Note that it has not been shown that in-kind transfers are necessary for efficiency. In fact, Brennan and Walsh (1977) show they are not which leads them to their 'impossibility theorem'. The term is somewhat misleading: their only claim is that no one can promote in-kind transfers on the argument that they are required for efficiency. It should be pointed out, by the way, that there is some disagreement in the literature as to whether cash grants can be used to achieve efficiency. Although Rodgers (1973) has shown that they are useless for efficiency given the first type of commodity - specific utility interdependence, Brennan and Walsh (1980) and Olsen (1980) disagree on the effectiveness of cash transfers in the second case. The argument is not crucial for the development of this chapter.
Olsen (1980) has recently shown - ignoring corner solutions in which donors are willing to sacrifice all of their own consumption for a finite increase in consumption by recipients - that in-kind transfers are required for efficiency if an efficient allocation is to be achieved that is preferred by everyone to the allocation in the absence of the government program. Obviously, this theorem requires more than the satisfaction of the efficiency criterion alone. In subsequent work, Olsen (1981) shows that the requirements of the theorem can always be satisfied with a combination of pure price subsidies and cash transfers. Moreover, he stresses the importance of satiation in that beyond a certain level of consumption by the recipient, increases are no longer valued by donors. They may even result in envy.

The results described in this section provide a justification for in-kind subsidies by introducing commodity-specific utility interdependence in the efficiency criterion. These supplement the somewhat vague justifications for these programs underlying distributional policy. In the case of housing, they lead to a simple rationale for government programs: if in general taxpayers care for the well-being of low-income families and think that these people undervalue the importance of decent housing, programs can be justified on efficiency grounds. Moreover, if we accept utility interdependence as a behavioral assumption and take into account some additional equity considerations, the discussion of this section yields a lot of interesting information concerning the characteristics of a 'desirable' housing program.

3. CHARACTERISTICS OF A DESIRABLE HOUSING PROGRAM: A NORMATIVE APPROACH

It was indicated in the previous sections that housing programs can be justified on efficiency grounds if better housing generates tangible externalities or feelings of paternalistic altruism exist within society. The purpose of this section is to present a set of
rules that take account of the existence and the extent of these feelings. Moreover, as it is generally believed that a government program should have desirable distributive effects, the suggested prescriptions incorporate equity considerations as well.

In view of these remarks and the ideas discussed in the previous section we believe that the implementation of a good housing program should be based on the following broadly defined objectives:

(i) they should improve the housing conditions of the participants;
(ii) they should focus on those families that are the subject of altruistic feelings by others;
(iii) they should fulfill (i) and (ii) in an equitable\(^1\) way, and,
(iv) housing services produced under the programs should be efficiently provided, i.e. in the least costly way.

Based on this scheme and under the assumption that tax-payer preferences incorporate feelings of paternalistic altruism, E.O. Olsen (1982) recently proposed a series of more precise normative prescriptions for a good program 'that would, on reflection, appeal to almost all taxpayers' (p.99). If this claim is true, his conjectures can be directly used for program design and implementation, i.e. for the actual determination of program parameters. This is the main advantage of the efficiency criterion for in-kind redistribution over alternative justifications, solely based on equity criteria.

A first prescription states that a good program should focus on and be limited to the neediest households\(^2\). This seems accept-

\(^1\) The content of the concept 'equity' will be discussed in more detail below.
\(^2\) Note that this prescription is consistent with a Rawlsian social welfare function.
able from an equity standpoint, although it also follows from the
ethical foundations of the efficiency argument discussed in the
previous section. The altruist probably mainly cares for the
housing consumption of those families, not for that of wealthier
people. Note that there is the difficult problem of translating
'needy' in terms of a few observable variables. Although there is
undoubtedly a large variation of opinion on this matter, many
housing programs consider mainly family size and income. The
existence of income limits for eligibility may be interpreted
as an expression of the belief that taxpayers only want to sub-
сидize households in the bottom part of the income distribution.

The Pareto efficiency argument produces three other logical
characteristics of the ideal housing program, although this is
not explicitly emphasized by Olsen. First, one should not subsidize
housing that is better than that typically consumed by households
that are marginally ineligible, i.e. households whose income is
slightly higher than the income limit for eligibility to the
program. The idea is that the altruistic taxpayer reaches satiation
if the low-income families consume housing above this level. It
is important to stress that program participants should not be
disallowed to consume more housing, only that taxpayers are not
willing to subsidize this extra consumption if they choose to do
so.

Second, a housing program should result in better housing for
the worst-housed recipients at each income level than they would
consume if they were given an unrestricted cash grant of the same
market value as the housing subsidy. Indeed, it is well-known that
in the absence of paternalistic feelings a cash transfer would be
preferable to help low-income households, as they would value the
latter more highly than an in-kind transfer with the same value.
If such feelings are present and used to justify the programs,

1 This feeling is clearly expressed by the US citizen who wrote to his senator
the following: 'Can you explain to me why I should be taxed to help someone
else buy a home that I myself could not afford to live in' (quoted in Aaron
(1972, p.139)).
however, they can be satisfied by 'forcing' the worst-housed recipients to occupy better units or to improve their present living conditions. Note that this only applies to families in poor housing. Those households that live in decent housing (according to the program's standards) at the expense of a high financial burden for housing, should be allowed to treat the subsidy as a grant.

Third, a good program should produce housing services as efficient as possible, so as to avoid subsidizing waste.

Three final desirable characteristics follow from equity considerations. Horizontal equity 'calls for equal treatment of people in equal positions' Musgrave (1976, p.4). Ideally, one would want to define 'equal positions' in terms of utility. Many authors have used a measure of income or consumption, however, to serve as a crude but readily available proxy for unobservable utility. Although a measure of permanent income, somehow defined, would clearly be more appropriate, in many cases the Housing Authorities have insufficient information and may have to focus on current income or an average of earnings over a limited period of time. In practice, many programs use income and family-size to define 'equally situated'.

Horizontal equity implies that similar people should receive the same subsidy so as to remain similar, at least if we accept income as a relevant variable to define similar people. Note that this program rule also implies that every household that satisfies the requirements for eligibility and is willing to participate should be allowed to do so.

1 Apart from an appropriate income measure, one might want to take into account the structure of prices in the operational definition of 'equal positions'. For example, it is obvious that handicapped people pay higher prices for some commodities, especially transportation. This provides an additional justification for small scale projects focusing on this minority group.
Vertical equity 'calls for a meaningful pattern of differentiation between people in unequal positions' (Musgrave (1976, p.3)). In the case of in-kind transfers, vertical equity requires that the program should preserve 'the same relative ordering in the well-being of all individuals', (Reeder (1983, p.83)). Under the same assumption as before it implies that the subsidy should be zero at the upper income limit for eligibility. If this is not the case, some participants would enjoy a higher 'augmented income' than some marginally ineligible families, thereby creating 'notches'.

As a final criterion, it is recommended that among otherwise similar families those with the lowest income should receive the largest subsidy. If not, the program would encourage vertical inequality.

To conclude this section, it is interesting to compare the characteristics of existing public rental housing programs with some of the normative prescriptions just described. First, it is clear that existing programs are not limited to the neediest families. According to the new income limits introduced in December 1979 almost 75% of the population is eligible for a public housing unit (Durez-Demal (1982, p.162)). Although not all these families actually apply for participation in the program, only a small fraction of households is served. The size of the government budget and the high cost of new construction imply that the demand for public units largely exceeds supply (Durez-Demal (1982, p.2)). It follows that not all households willing to participate are actually selected to do so, which violates the principle of horizontal equity discussed before.

There is also strong evidence that the subsidy at the upper income limit for eligibility is nonzero under the existing system. The existence of 'notches' is undeniable. It has been estimated that in 1974 more than 12% of the participating households had

\[^1\] Moreover, we found earlier (De Borger (1984)) that families with the same observed characteristics receive widely varying benefits from the program.
incomes that exceeded the eligibility limits for new entrants to the program (Durez-Demai, 1982, p.157bis). Moreover, empirical results reported in De Borger (1984) indicate that the subsidy to the beneficiaries is substantial but that it is not closely related to income. We did not find evidence of a strong negative relation between the subsidy or benefits and household income, ceteris paribus. These observations suggest that the existing public housing program violates the vertical equity prescriptions.

4. CONCLUSION

In this chapter we have reviewed explicit and implicit objectives of housing policy and analyzed the extent to which they can justify existing programs. An economic rationale for in-kind transfers in general and housing programs in particular was provided by incorporating commodity-specific utility interdependencies into the efficiency criterion of welfare economics. A set of normative prescriptions was derived based on the assumed preferences of taxpayers and consistent with efficiency considerations. We believe that the design of housing programs according to these rules leads to more efficient and equitable subsidy schemes than the existing system of public housing.
CHAPTER TWO

SIMULATING ALTERNATIVE DEMAND-ORIENTED HOUSING PROGRAMS

0. INTRODUCTION

We will develop and simulate several housing programs that have one important characteristic in common: within the limitations of our data they satisfy the most basic requirements for a desirable program, as discussed in chapter one. Due to data availability we used income and family-size to define both 'needy' and 'similar' families. If better data come available that would allow us to construct permanent income measures and to take into account differences in price structures, the simplification can easily be relaxed. It does not affect the design of the programs in a substantial way, although it obviously has an effect on program parameters.

The programs are such that income limits restrict entry to the neediest households. Similar families receive the same subsidy. The latter is inversely related to income and goes down to zero at the upper income limit for eligibility. Constraints on housing consumption guarantee that no housing is subsidized that is of better quality than what is typically consumed by marginally ineligible families. Moreover, they encourage the worst-housed to occupy better housing than they would choose were they given a cash grant.

Note that income and family size are also the main variables the Housing Authorities use to identify families that will receive support under the existing system. Obviously, in the case of specific projects tailored to the needs of subgroups of the population (e.g. handicapped people, the elderly) other factors should be taken into account as well.
Only demand-oriented price subsidies will be considered. Although many of the stated objectives could in principle be achieved by drastic changes in the rules of existing, construction-related public housing programs there is overwhelming evidence that demand-oriented subsidies yield any desired outcome at substantially lower cost to the government, see, e.g. Aaron (1981, p.89) or Bradbury and Downs (1981, p.400). Moreover, they are much more flexible that public housing programs.

The simulations were performed within the simplified framework discussed in de Borger (1984), in which people only care about two composite commodities, housing and all other goods. Although it is in principle possible to take into account the composition of the bundle of housing characteristics, the composite commodity approach is sufficiently appropriate for our purposes. The major goal of the simulations is to illustrate how housing programs can be designed that have desirable features and are relatively easy to implement. The definition of a composite housing commodity has no substantial implications for the comparison of the different simulated programs with the existing system. Its main consequence is that within a non-segmented housing market rent can be used as an index of the quantity of housing services consumed. Therefore, constraints on housing consumption can be imposed in terms of the market rent of the units. It should be noted that, even if one is not willing to accept rent as a measure of consumption, imposition of rent requirements may be preferred to a set of physical quality standards, as the latter are much more costly to implement.

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1 If markets are segmented leading to price differences for a given bundle of housing attributes the constraints may be varied accordingly. In practice, it may e.g. be preferable to adjust rent restrictions according to location so as to reflect regional price variation.

2 In addition, physical quality standards require housing inspections which are often inconvenient to tenants. For that reason, the Housing Allowance Program—a huge social experiment—used rent restrictions as an alternative, see Friedman and Weinberg (1982, pp. 8-5).
It is well-known that demand-oriented programs may suffer from relatively low participation rates. Many eligible households choose not to participate due to transaction costs and welfare stigma (for an economic model of stigma we refer to R. Moffitt (1983)). Participation rates are extremely hard to predict, especially for a completely hypothetical program. Therefore, the following simulations abstract from this complication. It is assumed that all households that are eligible and better-off under the program than in its absence (on the basis of their estimated preferences) will indeed participate. This is clearly a heroic and unrealistic assumption. However, it has no major predictable implications for the interpretation of our results, except for the fact that the total cost to the government net of administration costs should be interpreted as an upper bound. It can easily be relaxed once empirical evidence on the participation behavior of households comes available.

Demand-oriented subsidy programs cover the whole range between pure price subsidies and unconstrained income transfers. Out of a much wider spectrum of possibilities, we selected three different programs, all of which involved minimum rent requirements: a constrained price subsidy, a housing allowance program and finally an intermediate program that combines elements of both a price subsidy and an unrestricted cash grant. Although the programs are conceptually quite different, they yield qualitatively fairly similar results. Finally, note that all simulations are performed on the assumption that households buying all goods on the private market maximize a utility function \( u(H,X) \) subject to a welfare budget constraint

\[
p_H H + p_X X = y
\]

where: \( H \) and \( X \) = the composite goods 'housing services' and 'all other goods', respectively

\(^1\) In a recent dissertation, Reeder (1983) simulates a large number of variations on existing US programs, using a similar framework.
\( p_H \) and \( p_X \) = the respective unit prices, and
\( y = \text{income}. \)

Organization of this chapter is as follows: in section one the three alternative programs are presented and the parameters are determined. Section 2 contains aggregate results of the consumption effects and welfare implications of the simulated programs. The distributional effects and a comparison with the existing public housing program are discussed in section 3. A final section indicates some caveats and reviews the material in this chapter.

1. THE DESIGN OF ALTERNATIVE PROGRAMS

(1.1.) \textit{A price subsidy with rent requirements}

Under this program a price subsidy is provided to eligible households that consume housing with a market rent between minimum and maximum levels. Households are allowed to choose freely any rental housing they desire. If it satisfies the restrictions, the government pays the rent rebate directly to the landlord. Whereas the minimum rent requirements are arbitrary and can be varied - depending on the quality standards one wishes to impose - the maxima are uniquely determined by the policy maker's choice of income limits for eligibility.

The program offers eligible families the opportunity to consume housing at the subsidized price

\[ p_H \frac{\delta y}{\rho} \]

per unit where \( \delta \) and \( \rho \) are program parameters to be determined.
The subsidy is

\[ S = p_H H(1 - \frac{\delta y}{\rho}) \quad \text{if} \quad z \leq p_H H \leq \rho \]

\[ S = 0 \quad \text{otherwise} \]

where, obviously, z and \( \rho \) are the minimum and maximum rent requirements. In order to guarantee desirable outcomes from the operation of this program the parameters are determined as follows. Let, for a household of a given type, \( y_L \) denote the upper income limit for eligibility. Define \( \rho \) as the mean housing expenditures for households of this type with income \( y_L \). This implies that no housing is subsidized that is better than what is on average consumed by marginally ineligible families. Further, define \( \delta \) as the fraction of income spent on housing by such families, i.e. \( \delta = \frac{\rho}{y_L} \). This guarantees that the subsidy equals zero at the income limit for eligibility. Moreover, it is obvious that the subsidy decreases with income for households of a given type, since

\[ \frac{\delta S}{\delta y} = - \frac{\delta}{\rho} p_H H < 0 \]

Possible implications of the program for an eligible family are considered in figure 1. In the absence of the program the household consumes a combination of goods along budget constraint AD. Introduction of the subsidy enlarges the budget space by EPPR. One possible outcome it illustrate in figure 1a. The family decides to choose the bundle corresponding to R, along EF, at the subsidized price. Many other situations may occur, however. Depending upon preferences, the magnitude of the subsidy, the income limits for eligibility and the minimum rent requirements the household may choose to consume at the corners of the budget space (see figures 1c and 1e) or it may prefer not to participate (see figures 1b and 1d).
Note: (*) All graphs in this section have been constructed on the assumption that $p_H = p_X = 1$. 
To simulate this and subsequent hypothetical housing programs — or at least idealized versions without participation costs — we used the results obtained in De Börger (1984). There we estimated the parameters of a Stone-Geary utility function for different household types. Using these estimates we predicted for each eligible family the market rent of the housing they would optimally choose at the subsidized price (i.e. corresponding to constraint AG). Substituting \( \frac{\delta y}{\rho} p_H \) for \( p_H \) and using the Stone-Geary demand function for housing it follows that this market rent \( p_HH^* \) is given by

\[
p_HH^* = \frac{\left( \frac{\delta y}{\rho} \right) p_H^{\beta_H(1-\gamma)} - \gamma p_X^{\beta_X} + \gamma y}{\frac{\delta y}{\rho}}
\]

If \( p_HH^* \) satisfies the restrictions on rent, i.e. if \( z \leq p_HH^* \leq \rho \), \( H^* \) is the household's optimal consumption under the program. If \( p_HH^* < z \), we compare utility in the absence of the program, \( u(H^m, X^m) \), with the utility level at the minimum level of housing consumption required under the subsidy system, \( u\left(\frac{z}{p_H}, \frac{\delta y}{\rho}, \frac{\delta y}{\rho} \right) \). The outcome of this comparison allows us to decide whether the family will consume at the minimum level (at point E on figure 1c) or prefer not to enter the program. Similarly, if \( p_HH^* > \rho \) the household implicitly compares \( u(H^m, X^m) \) with utility at the maximum allowed housing quantity, \( u\left(\frac{\rho}{p_H}, \frac{\gamma (1-\delta)}{p_X}\right) \). Depending on the outcome, we can allocate the family to the group consuming at F, see figure 1e, or to the group of non-participants.
(1.2.) A housing allowance program

Housing allowances are basically income transfers with some strings attached as to quantity consumed. The program considered in this section provides eligible households with a cash grant, on the condition that they satisfy the minimum standards reflected in the minimum rent requirements\(^1\). The allowance, which obviously equals the subsidy, is determined as

\[ S = \rho - \delta y \quad \text{if } p^H_H \geq z \]

\[ S = 0 \quad \text{otherwise} \]

Operation of the program is illustrated in figure 2. The program produces a shadow budget line ED parallel to the initial constraint AB and enlarges the budget space by the area CDBF. For households whose optimal housing consumption under the extended budget space satisfies the requirements on rent the program results in a pure cash grant, see figure 2a. Under the assumption of Stone-Geary preferences optimal housing expenditures under the restriction \(p^H_H + p^X_X = y + s\), where \(s = \rho - \delta y\), are given by

\[ p^H_H^* = p^H_H(1-\gamma) - \gamma p^X_X \beta^X_X + \gamma(y(1-\gamma) + \rho) \]

If \(p^H_H^*\) does not exceed the minimum rent required, \(z\), the household may decide to consume precisely the minimum (at point C on figure 2b) or decide not to participate (figure 2c). The decision depends on the relative magnitude of the utility level in the absence of the program, \(u(H^m, X^m)\), and the level associated with housing ex-

\(^1\) Note that satisfaction of the rent requirement is ex post, i.e. after the introduction of the program. Obviously, a control mechanism will have to be designed, which may lead to substantial administrative costs.
Figure 2c
penditures $z$, $u\left(\frac{z}{p_H}, \frac{y(1-\gamma)+\rho-z}{p_X}\right)$

The described program rules imply that the subsidy decreases with income, since $\frac{\delta S}{\delta y} = -\delta < 0$. Moreover, our choice of parameters assures other desirable features such as a zero subsidy at the upper income limit for eligibility. Although this program is designed so as to satisfy the same general objectives as the constrained price subsidy, it will have slightly different implications. For example, it may be expected to generate a smaller increase in housing consumption because the subsidy is independent of rent and the family can freely allocate its extended income. Moreover, the subsidy decreases at a faster rate with income than in the price subsidy program, which may have distributive implications. Finally, note that budgetary costs will probably be somewhat higher because the subsidy is larger at each income level and it does not drop to zero for people consuming above the maximum standards imposed in program 1.

(1.3.) A combined price subsidy-cash grant program

A third simulated program combines elements of the two previous assistance schemes. This leads to slight improvements, at least in theory. Remember that the housing allowance is extremely close to an unrestricted cash grant. The minimum rent requirement is the only program feature that encourages the worst-housed at each income level to consume better housing than with an equally costly pure income transfer. Consequently, it may be expected that

---

1 Note that a countervailing force operates due to the fact that the allowance program provides a positive subsidy to households consuming more than the quantity corresponding to expenditures $\rho$. Empirical results indicate that this effect is less important.

2 The allowance program could have been simulated imposing the same maximum rent requirements. We preferred the version without these restrictions in order to provide a logical link to a third program, to be discussed below.
allowances of this type will have a rather weak effect on housing consumption by the worst-housed.

The constrained price subsidy on the other hand does provide a strong incentive for the worst-housed to improve their housing by directly subsidizing price in addition to minimum rent requirements. However, the subsidy equals zero for those households that, at the cost of high rent burdens, occupy housing that is better than what is typically consumed by marginally ineligible families. As a consequence, some families will actually have an incentive to consume less housing in order to be able to enjoy the subsidized price. We see no reason why any program should have this characteristic. However, it also seems inappropriate to provide a price subsidy to all eligible families satisfying the minimum rent restrictions. Families occupying decent housing satisfy the altruistic taxpayer and it may be assumed that forcing the household to consume even more would lead to satiation.

These slightly unsatisfactory characteristics of the two previous programs can easily be remedied as follows: provide a pure price subsidy to all eligible families that consume housing of which the market rent is not smaller than the minimum rent required and not greater than \( \rho \). Provide a pure grant for families who choose to consume more housing. The subsidy is simply:

\[
S = p_H(H(1 - \frac{\delta y}{\rho}) \quad z \leq p_H < \rho
\]

\[
S = \rho - \delta y \quad p_H > \rho
\]

\[
S = 0 \quad p_H < z
\]

The subsidy decreases with income, increases with housing expenditures up to \( \rho \) and then remains constant. Although families are free to consume any housing they desire, they are not explicitly subsidized to consume more than ineligible households: if they choose to do so, they pay market prices for this housing.
Figure 3 illustrates possible outcomes of this program for individual families. The budget space is enlarged by the area BDEFC. On figure 3a the situation of a household consuming along the shadow budget line AJ is depicted. Obviously, as previously shown on figure 1, it is both possible that a family consumes at B or decides not to participate. Figure 3b considers the case of a household enjoying a pure cash transfer along the shadow constraint GE. It is finally possible to locate a household's optimal consumption bundle under the program at D. This will happen if maximum utility subject to the shadow budget restrictions AJ and GE (u' and u", respectively) occurs along the infeasible segments GD and DJ, see figure 3c.

(1.4.) Parameters_in_the_simulation_exercise

To simulate the models we will use a sample of households occupying apartments. The data are discussed in De Borger (1984, appendix 1). It seems appropriate to determine the parameters in the models on the basis of this sample, rather than on the basis of nationally representative information. This will also highly facilitate the comparison of the different programs, as well as comparison with the existing public housing program. The sample contains 218 useful observations.

All models will be simulated with 4 different, but quite arbitrary, income limits for eligibility. Although the sample average was somewhat higher, it was assumed for simplicity that the average family contained 3 persons. Correction factors of 6.65% per person were applied so as to adjust for family-size. This number is implied by actual policies in rental housing programs in Belgium (Durez-Dumal (1982, p.142)). The four different sets of income limits make between approximately 30% (lowest limits) and 50% (highest limits) of the sample eligible for the
programs simulated. They are presented below.

<table>
<thead>
<tr>
<th>CHILDREN</th>
<th>ELIGIBILITY LIMIT</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>112.5</td>
<td>121.9</td>
<td>131.3</td>
<td>140.6</td>
</tr>
<tr>
<td>'1</td>
<td></td>
<td>120</td>
<td>130</td>
<td>140</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>128</td>
<td>138.6</td>
<td>149.3</td>
<td>160</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>136.5</td>
<td>147.8</td>
<td>159.2</td>
<td>170.6</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>145.6</td>
<td>157.6</td>
<td>169.8</td>
<td>181.9</td>
</tr>
</tbody>
</table>

Given income limits of eligibility it is straightforward to derive estimates of the parameters $\rho$ and $\delta$ to be used. The average expenditures on housing at the income limits for each family-size were determined by estimating a simple linear relation between housing expenditures, income and family-size on the basis of the sample of uncontrolled private housing. Substitution of the appropriate family-size and eligibility limit provides an estimate of $\rho$ for that particular household size, i.e. an unbiased prediction of the mean housing expenditures at the income limit. Dividing $\rho$ by $y_L$ yields the parameter $\delta$.

In practice, minimum standards will be imposed according to policy makers' view concerning what is considered 'decent' housing for low-income families. As this chapter is mainly intended to illustrate the implications of demand-oriented programs and not to provide numerical values for the parameters for practical implementation, we used the following arbitrary procedure to determine a set of minimum rent requirements. First, a linear hedonic regression was estimated between rent, the number of rooms

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1 Figures are in $10^2$ Belgian francs per month.
2 Adding nonlinear terms produced insignificant coefficients and yielded very similar predictions for $\rho$. 

and a few additional control variables with respect to the construction date of the unit, the story on which it was situated etc. We then made some educated guesses with respect to the minimum acceptable number of rooms for households of different sizes in order to predict a minimum acceptable housing expenditure. The values used as input in the simulation programs varied between approximately 1,400 Belgian francs (families without children) to 1,900 Belgian francs (families with 4 children)\(^1\).

2. SIMULATION RESULTS: BENEFITS AND CONSUMPTION EFFECTS

We evaluate the results in function of the requirements for a good housing program stated before. Several of these requirements were explicitly built-in by the design of the simulation exercise and an appropriate choice of parameters. Income limits restrict participation to the neediest families and the choice of \(\delta\) and \(\rho\) guarantees a zero subsidy at the upper income limit for eligibility. Moreover, it implies that on average no better housing is subsidized than what is consumed by marginally ineligible households. The programs may substantially vary with respect to other aggregate results, however. We therefore consider the effect on consumption of housing and other goods, the reduction in the price of housing, the extent to which the program induces participating families to occupy better housing than with an equally costly cash grant, the average amount of the subsidy and a benefit measure of the operation of the program (equivalent variation). We also derive the cost to the government on the assumption of zero administration cost, i.e. the total subsidy paid to landlords and tenants.

\(^1\) Variations in the rent requirements would have yielded information concerning the sensitivity of the results with respect to \(z\). Although we did estimate the models without any minimum levels at all, we did not experiment with different sets of minimum rent requirements.
To facilitate interpretation of the results, we present in table 1 the notation and formulas used to calculate aggregate effects. Unless otherwise noted, all results in the rest of this section are averages over the sample of participants.
Table 1: Notation and formulas used to calculate aggregate effects

1. Housing consumption under the program \( H^S \)
2. Housing consumption in the absence of the program \( H^o \)
3. % increase in housing consumption
\[ 100 \times \left( \frac{H^S - H^o}{H^o} \right) \]
4. % increase in consumption of other goods
\[ 100 \times \left( \frac{X^S - X^o}{X^o} \right) \]
5. Rent paid under the program \( R^S \)
6. % Reduction in the price of housing
\[ -100 \times \left( \frac{R^S - H^S}{H^S} \right) \]
7. Income \( y \)
8. % Increase in housing consumption as compared to an equally costly cash grant
\[ 100 \times \left( \frac{H^S - H^{CG}}{H^{CG}} \right) \]
where \( H^{CG} = \frac{p^H p^X (1-\gamma) - \gamma p^X p^X + \gamma (y+S)}{p^H} \)
9. % Increase in consumption of other goods as compared to an equally costly cash grant
\[ 100 \times \left( \frac{X^S - X^{CG}}{X^{CG}} \right) \]
where \( X^{CG} = \frac{\gamma p^X p^X (1-\gamma) - \gamma p^X p^X + \gamma (y+S)}{p^X} \)
10. Subsidy \( S \)
11. Benefit: Hicks equivalent variation
\[ B = \frac{p^H (H^S - H^o)}{\gamma} \left( \frac{p^X (X^S - X^o)}{1-\gamma} \right)^{1-\gamma} + p^H p^o + p^X p^X - y \]
12. Ratio benefit subsidy
\( B/S \)
13. Number of eligible families \( n_1 \)
14. Number of participating families \( n_2 \)
15. Total cost to the government (total subsidy) \( TS \)
16. Total % increase in housing consumption \[ 100 \times \frac{\sum_{i=1}^{n_2} (H^{S}_{i} - H^{O}_{i})}{\sum_{i=1}^{n} H^{O}_{i}} \]

\( H_{i} \): consumption by household \( i \)

where

\( n \): number of families in the sample (218)
The major effects of the constrained price subsidy program are summarized in table 2. As expected, the program generates a large increase in housing consumption for the participants: depending upon the limits for eligibility average increases of 15% to 20% were simulated. The effect on the consumption of other goods is obviously smaller, about 1% to 2% on average. Under all 4 sets of eligibility limits, many families consumed more of both housing and other goods. Note that average consumption shifts are larger for higher eligibility limits. This is not surprising, because the subsidy increases on average when more households become eligible. As far as consumption of other goods is concerned these findings suggest that the income effect dominates the compensated cross-price effect\(^1\).

The rent paid under the program is substantially below the market value of the housing quantity consumed. This results in an average price reduction of 15% to 25%.

Interestingly, the average increase in housing consumption as compared to an equally costly cash grant is large, between 12% and 15%. These figures are a large fraction of the change in consumption as compared to no program at all. The main reason is that a grant equal to the subsidy will only produce modest changes in housing demand. For most households, the subsidy amounts to less than 4% of income and income elasticities implied by the estimated Stone-Geary indifference map were on average smaller than unity (see De Borger (1984)). Obviously, the price subsidy program is much more effective at raising demand because estimated price elasticities were, in absolute value, in the range 0.7-0.9 and the price reduction was large.

\(^1\) Another partial explanation for the increasing effect on the consumption of other goods is that the minimum rent requirements force some households to buy less other goods than they would buy under optimizing behavior at the subsidized price. This effect decreases for higher eligibility limits, as a smaller fraction of the sample consumes at the minimum required housing quantity.
### Table 2

**Aggregate Simulation Results Constrained Price Subsidy Program**

(Monetary variables are in $10^2$ Belgian Francs per month)

<table>
<thead>
<tr>
<th>ELIGIBILITY LIMITS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Market value of housing consumption:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1. under the program</td>
<td>19.81</td>
<td>20.72</td>
<td>21.86</td>
<td>22.84</td>
</tr>
<tr>
<td>1.2. in the absence of the program</td>
<td>17.32</td>
<td>17.86</td>
<td>18.76</td>
<td>19.22</td>
</tr>
<tr>
<td>2. % increase housing consumption</td>
<td>15.39</td>
<td>16.93</td>
<td>17.36</td>
<td>18.73</td>
</tr>
<tr>
<td>3. % increase consumption of other goods</td>
<td>0.98</td>
<td>1.35</td>
<td>1.82</td>
<td>1.91</td>
</tr>
<tr>
<td>4. Rent paid under the program</td>
<td>16.71</td>
<td>16.67</td>
<td>17.16</td>
<td>17.42</td>
</tr>
<tr>
<td>5. % reduction in the price of housing</td>
<td>14.92</td>
<td>18.66</td>
<td>21.38</td>
<td>24.12</td>
</tr>
<tr>
<td>6. Income</td>
<td>107.48</td>
<td>111.40</td>
<td>117.18</td>
<td>121.22</td>
</tr>
<tr>
<td>7. % increase housing compared to a grant</td>
<td>12.33</td>
<td>13.52</td>
<td>14.47</td>
<td>15.01</td>
</tr>
<tr>
<td>8. % increase other goods compared to a grant</td>
<td>-2.48</td>
<td>-2.81</td>
<td>-2.86</td>
<td>-3.03</td>
</tr>
<tr>
<td>9. Subsidy</td>
<td>3.10</td>
<td>4.03</td>
<td>4.69</td>
<td>5.42</td>
</tr>
<tr>
<td>10. Benefit</td>
<td>2.47</td>
<td>3.39</td>
<td>4.09</td>
<td>4.78</td>
</tr>
<tr>
<td>11. Benefit/subsidy at the mean</td>
<td>0.87</td>
<td>0.89</td>
<td>0.91</td>
<td>0.91</td>
</tr>
<tr>
<td>12. Number of eligible families</td>
<td>67</td>
<td>79</td>
<td>94</td>
<td>106</td>
</tr>
<tr>
<td>13. Number of participating families</td>
<td>66</td>
<td>79</td>
<td>94</td>
<td>105</td>
</tr>
<tr>
<td>14. Total cost to the government</td>
<td>204.50</td>
<td>317.98</td>
<td>441.24</td>
<td>569.10</td>
</tr>
<tr>
<td>15. Total % increase in housing consumption</td>
<td>2.99</td>
<td>3.83</td>
<td>4.62</td>
<td>5.75</td>
</tr>
</tbody>
</table>
On average, the program induces households to consume 12-15% more housing and 2-3% less other goods than a pure income transfer. Moreover, detailed analysis of our sample revealed that these effects were even stronger for the worst-housed families in the absence of the program. The imposition of the minimum rent requirements was largely responsible for this finding.

As already noted, subsidies were small: even for the highest eligibility limit the average subsidy was less than 550 Belgian francs per month. This is substantially less than the mean subsidy estimated for the existing public housing program, which amounted to approximately 1,100 Belgian francs. These results suggest that the cost to the government of the simulated program will be relatively small. Net of administration costs, it amounts to some 300-550 Belgian francs per participating family per month.

The ratio of benefits to the subsidy was large in all cases. Evaluated at the mean it equalled 0.87-0.91 depending on the eligibility limits. The ratio was in general smaller for families consuming the minimum or maximum quantity required to enjoy the subsidy. Note that the estimated benefits are the cash value of the program to the participants. They obviously do not include the value of the program to altruistic taxpayers who gain utility by the increased housing consumption of the neediest households.

Given our program design and in the absence of participation costs it is not surprising to find that almost all eligible families choose to participate. For the lowest eligibility limit the subsidy was insufficient for one family to induce it to consume the minimum required quantity. At the highest limit for eligibility one family with a strong taste for housing was estimated not to participate. This yielded higher utility than cutting down on housing consumption under the program.
The final row in table 2 gives the total increase in housing consumption for the complete sample. Even the program with the highest income limits, which makes about half the sample eligible, results in an increase of less than 6%.

The simulated effects of the allowance program are in table 3. The program is clearly less effective in stimulating housing consumption. Average changes are between 7% and 12%. Contrary to the price subsidy program the shift in consumption strongly decreases at higher eligibility limits. The reason is simple: for many families the allowance is a pure cash grant, generating small consumption changes. A large proportion of the increase in housing is due to the imposition of minimum rent requirements. The fraction of families consuming at the minimum quantity decreases with higher eligibility limits, which produces previous result.

The impact on the demand for other goods is larger than for the first program. It increases when more families participate. Somewhat surprisingly, the program still generates much more housing consumption and less other goods than a pure grant, despite the fact that for many families the differential effect is zero. Again, the explanation lies with the minimum rent restrictions: for households 'forced' to consume the minimum required level the differences with a grant system were generally large, in some cases more than 50%. Note that the average differential effect rapidly decreases at higher income limits.

As predicted in the previous section, we found that this program has a smaller effect on the housing improvements by the worst-housed families. If this is considered of primary importance the price subsidy is to be preferred.

Note that all eligible households are estimated to participate. Due to the slightly larger subsidies the cost to the government is higher than for the first program. The average subsidy per
TABLE 3
AGGREGATE SIMULATION RESULTS HOUSING ALLOWANCE PROGRAM
(Monetary variables are in $10^2$ Belgian francs per month)

<table>
<thead>
<tr>
<th></th>
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<tr>
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<td>19.39</td>
</tr>
<tr>
<td>1.2 in the absence of the program</td>
<td>17.32</td>
</tr>
<tr>
<td>2. % increase in housing consumption</td>
<td>11.15</td>
</tr>
<tr>
<td>3. % increase in consumption other goods</td>
<td>1.81</td>
</tr>
<tr>
<td>4. Income</td>
<td>107.48</td>
</tr>
<tr>
<td>5. % increase housing compared to a grant</td>
<td>9.32</td>
</tr>
<tr>
<td>6. % increase other goods compared to a grant</td>
<td>-2.17</td>
</tr>
<tr>
<td>7. Subsidy</td>
<td>3.66</td>
</tr>
<tr>
<td>8. Benefit</td>
<td>3.08</td>
</tr>
<tr>
<td>9. Benefit/Subsidy at the mean</td>
<td>0.90</td>
</tr>
<tr>
<td>10. Number of eligible families</td>
<td>67</td>
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<tr>
<td>11. Number of participating families</td>
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<tr>
<td>12. Total cost to the government</td>
<td>245.22</td>
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<tr>
<td>13. Total % increase in housing consumption</td>
<td>2.50</td>
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</tbody>
</table>
household was found to be in the range of 350 to 600 Belgian francs per month. Benefits were only slightly smaller, leading to extremely high B/S ratios. The program clearly comes very close to a cash grant system at the highest eligibility limits. Finally, note that this program results in a smaller total change in housing consumption than the constrained price subsidy.

Results for the third program, a combination of a price subsidy with a cash grant, are summarized in table 4. On average, they are extremely similar to those of the first simulation. The reason is that we estimated that a large proportion of all households would consume along the rotated portion of the piecewise linear budget constraint under the program, see segment BD on figure 3. For those families the program produces the same results as the price subsidy. Only for a few households, who consumed along the portion parallel to the original constraint (see DE on figure 3), different results were obtained. Consequently, mean differences are small. The combined price subsidy-cash grant program has a marginally higher effect on housing consumption. The rent paid is somewhat higher on average, because a few households prefer to pay market prices and to enjoy the subsidy as a grant. Accordingly, the reduction in the price of housing is smaller. The program also produces marginally larger differential effects compared to a cash grant system, both for housing and other goods. Benefits are almost identically the same as for the first program. Only families using the subsidy as a grant enjoy slightly higher benefits.

Two remarks concerning aggregate results in tables 2, 3 and 4 are in order. First, policy makers are often interested in the impact of a housing program on the participants' rent burden. The best measure for the change in rent burden is simply the percentage change in consumption of other goods. It follows

\[ \text{See, e.g. Aaron (1982, p.72). There is only an effect on the rent burden insofar as families have more resources available to consume other goods or to save.} \]
<table>
<thead>
<tr>
<th>ELIGIBILITY LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

1. Market value of housing consumption:

1.1. under the program

1.2. in the absence of the program

2. % increase in housing consumption

3. % increase in consumption of other goods

4. Rent paid under the program

5. % reduction in the price of housing

6. Income

7. % increase housing compared to a grant

8. % increase other goods compared to a grant

9. Subsidy

10. Benefit

11. Benefit/Subsidy at the mean

12. Number of eligible families

13. Number of participating families

14. Total cost to the government

15. Total % increase in housing consumption

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.87</td>
<td>20.76</td>
<td>21.87</td>
<td>22.84</td>
<td></td>
</tr>
<tr>
<td>17.32</td>
<td>17.86</td>
<td>18.76</td>
<td>19.22</td>
<td></td>
</tr>
<tr>
<td>15.68</td>
<td>17.04</td>
<td>17.51</td>
<td>18.80</td>
<td></td>
</tr>
<tr>
<td>0.82</td>
<td>1.23</td>
<td>1.71</td>
<td>1.87</td>
<td></td>
</tr>
<tr>
<td>16.98</td>
<td>17.08</td>
<td>17.41</td>
<td>17.65</td>
<td></td>
</tr>
<tr>
<td>13.91</td>
<td>17.73</td>
<td>20.79</td>
<td>23.54</td>
<td></td>
</tr>
<tr>
<td>107.48</td>
<td>111.40</td>
<td>117.18</td>
<td>121.22</td>
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</tr>
<tr>
<td>12.74</td>
<td>13.70</td>
<td>14.60</td>
<td>15.09</td>
<td></td>
</tr>
<tr>
<td>-2.55</td>
<td>-2.88</td>
<td>-2.91</td>
<td>-3.05</td>
<td></td>
</tr>
<tr>
<td>3.10</td>
<td>4.03</td>
<td>4.69</td>
<td>5.41</td>
<td></td>
</tr>
<tr>
<td>2.49</td>
<td>3.40</td>
<td>4.10</td>
<td>4.78</td>
<td></td>
</tr>
<tr>
<td>0.87</td>
<td>0.90</td>
<td>0.91</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>79</td>
<td>94</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>79</td>
<td>94</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td>204.50</td>
<td>317.98</td>
<td>441.24</td>
<td>573.46</td>
<td></td>
</tr>
<tr>
<td>3.05</td>
<td>3.88</td>
<td>4.63</td>
<td>5.75</td>
<td></td>
</tr>
</tbody>
</table>
from tables 2, 3, and 4 that the allowance program results in the largest change in rent burden. Second, it is interesting to analyze the extent to which each program is a housing program or income maintenance. Some insight into this question may be gained by calculating the fraction of the subsidy 'used' for increased housing consumption, i.e.

\[ \frac{p_H^{H_S} - p_H^{H_m}}{S} \]

where \( p_H^{H_S} \) and \( p_H^{H_m} \) are the market value of housing consumption under the program and in its absence, respectively. Note that this measure is not necessarily between 0 and 1. However, the fraction devoted to housing under a pure income transfer may serve as a point of reference for the comparison of alternative programs. Results are in table 5. Obviously, programs 1 and 3 induce families to spend a large fraction of the subsidy on housing. The allowance program has a much weaker effect, especially for eligibility limit 3 and 4 where the effect of the rent requirements is less important.

**TABLE 5**

**FRACTION OF THE SUBSIDY USED FOR INCREASED HOUSING CONSUMPTION**

<table>
<thead>
<tr>
<th>ELIGIBILITY LIMITS</th>
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</thead>
<tbody>
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<tr>
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</tr>
<tr>
<td>0. Pure cash grant program</td>
</tr>
<tr>
<td>1. Constrained price subsidy</td>
</tr>
<tr>
<td>2. Housing allowance</td>
</tr>
<tr>
<td>3. Combined price subsidy-cash grant</td>
</tr>
</tbody>
</table>
3. DISTRIBUTIONAL RESULTS

In order to analyze equity questions we investigate the extent to which similar families receive equal benefits from the simulated programs. Moreover, we look at differences in benefits for households with different observed characteristics.

As usual, we regressed benefits on a few household characteristics, viz. income, family-size and age. Other family traits did not improve the performance of the estimated equations. Regression results for the three simulated programs are in tables 6, 7 and 8. All results are very satisfactory. The degree of explanation is high, a strong negative relation with income is estimated in all cases and many coefficients are significant at the usual levels.

The main differences between the simulated programs may be summarized as follows. The allowance program implies a larger effect of both income and family-size on benefit, although the differences are small. The more important effect of income is not surprising because $\delta S/\delta y$ was larger by construction of the program. Also note that $R^2$ is substantially higher for the allowance program and that it does not vary much with changes in eligibility limits, unlike $R^2$ for the two alternative programs. The reason for the lower $R^2$ for the price subsidy programs is probably that the subsidy partly depends on housing consumption. This results in additional variation in the subsidy and in benefits which is not well captured by the estimated relation with income, family-size and age. The effect of this variation slightly decreases at higher eligibility limits when the impact of the rent requirements which cause extra variation in housing consumption and the subsidy independent of income diminishes.

---

1 Regressions using both participants and non-participants and regressions with the subsidy as dependent variable all lead to the same qualitative conclusions.
TABLE 6
DISTRIBUTION OF BENEFITS PRICE SUBSIDY PROGRAM
(Independent variable is benefit; t-statistics between parentheses)

<table>
<thead>
<tr>
<th>INDEPENDENT VARIABLES</th>
<th>ELIGIBILITY LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>11.24</td>
</tr>
<tr>
<td></td>
<td>(4.55)</td>
</tr>
<tr>
<td>INCOME</td>
<td>-0.096</td>
</tr>
<tr>
<td></td>
<td>(-9.68)</td>
</tr>
<tr>
<td>(INCOME)^2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>FAM. SIZE</td>
<td>0.617</td>
</tr>
<tr>
<td></td>
<td>(1.34)</td>
</tr>
<tr>
<td>(FAM. SIZE)^2</td>
<td>-0.080</td>
</tr>
<tr>
<td></td>
<td>(-0.96)</td>
</tr>
<tr>
<td>AGE</td>
<td>0.027</td>
</tr>
<tr>
<td></td>
<td>(1.21)</td>
</tr>
<tr>
<td>R^2</td>
<td>0.62</td>
</tr>
<tr>
<td>n</td>
<td>66</td>
</tr>
<tr>
<td>σ_u</td>
<td>1.11</td>
</tr>
<tr>
<td>INDEPENDENT VARIABLES</td>
<td>ELIGIBILITY LIMITS</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>13.37</td>
</tr>
<tr>
<td></td>
<td>(5.28)</td>
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<tr>
<td>INCOME</td>
<td>-0.119</td>
</tr>
<tr>
<td></td>
<td>(-25.01)</td>
</tr>
<tr>
<td>(INCOME)^2</td>
<td>-0.000044</td>
</tr>
<tr>
<td>FAM. SIZE</td>
<td>0.809</td>
</tr>
<tr>
<td></td>
<td>(3.66)</td>
</tr>
<tr>
<td>(FAM. SIZE)^2</td>
<td>-0.042</td>
</tr>
<tr>
<td></td>
<td>(-0.83)</td>
</tr>
<tr>
<td>AGE</td>
<td>0.027</td>
</tr>
<tr>
<td></td>
<td>(2.53)</td>
</tr>
<tr>
<td>R^2</td>
<td>0.91</td>
</tr>
<tr>
<td>n</td>
<td>67</td>
</tr>
<tr>
<td>σ_u</td>
<td>0.53</td>
</tr>
<tr>
<td>INDEPENDENT VARIABLES</td>
<td>1</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>11.23</td>
</tr>
<tr>
<td>(8.13)</td>
<td>(8.07)</td>
</tr>
<tr>
<td>INCOME</td>
<td>-0.097</td>
</tr>
<tr>
<td>(-9.69)</td>
<td>(-11.84)</td>
</tr>
<tr>
<td>(INCOME)^2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>FAM. SIZE</td>
<td>0.614</td>
</tr>
<tr>
<td>(1.34)</td>
<td>(2.26)</td>
</tr>
<tr>
<td>(FAM. SIZE)^2</td>
<td>-0.079</td>
</tr>
<tr>
<td>(-0.79)</td>
<td>(-1.32)</td>
</tr>
<tr>
<td>AGE</td>
<td>0.028</td>
</tr>
<tr>
<td>(1.25)</td>
<td>(2.11)</td>
</tr>
<tr>
<td>R^2</td>
<td>0.62</td>
</tr>
<tr>
<td>n</td>
<td>66</td>
</tr>
<tr>
<td>σ_u</td>
<td>1.11</td>
</tr>
</tbody>
</table>
In order to fully appreciate the implications of the estimated close relationship between program benefits and household characteristics it is useful to compare the demand-oriented programs with the existing public housing programs. In previous work (De Borger (1984)) we concluded that the latter generated a very poor relation between benefits and especially income. There was no evidence that poorer families received systematically larger benefits, ceteris paribus, and it was found that 'similar' households derived wildly different benefits from the program. To illustrate this once more we estimated the same specification as in the case of the demand-oriented programs, using the 59 participants occupying apartments in the existing public housing program. The following equation was obtained (t-statistics in parentheses):

\[
\text{BENEFIT} = -7.89 + 0.085 \text{ (INCOME)} - 0.0002 \text{ (INCOME)}^2
\]
\[\begin{array}{c}
(-1.12) \\
(1.05) \\
(-0.99)
\end{array}\]

\[+ 5.44 \text{ (FAMILY-SIZE)} - 1.09 \text{ (FAMILY-SIZE)}^2 + 0.14 \text{ (AGE)}\]
\[\begin{array}{c}
(1.91) \\
(-1.07) \\
(0.88)
\end{array}\]

\[R^2 = 0.12\]
\[\sigma_u = 7.01\]

The income coefficient in this relation is of the wrong sign, although it is insignificant. Moreover, \(R^2\) and \(\sigma_u\) suggest that the program does not at all provide similar benefits to households with the same observed characteristics.\(^1\)

Taking into account these and other undesirable features of the existing program, briefly discussed in chapter 1, we believe demand-oriented systems of the type described in this chapter are at least worth considering.

\(^1\) A regression using the complete sample, in which non-participants were entered with a zero benefit, produced a negative but very insignificant income coefficient and an even smaller \(R^2\). Regressions using the subsidy as dependent variable yielded similar, poor results.
4. SOME CONCLUDING REMARKS

In this paper, we designed and simulated several alternative demand-oriented programs for the rental housing market. Although some simplifying assumptions had to be introduced due to data limitations, the programs largely satisfied the prescriptions derived in chapter 1. Income limits restrict participation to low-income families. Similar families receive the same subsidy. Among otherwise similar families the subsidy decreases with income and it is zero at the upper income limits for eligibility. Constraints on housing consumption imply that the programs do not subsidize housing in excess of what is typically consumed by marginally ineligible families, i.e. households whose income is slightly above the eligibility limit. Moreover, the programs induce the worst-housed families to consume more housing than they would choose were they given a cash grant with the same market value as the program.

Admittedly, the methodology used was based on some very strong assumptions. The composite commodity approach to housing program analysis does not distinguish between quantity and quality aspects of the housing bundle\(^1\). Moreover, it was assumed that there were no participation costs. Especially the latter assumption may lead to large differences between simulated and observed outcomes of the operation of a given program.

The main purpose of this paper was to show the possibility of designing more efficient and equitable housing programs using

---

\(^1\) In principle, the analysis could be extended to allow for the imposition of a set of explicit physical housing requirements. Simulation of the programs without any restriction on consumption at all is another possible alternative. Indeed, some people argue against quantity restrictions because they are arbitrary, discontinuous, costly to implement and because they prevent higher participation rates among the worst-housed families. Simulations of the programs without minimum rent requirements in general yielded smaller increases in housing consumption and slightly lower mean benefits.
very simple subsidy formulas. Despite some obvious shortcomings we believe we largely achieved our goal. All simulated programs were consistent with the conjectures concerning taxpayer preferences stated before. Moreover, by construction, a close relationship between program benefits and household characteristics, especially income, exists. Compared to the existing program, the simulated alternatives were shown to have many desirable characteristics.

Several concluding remarks are in order. First, the cost of the programs to the government, net of administration costs, crucially depends on the income limits for eligibility and on participation rates. As there is not necessarily a trade-off between the level of the income limit and the mean subsidy small changes in the eligibility limits may result in substantial differences in budgetary costs. However, through variation of income limits (both the level and the variation with household characteristics such as family-size), quantity restrictions and physical housing requirements the government has some flexibility and it can shape any given program according to its needs and financial possibilities. Unfortunately, participation rates are largely beyond its control and extremely difficult to predict.

Second, the results do not show the feasibility of all demand-oriented programs within a given political environment. It is, e.g., to be expected that allowance programs will be harder to defend politically than price subsidies or construction-linked public housing programs. The latter will generally be supported by a large coalition of all interested parties, including builders, housing administrators, construction unions and advocates of assistance to the poor.

1 Whether increasing the income limits results in a larger mean subsidy depends among others on the distribution of housing consumption over the population. This information is used to determine the program parameters ρ and δ. Under the specification used in this study and given the characteristics of our sample, the average subsidy increased with higher eligibility limits.
Except for the last group, most individuals in this coalition will not favor housing allowances if they find out how little of the allowance is actually spent on housing. On the other hand, the coalition will probably prefer all demand-oriented programs, including allowances, over pure income maintenance schemes.

'Experience shows that coalitions of specific producer groups can be rallied in support of specialized forms of aid more effectively than broad political support can be organized for general income maintenance or job creation. Such coalitions are built around the suppliers of particular goods or services involved in the specialized forms of aid. These suppliers believe such aid is somehow tied to requirements for greater consumption of their products' {Downs and Bradbury (1981, p.403)}. Consequently, whereas price subsidies are likely to get some support from the political coalitions, allowances may receive support from government officials, who favor income maintenance programs and view this housing program as a second best way of providing cash grants to eligible families, without admitting to do so.

Third, very little is known about the effects of different types of programs on housing price inflation\(^1\). Even the price effects of the existing programs have not systematically been studied. An analysis of the differential implications of demand and construction-oriented programs within a general equilibrium framework would be a difficult, but promising area for further research.

\(^1\) One possible source of price increases in the case of demand-oriented programs may be collusion between landlords and tenants. In the extreme, the only effect of the programs would be price changes without any increase in consumption. Although we doubt the practical seriousness of this possibility, collusion is an option that should be taken into account.
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