DISCUSSION PAPER

UDD 83

Report No. UDD-83

SITES AND SERVICES—AND SUBSIDIES:
THE ECONOMICS OF LOW-COST HOUSING
IN DEVELOPING COUNTRIES

by

Stephen K. Mayo

with

David J. Gross

June 1985 (Revised)

Water Supply and Urban Development Department
Operations Policy Staff
The World Bank

The views presented here are those of the author, and they should not be interpreted as reflecting those of the World Bank.
Stephen K. Mayo is an economist in the Water Supply and Urban Development Department of the World Bank. David J. Gross, a consultant to that department, is assistant professor of Public Administration at Louisiana State University.

This paper was prepared for a conference on Government Policy and the Poor in Developing Countries" at the University of Toronto, Toronto, Canada, April 24-25, 1985 and for a World Bank workshop in May, 1985. Opinions expressed herein are solely those of the author and should not be interpreted as those of any organization. The author gratefully acknowledges the comments and suggestions of many of his colleagues while research for this paper was in progress, especially, Alain Bertaud, Anthony Churchill, Michael Cohen, Emmanuel Jimenez, Richard Veen, and James Wright. Helpful comments were made on a draft by Bertrand Renaud, Stephen Malpezzi, Barry Pinsky, Paul Strassman, and Richard Stren. Major substantive contributions to analyses of housing demand were made by Stephen Malpezzi; Waled El-Ansary provided competent and responsive research assistance; and Sylvanus Best typed this draft with impeccable efficiency.
ABSTRACT

Sites and services projects represent a major innovation in shelter policy in developing countries. Such projects, now having been sponsored by international aid agencies for a bit more than a decade, are government projects that deliver a package of shelter-related services the standards of which depend on the ability and willingness-to-pay of intended beneficiaries. Typically such projects represent a sharp break with pre-existing government shelter policies in that they attempt, in principle, to focus directly on lower income groups and to deliver shelter and services with small or no subsidies. This paper describes the background of the sites and services concept; reviews recent evaluations of sites and services projects; presents an analytical model of the sites and services paradigm (which is used to examine how major project outcomes are influenced by project design); summarizes recent research on housing demand in developing countries (which is relevant to designing appropriate sites and services projects); reviews planning assumptions used in World Bank sites and services projects, compares these to empirical evidence on willingness-to-pay for housing, and examines project experience in light of contrasts between actual planning assumptions and empirical research on demand for shelter. The paper concludes with suggestions for ways to improve the project design process and reform housing sector policies to improve the efficacy of the sites and services paradigm.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>1</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>iv</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>2. Sites and services projects—background and recent evaluations</td>
<td>3</td>
</tr>
<tr>
<td>3. An analytical model of sites and services projects</td>
<td>14</td>
</tr>
<tr>
<td>4. Demand for housing in developing countries</td>
<td>18</td>
</tr>
<tr>
<td>a. Housing demand</td>
<td>18</td>
</tr>
<tr>
<td>b. Minimum subsidies necessary to induce participation</td>
<td>25</td>
</tr>
<tr>
<td>c. Income levels of participants at zero subsidy or upon resale by initial occupants</td>
<td>31</td>
</tr>
<tr>
<td>5. Sites and services project design practice and project outcomes</td>
<td>34</td>
</tr>
<tr>
<td>6. Summary and conclusions</td>
<td>48</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>58</td>
</tr>
<tr>
<td>APPENDIX—An analytical model of sites and services projects</td>
<td>1</td>
</tr>
<tr>
<td>a. A simple case: the representative consumer</td>
<td>1</td>
</tr>
<tr>
<td>b. The representative consumer in a market with imperfect consents</td>
<td>5</td>
</tr>
<tr>
<td>c. Multiple consumers with different preferences</td>
<td>10</td>
</tr>
<tr>
<td>d. Subsidies, subletting, and selling out</td>
<td>12</td>
</tr>
<tr>
<td>e. Recapitulation</td>
<td>19</td>
</tr>
</tbody>
</table>
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Estimated Parameters of Housing Expenditure Functions</td>
<td>20</td>
</tr>
<tr>
<td>3.</td>
<td>Cost and Subsidy Elements in Sites and Services Projects</td>
<td>42</td>
</tr>
<tr>
<td>4.</td>
<td>Estimated Subsidies in Sites and Services Projects</td>
<td>45</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rent-to-income ratios by income for renters</td>
<td>22</td>
</tr>
<tr>
<td>2. Minimum subsidies necessary to induce participation</td>
<td>30</td>
</tr>
<tr>
<td>3. Income percentile of participating households with no subsidy at alternative design affordability ratios</td>
<td>33</td>
</tr>
<tr>
<td>4. Assumed willingness-to-pay in World Bank sites and services projects in relation to empirically estimated willingness-to-pay</td>
<td>39</td>
</tr>
</tbody>
</table>

**Appendix Figure**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1. The representative consumer in a sites and services project</td>
<td>6</td>
</tr>
<tr>
<td>A.2. The representative consumer in a market with imperfections</td>
<td>6</td>
</tr>
<tr>
<td>A.3. Multiple consumers with different preferences</td>
<td>13</td>
</tr>
<tr>
<td>A.4. Consumer behavior with subsidies, subletting, and selling out</td>
<td>13</td>
</tr>
</tbody>
</table>
1. Introduction

This is a paper about a major innovation in delivering shelter and related services to the poor in developing countries—"sites and services" projects. Sites and services projects, now having been sponsored by international aid agencies for a bit more than a decade—have been government-sponsored projects that deliver a package of shelter related services, from a minimal level of "surveyed plots" to an intermediate level of "serviced sites" to an upper level of "core housing" complete with utilities and access to community-based services, depending on the ability and willingness of beneficiary populations to afford a particular level of services. Typically such projects represent a sharp break with pre-existing government shelter policies in that they attempt, in principle, to focus directly on lower income groups and to deliver shelter and services with small or no subsidies.

In addition they constitute a package of policy alternatives in the small that, if extended more broadly, would address most land use and shelter policy areas in which governments have actively intervened. For example, sites and services project designers must confront issues of building codes, zoning and land use regulations, tenure security, subsidy levels and mechanisms, housing and infrastructure standards and pricing policies, expropriation and compensation, cost recovery mechanisms, financing instruments and terms, project siting and layout, land acquisition mechanisms, the mix of public and private roles in project implementation, and a host of other administrative and institutional issues. Thus, to study the impacts of sites and services projects and to link those impacts to specific project

1 The earliest sites and services schemes (in South Africa, Chile, and Kenya) were undertaken largely without external assistance in the 1940s and 1950s. It was not until the late 1960s and early 1970s, however, that international agency assistance began in earnest.
design features and policies is in a real sense to study housing policy for the poor in a far more generic way than might at first appear to be the case.

By now, large numbers of sites and services and slum upgrading projects have been implemented. The World Bank alone, for example, had initiated some 68 projects through 1984, each benefitting more than 25,000 households on average. Having now had a decade of experience with such projects, it is useful to look closely at how they have worked and to determine the lessons that can be learned from their successes and failures.

In order to understand better the workings of sites and services projects, it is useful to have an analytical framework. In this paper, after describing the background of the concept and reviewing some recent evaluations and critiques of sites and services projects, I present results of an analytical model of how the sites and services paradigm is likely to influence household behavior (The model itself is presented in an appendix.). Relevant areas of impact are housing consumption and investment, consumption of non-housing goods and services, incentives to sublet or to sell out to higher-income groups, and incentives to default on mortgages. In addition, the analytical framework provides a basis for estimating the economic benefits that accrue to project participants, estimating the subsidies that are required to achieve certain project outcomes (such as housing that meets minimum project design standards), and the welfare losses to society associated with subsidy elements. The analytical framework indicates that a critical element in understanding project impacts is having a firm grasp of housing demand parameters in developing countries. Thus, after discussing the analytical model, I review recent evidence on housing demand in developing countries based on an ongoing research project at the World Bank.

Implications of that research for sites and services project impacts are then
described. This discussion is followed by a review of several major project outcomes of 68 World Bank sponsored sites and services projects, in which it is suggested that failure to incorporate correct information on housing demand behavior in project designs has resulted in downstream problems which seriously threaten the ability to achieve some of the most fundamental goals of sites and services projects. The most serious of these are creating conditions that lead to either large subsidies and hence poor prospects of replicability or to smaller subsidies but with benefits going to relatively higher-income groups. The final section presents some conclusions and recommendations relevant to improving both the design of sites and services projects and the choice of housing policy instruments in developing countries.

2. Sites and services projects—background and recent evaluations

The growth of developing country populations and their increasing concentration in urban areas has put enormous pressure on governments to mobilize resources to meet the basic needs of their people. Shelter demands have been particularly acute. For example, between 1960 and 1980, the population of developing country cities is estimated to have increased by 135 percent, from 234 million to 549 million; between 1980 and 2000, a further increase, to 1.2 billion people, is expected, thereby creating major demands on countries to provide both housing and related services (World Bank, 1975).

The initial response of many developing country governments to the press of urban population growth was to adopt the shelter “solutions” of developed countries—heavily subsidized blocks of public housing flats with high standards of construction and infrastructure, zoning and building code regulations discouraging production of housing of lower standards, and, in
many cases, destruction of slum areas and squatter settlements in the name of either "law and order" or "urban renewal." These policies did not work.

Public housing did not reach most of the population; Grimes (1976), for example, reported that from one-third to two-thirds of urban populations could not afford the least expensive public housing unit in six developing country cities he studied. Subsidy levels were high enough to virtually guarantee that public housing could not be made available to most of the population. Zoning and building regulations were widely flouted as "informal housing" and squatter settlements proliferated. In Cairo, for example, where zoning laws forbid conversion of agricultural land to residential use and where building codes require approved architectural or engineering plans for legal housing construction, it was estimated that approximately 84 percent of housing built since 1970 is "informal"—built in violation of either zoning or building codes or both (Mayo et al., 1982). When squatter settlements were removed, hydra-like they returned, sometimes nearby but often in the same place.

By the 1970s, it was clear to many in positions to affect third world housing policy that the failed (or failing) programs of the 1950s and 1960s had to be replaced by more constructive solutions. What was called for, and what found expression in the works of Turner, Mangin, and others, was an approach more in harmony with the natural processes of shelter acquisition and development of the poor themselves. In place of previous policies, it was proposed that public programs capitalize on the untapped energies and resources of the poor through "progressive development" schemes which provided housing or simply serviced sites that were affordable by low-to-moderate income households and which could be progressively upgraded over time. Complementing such "sites and services" schemes, there were to be "slum
upgrading" or "squatter upgrading" schemes that focused on improving existing residential areas of the poor rather than on developing undeveloped land.

The key to making such projects work was to bring down the cost of shelter and infrastructure from the high and unaffordable levels prescribed by most governments. As noted in a World Bank policy paper (1975):

This can be achieved, in the first instance and most rapidly, by reducing standards; permitting and encouraging the use of low-cost (frequently indigenous) building materials and a lower quality of finish; providing communal rather than private plumbing and sanitary facilities; encouraging or providing higher density construction, with less land per dwelling unit; and providing less living space per dwelling unit. (p. 5)

Reducing standards was not enough, however. It was also seen to be important to deal with problems and constraints in urban land and housing markets which were assumed to restrict the level of housing investment among low-income households; for example, shortages of urban infrastructure, uncertain and insecure land tenure, unavailability of formal housing finance, shortages of low-cost building materials, and difficulty in assembling land for development. Removal of such supply-side barriers to investment was seen as essential in establishing the context within which household resources could be mobilized to upgrade shelter and infrastructure beyond initial affordable but minimal levels.

It was also assumed that the progressive housing development engendered by household resource mobilization and investment would be paralleled by a similar phenomenon at an institutional scale. That is, it was expected that public institutions responsible for implementing sites and services schemes and upgrading projects would price sites and shelter at a level that would not only fully recover costs, but would generate a modest surplus that could be recycled in order to replicate projects at a larger scale. While subsidies, particularly for the lowest income participants, were
not altogether ruled out of the sites and services paradigm, it was assumed that they would be modest, often generated internally by allocating profits earned on sales of higher-income and commercial sites to write down prices of sites for lower-income households. Thus, the important goal of "replicability" of projects was seen to depend critically on both "appropriate standards and sound pricing policies" (World Bank, 1983, p. 9), the latter implying prices that recovered costs and entailed small or no subsidies, the former implying that standards were not only affordable but represented a bundle of housing and infrastructure characteristics for which poor households were willing to pay. These principles were succinctly set out by the director of the World Bank Urban Projects Department who stated that "... affordability is the key to cost recovery, and cost recovery is the key to replicability. It's as simple as that." (Ayres, p. 162)

These principles were to be reflected in the 1970s and 1980s in a growing number of sites and services and upgrading projects sponsored by developing country governments and funded in part by outside agencies such as the World Bank, U. S. Agency for International Development, regional development banks (e.g., Asian Development Bank, Inter-American Development Bank), and other bilateral aid agencies. The World Bank alone made loans for 36 sites and services or upgrading projects between 1972 and 1981, involving total Bank lending of more than $1 billion and estimated to have benefited nearly 2 million people. (World Bank, 1983, p. 46) Under its Housing Guarantee Program, USAID sponsored preparation of a number of similar schemes, many of them in Latin America (World Bank, May, 1975).

Evaluations of the workings of such projects, of their impacts, and their potential problems are beginning to emerge in some numbers. For
example, reviewing possible beneficial policy impacts of sites and services projects, Ayres concluded that:

The most obvious manifestation of these [policy] changes is held to be that publicly constructed housing, the model of the 1950s and 1960s, has given way to private investment through self-help, thereby reducing the role of the public sector. (pp. 176-7), citing as examples policy changes consistent with the sites and services approach in a number of countries. In addition to policy-level impacts, Ayres concluded that:

The Bank impact on project design, planning, and investment programming is more measurable. Changes in design standards have brought shelter costs way down. (p. 177)

In Zambia, for example, complete houses in sites and services projects were estimated to cost less than one-fifth as much as the least expensive government-subsidized housing; in El Salvador, the better quality sites and services project houses cost less than half as much as the cheapest conventional house (Keare and Parris, p. xiv).

In a recent evaluation study of four early World Bank projects jointly sponsored by the Bank and IDRC, the authors stated that "... the experiment embodied in the first generation of Bank-supported urban shelter projects [has] been remarkably successful" (Keare and Parris, p. v), citing (1) increased production of housing and infrastructure, (2) stimulation of beneficiaries to produce housing of higher quality than had been expected, (3) continued investments by beneficiaries in both housing and community facilities, (4) allocation of lots as low as the 20th income percentile, (5) residential turnover no greater among project residents than among control group households, (6) "affordability" among target groups, and (7) generation of income and employment among project beneficiaries and producers of sites and services (Keare and Parris, pp. v - vi).
These relatively up-beat assessments speak to accomplishments that are real, and that were achieved only at the expense of "hard and sometimes bitter arguments ... to persuade borrowing nations to reduce their standards and costs, [and] to increase the amounts that were charged to project participants," with the effect that available public resources were spread far more broadly among the population than had been the case before the advent of sites and services and upgrading projects (Tym, p. 217). For these accomplishments a generation of social innovators and implementors deserve considerable credit.

Despite the running accomplishments of sites and services and upgrading projects, a number of reservations and criticisms have been expressed concerning the way the sites and services paradigm is working. These critiques go in many ways to the heart of the paradigm, claiming variably that (1) shelter provided is not in fact affordable by the poor, (2) that benefits accrue disproportionately to better-off households, (3) that cost recovery experience is poor, (4) that subsidies persist at unsustainable levels, and, because of the above, (5) projects as they are now designed and implemented are not replicable on a large scale. Consider the arguments regarding each point.

Concerning affordability, Ayres states that:

There is some evidence that the [World] Bank's project designs may have been overly optimistic about the ability of intended beneficiaries to afford improvements rendered by the projects (p. 193), citing the slow speed of housing consolidation beyond initial stages and biases in the distribution of sites and services plots toward higher-income groups in some projects. Payer goes further, claiming that:

... the World Bank figures turn out to be highly unrealistic as a guide to 'affordability' of the projects by the poorer slum residents (pp. 336-7),
and elsewhere elaborates by speculating that:

... the 'improvements,' however desirable some of them may be, will eventuate in the collection of payments and taxes that are considerably higher than what the population is now paying, and that will be for many, if not most, more than they can afford. (p. 325)

Jere, in reviewing the experience of a sites and services project in Lusaka, Zambia noted that, "Cost recovery in low-cost housing remains a major source of concern ... ", explaining that:

Officials involved in the early planning stage had assumed the residents would be willing to pay up to 20 to 25 percent of their monthly income towards housing costs. Now it appears that the questions of affordability and willingness-to-pay were not studied with sufficient care. (p. 67)

The result of this oversight is "the inability of some residents to pay even if they wanted to ..." (p. 67)

Over-optimism in design standards and the resultant inability of the poor to afford to be in the project has an inevitable corollary—that benefits will tend to accrue to higher-income households that can afford the higher standards. "Leakage" of benefits to middle income households in some sites and services projects is well known (Cohen, p. 95), and is in fact cited in the World Bank-IDRC evaluation cited above:

... the principal finding ... with respect to accessibility [of different income groups to project benefits] is that, in both sites and services and upgrading projects, the participating populations span a wide range of incomes and tend to be more representative of median income groups than of the poorest urban households. (Keare and Parris, p. 12)

The mechanism by which higher-income households become project beneficiaries varies. In some cases, they misstate incomes in order to meet initial project income eligibility limits; in some, they may legally or surreptitiously purchase or lease project units from initial low-income occupants. For example, Keare and Parris note that in the Philippines:
... a number of cases of illegal selling of rights to tagged (censused) dwellings in the poorest area have been observed, and some other interim reports have suggested that a significant proportion of families may not be able to meet regular payments for reblocked housing. (p. 15)

Chana (p. 52), in reviewing the experience of one of the most celebrated among sites and services projects—the project at Dandora in Nairobi, Kenya—notes that about half of all occupied plots were rented out fully to non-allottees and some units had been illegally sold, presumably to members of higher-income groups. It should be noted that in many sites and services projects, formal restrictions exist for stipulated periods on sales or rentals by initial allottees, with the effect that distributional consequences of initial design and pricing decisions may become apparent only over a number of years. This tendency for distributional consequences to be disguised initially is aggravated by the existence of subsidies. As Keare and Parris note:

... it is also likely that where subsidization of (a portion of) project costs coexists with barriers to transfer the subsidy in the event of resale, the participant may be, or at least feel, 'locked in' for a time. (pp. 56-7)

Subsidies can also disguise the existence of potential cost recovery problems by creating situations whereby such "locked-in" households undertake extraordinary financial sacrifices to reach a point at which they can either comfortably make payments on mortgage loans or, perhaps as likely, sell out to higher-income households.

Despite the incentive for low-income project beneficiaries to hold on in the face of economically precarious positions, cost recovery problems have nevertheless arisen in World Bank and other sites and services projects. Keare and Parris, for example, note that cost recovery was a problem in three of the four projects they reviewed, although "causes and severity of the problems varied significantly." (p. xii) Reviews of cost recovery experience at the World Bank, cited by Keare and Parris, have focused
on the degree to which poor cost recovery depends on poor financial administration, lack of enforcement mechanisms or political will, unwillingness of populations to pay before services are connected and functioning adequately, and an endemic disdain for payment of charges for services. (p. xii) Somewhat surprisingly, the possible inability or unwillingness of project beneficiaries to pay for project benefits has been discounted by Keare and Parris. Recalling the questions raised by Ayres, Payer, and others concerning the questionable appropriateness of affordability assumptions that underpin some project design standards, it may be appropriate to ask whether or not the explanations cited by Keare and Parris are "derived variables"—the product of household unwillingness-to-pay for standards well beyond their needs and of governments' tacit recognition of either the validity of project beneficiaries' reticence or of the risk to the government of admitting a mistake. That is, how much of an incentive exists for governments to quietly increase subsidies or to fail to vigorously pursue cost recovery goals when it is clear to them that by not doing so they would risk evicting or impoverishing a highly visible group in a highly visible project?

Regardless of the answer to such questions, it is clear that cost recovery is a significant problem in a number of World Bank (and undoubtedly other agencies') sites and services projects. And as Ayres notes, citing a Bank assessment:

... obviously more needs to be done to improve collections of monthly charges from sites and services occupants and/or develop alternative financing sources. Otherwise affordability cannot be equated with replicability. (p. 197, underlining mine)

Unfortunately, even this prescription for improvement does not ring quite true, for, noting the underlined phrase, developing alternative financing
sources almost inevitably means increasing subsidies, and it can almost never be true that affordability plus subsidies equals replicability.

Yet it appears that in many projects affordability has been purchased with subsidies that are considerably higher than the minimal levels envisioned by the original architects of the sites and services paradigms. For example, in one project in Ismailia, Egypt undertaken by the Egyptian government (with some support from the British Overseas Development Council), selling prices for serviced land were set at LE 2.25 per square meter when the market price was between LE 10 and LE 15 per square meter (Davidson, p. 142); purchase was financed by the government at an interest rate of 5 percent per annum at a time when the prevailing market rate was about 12 percent. Such land price writedowns and interest rate subsidies are common in sites and services projects and can easily, as in the example just cited, constitute from half to as much as 90 percent of the true resource cost of the shelter or land provided in a project. And despite the fact that many subsidy elements are implicit, off-budget transfers, they imperil the long-term replicability of projects just as surely as do direct government payments to project beneficiaries.

Reducing such subsidies has often proven to be extremely difficult for designers of sites and services projects, in that there is often a powerful inertia, of two major dimensions, at work in shelter policy. One dimension is that of standards, the other that of subsidies; each derives from earlier practice in shelter policy in developing countries—the often inappropriate policies of the 1950s and 1960s discussed above. The two are intimately related; as noted by Payne:

The frequent exclusion of all land, financing, and administrative costs from project accounting may be considered to represent positive discrimination in favor of the poor and therefore a socially progressive approach. In practice,
however, it is often an excuse to maintain unrealistically high standards irrespective of their appropriateness ...
(p. 8)

Another problem with subsidies is that little thought appears to be given in project planning to their form, magnitude, distribution among different sorts of households, or their impacts on either the behavior of beneficiaries (e.g., impacts on housing consumption, investment, or tenure choice) or the viability of subsidy-generating institutions. In most developed countries with significant social housing policies, such questions are at the heart of policy and technical debates concerning the choice of housing programs and policies; in most developing countries they are ignored—often at the peril of long-run replicability of low-income housing programs.

Yet it is on the basis of their replicability on a large scale that sites and services and upgrading projects will ultimately be judged. Achieving other project goals—physical implementation, affordability, cost recovery of "scheduled costs"—at the expense of replicability simply cannot be viewed as the ultimate objective. Thus, as Cohen noted in reviewing the first decade's performance of World Bank shelter projects:

By the end of the seventies, it was evident that the notion of replicability could no longer mean doing more of the same thing, but rather it had to involve seeking ways to increase the scale in the provision of housing whether through public or private sector efforts ... (p. 9)

To meet this challenge means, among other things, having a clearer analytical understanding of how sites and services projects affect the behavior of potential beneficiaries and how one can modify project features in order to produce projects that are both affordable and replicable. The next section addresses in part these issues.
3. An analytical model of sites and services projects

This section briefly summarizes the major conclusions derived from an analytical model of sites and services projects that is presented in detail in an appendix. The model presented in the appendix is based on the standard neo-classical economic paradigm, and explores the ways in which household behavior is likely to be influenced when households are given opportunities to participate in typical sites and services projects.

The principal outcomes of interest are housing consumption and investment, consumption of non-housing goods and services, incentives to sublet or sell out to higher-income groups, and incentives to default on mortgages. In addition, the appendix examines the economic benefits that accrue to households that participate in a project, the welfare losses attributable to certain types of project restrictions (such as requiring households to consume housing of certain minimum standards), and the subsidies necessary to induce certain households to participate in sites and services projects. In addition, the appendix indicates how to determine the income groups that are most likely to participate in projects if subsidies are minimized or, alternatively, the groups most likely to attempt to purchase shelter from original allottees if transfer of ownership is permitted.

The appendix explores such impacts based on a simplified model of the sites and services project design process which has the following stylized features:

1. The project designer picks a target income group whose income is $y_0$

2. An assumption is made concerning the fraction of income households are willing and able to pay for shelter; this fraction is "a", the affordability ratio.
3. A target housing expenditure level (rent) is set; $R_o = a y_o$.

4. Project standards such as lot size, location, infrastructure type and quality, shelter size and quality, etc. are established and units are built with a cost, $C$, set just equal to $R_o$.

Such units are then offered to target income group households at a price $R_o$ which fully recovers costs. The amount of housing offered is equal to $H^*$, an amount assumed to be greater than the amount originally consumed by the household ($R_o$), but offered at a lower price per unit ($p_H^*$) than the market price $p_H$. The price per unit of housing services offered in the project may be lower than the market price for a number of reasons, many having to do with removing supply-side constraints. For example the project may offer long-term housing finance at a rate of interest below that of the informal money market (yet still at a level sufficient to cover borrowing costs of the lending institution); water may be supplied at less than its cost from private vendors; secure tenure can be offered at less than the differential cost of securing legal housing in the marketplace.\(^1\)

The economic benefit to households of participating in the project depends on the amount of shelter and services received in the project and what is required to be paid for it. If benefits of participating exceed the costs, households will presumably enter a project. Once having entered the project, incentives to households to sell out, sublet, or default are determined by households' preferences, income fluctuations, market prices of units provided in the project, and by rules and restrictions governing the ability of households to profit by selling out or subletting.

\(^1\) For a model of the "cost" of tenure security to urban households, see Jimenez (1984) and Friedman, Jimenez, and Mayo (forthcoming).
The appendix analyzes the complex incentives and disincentives that are set in motion when the standard sites and services paradigm is implemented. Among the more important lessons discussed there are the following:

1. Sites and services projects create economic benefits for potential participants by either lowering the effective market price of shelter and services or relaxing market restrictions or both. The magnitude of potential benefits varies depending on the household preferences for housing vis-à-vis other goods, on housing market features (especially the existence and magnitude of market imperfections and, although only touched on, expectations concerning inflation in prices and income), and on project design features.

2. Among the project design features that affect potential benefits are the level of standards of shelter and services, prices charged within a project, the type and level of subsidies, and whether or not subletting and resale are permitted.

3. Among the outcomes affected by project designs and other factors noted above are consumption (and investment) in shelter and other goods, incentives to invest further in project-provided units, incentives to resell or sublet, and incentives and propensities to default on project-related loans.

4. Of the factors influencing project outcomes, the choice of project design standards and pricing standards based on "affordability" criteria are of particular importance. The appendix indicates that there is some degree of arbitrariness in the application of affordability calculations to project design and pricing, with the result that differential incentives are
created for households to participate in projects and to attain outcomes of interest. Some potential beneficiaries, particularly those with strong preferences for housing, will not only be induced to participate in the absence of subsidies, but will also have incentives to upgrade project units. For many potential beneficiaries, however, participation can be purchased only at the cost of subsidies. For those households induced by subsidies to participate, benefits will be lower than is at first apparent; consequently such households may have significant incentives to sell out to higher-income groups and to sublet part of their space, and they may be subject to high default rates in spite of subsidies. Whether or not such propensities are in fact observed will depend critically on how well design standards and pricing mirror the effective demand or willingness-to-pay of potential beneficiaries. If standards are too high because effective demand has been overestimated, project problems such as high default rates, high turnover in favor of higher-income households, and slow project upgrading will occur.1/

The next two sections take up the issue of, first, the effective demand for housing in developing countries and, second, the actual planning practice of World Bank sites and services projects regarding affordability assumptions and the design and pricing decisions that follow from them.

1/ As noted in the appendix, however, large subsidies and strong self-selection by beneficiaries (the latter particularly a problem when project scale is small) can disguise the existence of project problems. Thus, entirely “successful” small-scale projects with hidden subsidies can be implemented, but which would have problems being replicated on a large scale.
4. Demand for housing in developing countries

The previous section suggests the importance of getting good estimates of the effective demand for housing if sites and services projects are to be designed appropriately, that is, in ways that provide significant benefits to intended beneficiaries without adverse side-effects. Here I review recent research on household demand for housing in developing countries and present some of the major implications of that research for the design and likely outcomes of sites and services projects.

a. Housing demand

Until recently, few comparative studies of housing demand in developing countries existed. Most of the studies of household demand for housing services in developing countries were based on specialized data bases, not usually collected for the express purpose of estimating housing demand relationships. Different analyses used different variable definitions, different functional forms, and different stratification variables. This made comparison of results regarding demand parameters across studies exceedingly tenuous.

In 1981, a major comparative study of housing demand in developing countries was initiated at the World Bank. In that analysis high quality data were collected for 16 cities in 8 countries (Colombia, Egypt, El Salvador, Ghana, India, Jamaica, Korea, and the Philippines) and were used to estimate housing demand relationships using relatively comparable variable definitions and identical functional forms and stratifying variables. For comparative purposes identical models were estimated for two U.S. cities, Pittsburgh and

1/ For a review of the pre-1984 literature see Malpezzi and Mayo (1985).
Phoenix. A description of much of that research is contained in Malpezzi and Mayo (1985). The following represents a highly abbreviated description of the study and of its major empirical findings.

Malpezzi and Mayo first estimate a simple log-linear model of housing expenditures in each of the sixteen cities:

\[ \ln R = a + \varepsilon_y (\ln y) + bH + cH^2 + u \]

where \( R \) is rent; \( y \) is income; \( H \) is household size; \( \varepsilon_y \) is the estimated income elasticity of demand; \( a, b, \) and \( c \) are regression coefficients, and \( u \) is an estimated disturbance. The model is stratified for renters and owners. For renters, rent is defined as net rent, exclusive of utility payments. For owners, rent is defined variously, and in order of availability, as owner imputations of net rent, hedonic estimates of net rent based on applying renter-based hedonic price equations to owners' housing characteristics, or imputed rents based on applying a fixed amortization ratio (from one percent to one and one-half percent per month depending on the country) to owners' estimates of housing value. While other functional forms were tried, and many other demographic variables were included in alternative estimating equations, results from the simple log-linear model were found to provide adequate fits and robust findings regarding major demand parameters.

Table 1 presents the estimated parameters of housing expenditure functions for renters and owners.\(^1\) In general the results are remarkably consistent with results from developed countries (see Mayo, 1981). The regression fits are typical for this type of equation: typical R-squared

\[^1\] Malpezzi and Mayo discuss findings concerning household size; here we focus only on income elasticity and intercept estimates.
<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>CITY</th>
<th>CONSTANT</th>
<th>LOG INCOME</th>
<th>HH SIZE</th>
<th>HH SIZE SQUARED</th>
<th>R-SQUARED/ N</th>
<th>CONSTANT</th>
<th>LOG INCOME</th>
<th>HH SIZE</th>
<th>HH SIZE SQUARED</th>
<th>R-SQUARED/ N</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLOMBIA</td>
<td>BOGOTA</td>
<td>1.11</td>
<td>0.66</td>
<td>0.03</td>
<td>-0.006</td>
<td>0.40</td>
<td>0.77</td>
<td>0.03</td>
<td>0.04</td>
<td>-0.003</td>
<td>0.49</td>
</tr>
<tr>
<td></td>
<td>(1978)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CALI</td>
<td>2.81</td>
<td>0.44</td>
<td>0.06</td>
<td>-0.006</td>
<td>0.27</td>
<td>1.25</td>
<td>0.06</td>
<td>0.07</td>
<td>-0.005</td>
<td>0.38</td>
</tr>
<tr>
<td></td>
<td>(1978)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EGYPT</td>
<td>CAI</td>
<td>0.25</td>
<td>0.46</td>
<td>0.06</td>
<td>-0.017</td>
<td>0.16</td>
<td>0.89</td>
<td>0.12</td>
<td>0.21</td>
<td>-0.009</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>BENI SUEF</td>
<td>-1.2</td>
<td>0.51</td>
<td>0.14</td>
<td>-0.047</td>
<td>0.25</td>
<td>-0.09</td>
<td>0.42</td>
<td>0.14</td>
<td>-0.003</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>(1961)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EL SALVADOR</td>
<td>SANTA ANA</td>
<td>0.37</td>
<td>0.48</td>
<td>0.11</td>
<td>-0.014</td>
<td>0.16</td>
<td>-2.8</td>
<td>1.11</td>
<td>0.12</td>
<td>-0.004</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td>(1980)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SONSONATE</td>
<td>0.79</td>
<td>0.50</td>
<td>0.12</td>
<td>-0.10</td>
<td>0.16</td>
<td>0.39</td>
<td>0.79</td>
<td>0.15</td>
<td>-0.013</td>
<td>0.57</td>
</tr>
<tr>
<td></td>
<td>(1980)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GHANA</td>
<td>KUMASI</td>
<td>0.82</td>
<td>0.33</td>
<td>0.04</td>
<td>0.007</td>
<td>0.83</td>
<td>0.39</td>
<td>0.16</td>
<td>0.17</td>
<td>0.002</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>(1980)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INDIA</td>
<td>BANGALORE</td>
<td>0.66</td>
<td>0.58</td>
<td>0.04</td>
<td>-0.08</td>
<td>0.18</td>
<td>2.84</td>
<td>0.43</td>
<td>0.08</td>
<td>-0.007</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>(1975)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JAMAICA</td>
<td>KINGSTON</td>
<td>-1.12</td>
<td>0.70</td>
<td>0.08</td>
<td>-0.012</td>
<td>0.30</td>
<td>2.16</td>
<td>0.79</td>
<td>0.05</td>
<td>-0.003</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>(1975)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KOREA</td>
<td>SEOUL</td>
<td>5.04</td>
<td>0.45</td>
<td>0.03</td>
<td>-0.004</td>
<td>0.15</td>
<td>6.06</td>
<td>0.44</td>
<td>0.04</td>
<td>0.002</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>(1979)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BUSAN</td>
<td>6.26</td>
<td>0.31</td>
<td>0.07</td>
<td>-0.001</td>
<td>0.08</td>
<td>5.93</td>
<td>0.45</td>
<td>0.08</td>
<td>0.002</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>(1979)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TAEUGU</td>
<td>4.95</td>
<td>0.44</td>
<td>0.07</td>
<td>-0.003</td>
<td>0.23</td>
<td>6.32</td>
<td>0.47</td>
<td>0.08</td>
<td>0.011</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>(1979)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>KWANGJU</td>
<td>2.70</td>
<td>0.62</td>
<td>0.09</td>
<td>-0.002</td>
<td>0.32</td>
<td>7.53</td>
<td>0.41</td>
<td>0.11</td>
<td>0.016</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td>(1977)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OTH. K. C.</td>
<td>3.33</td>
<td>0.54</td>
<td>0.09</td>
<td>-0.002</td>
<td>0.17</td>
<td>2.16</td>
<td>0.79</td>
<td>0.05</td>
<td>0.005</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>(1979)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHILIPPINES</td>
<td>DA'AON</td>
<td>-1.6</td>
<td>0.88</td>
<td>0.03</td>
<td>-0.002</td>
<td>0.42</td>
<td>-3.2</td>
<td>0.99</td>
<td>0.04</td>
<td>-0.004</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>(1979)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MANILA</td>
<td>0.57</td>
<td>0.55</td>
<td>0.04</td>
<td>-0.002</td>
<td>0.22</td>
<td>2.46</td>
<td>0.57</td>
<td>0.04</td>
<td>-0.003</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>(1983)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PITTSBURGH</td>
<td>3.01</td>
<td>0.26</td>
<td>0.02</td>
<td>-0.002</td>
<td>0.15</td>
<td>3.50</td>
<td>0.18</td>
<td>0.01</td>
<td>-0.005</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>(1975)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHOENIX</td>
<td>3.68</td>
<td>0.18</td>
<td>0.02</td>
<td>0.005</td>
<td>0.18</td>
<td>3.62</td>
<td>0.18</td>
<td>0.01</td>
<td>-0.011</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td>(1975)</td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
<td>(COEF)</td>
<td>(STD ERR)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
statistics are in the 0.1 to 0.3 range (minimum is 0.06, maximum, 0.57). Fits are similar for owners and renters.

The median of all renters income elasticities is 0.49; developing country elasticities range from 0.31 (Busan, Korea) to 0.88 (Davao, the Philippines). Most cluster between 0.4 and 0.6, with estimated U.S. elasticities, however, lower than developing country estimates. The median of all point estimates of owner income elasticities is 0.46, with extremes of 0.17 in Cairo and 1.11 in Santa Ana, El Salvador. The majority of point estimates lie between 0.4 and 0.6. In 9 of 14 cases where comparison is possible, estimated developing country owner income elasticities are greater than those of renters; this finding parallels findings in the literature for developed countries (Mayo, 1981). Comparing expenditure equations across countries reveals practically no systematic variation of income elasticities with country or city income level or population size, but considerable variation in dollar-adjusted intercepts, which are positively related to average city income. Rent-to-income ratios therefore decline systematically with income within cities, but increase with income across cities.1/

These relationships are shown graphically in Figure 1 for renters in four representative cities. Relationships for owners are similar, although average rent-to-income ratios are invariably higher at every income level for owners within given housing markets.2/

1/ It should also be noted that the relative variation in rent-to-income ratios is greater at low-income levels than at high-income levels, a result that has implications for the degree to which self-selection problems such as those noted in Sec. 3 will occur within sites and services projects with high standards. See Malpezz (1984) for evidence.

2/ On average, owners' housing consumption is roughly eighty percent greater than that of renters' at given incomes within particular markets.
The relationships portrayed in Figure 1 are very similar to the consumption patterns within and across countries documented by Kuznets (see Kuznets, 1961 and other works cited therein). Qualitatively, housing consumption is remarkably similar to total consumption; that is, within-country differences are markedly smaller at various income levels than are between-country differences at different average income levels. Malpezzi and Mayo explore alternative theoretical explanations for these results and then test a series of cross-country housing expenditure models, which are designed to explore presumably long-run cross-country housing demand relationships. The simplest cross-country model they test parallels the log-linear within-country model, but with the addition of a price term, the relative price of housing which is constructed using data from Kravis, Heston and Summers (1982). Defining \( p_H \) as the relative price of housing, we estimate the following models for renters and owners in developing countries.\(^1\)

Renters

\[
\ln R = -5.39 + 1.60 \ln y + 0.15 \ln p_H \\
(0.18) \quad (0.29)
\]

\[ R^2 = 0.90 \]
\[ d.f. = 13 \]

\(^1\) Models were also estimated for a pooled sample of U.S. and developing country cities; these are reported in Malpezzi and Mayo.
Owners

(3) \[ \ln R = 3.57 + 1.38 \ln y + 0.65 \ln p_H \]
\[
(0.25) \quad (0.50)
\]

\[ R^2 = 0.76 \]
\[ \text{d.f.} = 11 \]

where the dependent variable, rent, and income are city means and are converted to 1981 U.S. dollars.\(^1/\)

The implications of these models, which are confirmed with alternative specifications, are straightforward: in the very long run, housing consumption is income elastic. Price elasticities are smaller in absolute value than income elasticities, although confidence intervals are quite wide for the former. Long-run income elasticities are estimated to be higher for renters than owners. This means that as cities' economies develop over the very long run, that owner and renter consumption patterns increase at a similar pace, ceteris paribus. However, because relative housing prices rise with income (at least in our sample) and because renter price elasticities are estimated to be higher than owner elasticities, the net effect of both incomes and prices rising with economic development is that owners' consumption increases faster than renters' consumption over most of the range of the data.

These findings have important implications for the design of housing programs and, in particular, of sites and services projects. An obvious general rule is that the fraction of income allocated by households for housing is highly variable, depending on income, the level of economic...\(^1/\)

Note that in a log-linear expenditure equation the coefficient of price is equal to one plus the price elasticity; thus the price elasticity is the estimated coefficient minus one, or -0.85 and -0.35 for owners.
development, the relative price of housing, and tenure (own or rent). Thus it
is inappropriate to use any single rule-of-thumb "affordability ratio" as the
basis for establishing design standards in sites and services projects. If a
single value is used, particularly if it is higher than normal spending
patterns would indicate, then subsidies might be required to induce target
groups to participate and higher-income groups might find their way into
projects, either initially or by purchasing from initial allottees.

In order to get a sense of how serious these problems might be, it
is useful to examine (1) the minimum subsidy (or benefit) necessary to induce
typical target groups to participate and (2) the likely income levels of
participants in the absence of subsidies based on the empirical findings on
housing demand presented above and assuming alternative affordability rules-
of-thumb.

b. Minimum subsidies necessary to induce participation

The appendix develops a general procedure (see Equations. (A.5) -
(A.7)) for estimating minimum subsidies (benefits) necessary to induce
participation by households whose normal housing equilibria are below those
implied by project standards. Here we operationalize that procedure by
assuming a particular utility function, the parameters of which can be
approximated using our empirical results, and examine the impact on required
subsidies as they vary with alternative affordability planning assumptions.
Specifically, assume that household preferences can be approximated by a Stone-Geary utility function:

\[ U = (H - \theta_h)^{b_h} (X - \theta_x)^{b_x} \]

where \( H = \) housing consumption
\( X = \) other goods consumption
and \( \theta_h, \theta_x, b_h, \) and \( b_x = (1 - b_h) \) are parameters. Applying the procedures described in the appendix, the following expressions can be derived for the minimum housing necessary to induce participation, \( H_{min} \), and the minimum subsidy (benefit) necessary to induce participation, \( S_{min} \):

\[ H_{min} = \left( \frac{y - R_s - \theta_x}{y - R_s - \theta_x} \right)^{b_x/b_h} \frac{b_x}{b_h} (H_0 - \theta_h) + \theta_h \]

and

\[ S_{min} = p_h (H_s - R_s) \]

where,
\( R_o = \) initial pre-project rent
\( R_s = \) within-project rent
\( p_h H_{min} = \) market value of shelter and services provided in the project

---

1/ See Philips (1974) for an extended discussion of the properties of this function.
If the project is designed according to the typical sites and services paradigm, within-project rent reflects the "design affordability ratio," "a," and hence \( R_s = a y \). Thus Equations (5) and (6) become:

\[
H_{\text{min}} = \left( \frac{y - R_0 - \theta}{y(1 - a) - \theta} \right)^{\frac{b}{b'}} \left( h_0 - \theta \right) + \psi_h
\]

and

\[
S_{\text{min}} = p_h H_{\text{min}} - a y,
\]

where \( R_0 \) is determined by the housing expenditure function.

The parameters of a Stone-Geary utility function may be locally approximated using knowledge of the parameters of a log-linear housing expenditure function; the resulting parameters can then be used to evaluate Equations (7) and (8) for various values of "a." Figure 2 presents results of such a procedure based on the actual housing expenditure equations estimated in Malpezzi and Mayo where, for simplicity, it was assumed that a within-city income elasticity of 0.5 and a corresponding price elasticity of -0.4 typified developing country cities, and where a typical target income group for sites and services projects is in the 35th percentile of the income

\[1/\] This approximation requires knowing the price elasticity of demand, \( \epsilon_p \), the income elasticity of demand, \( \epsilon_y \), and the rent-to-income ratio at the point where the function is to be approximated. These parameters are successively substituted into the expenditure equation consistent with the Stone-Geary utility function \( R = \theta h \left( 1 - b \right) p_h + b h y - b_y \), and the expressions for \( \epsilon_y \) and \( \epsilon_p \), \( \epsilon_y = b_h y/R \) and \( \epsilon_p = -\frac{b_y y}{\theta} \), to solve for \( \theta_h, \theta_x, b_h, \) and \( b_x \).
distribution. The horizontal axis is monthly household income in 1981 U.S. dollars and the vertical axis is the ratio of the minimum subsidy necessary to induce participation as a percentage of the market value of the housing provided in a project for various values of "a", the design affordability ratio. For reference, estimated monthly household incomes in 1981 dollars in most African countries and countries on the Indian subcontinent were below $100; some of the countries with incomes between $100 and $200 were Botswana, Cameroon, Egypt, El Salvador, Indonesia, the Philippines, and Thailand; countries between $200 and $400 included a number of Latin American and North American countries, Nigeria and Zambia; and countries above $400 included Caribbean, Latin American, and East Asian countries such as Jamaica, Bahamas, Brazil, Mexico, Panama, and Korea.

1/ Our research indicated that on average, income at the 35th percentile was about 43 percent of city average income. The quantity \( R_0 \) was estimated in two steps, first estimating average rent at average city income using Equation (2), for renters, and then moving up the within-city expenditure equation (assuming \( a = 0.5 \)) to \( y = 0.43 \frac{y}{y} \) and the corresponding value of \( R_0 \). Renters' rather than owners' expenditure functions are used here. The main reasons for this are (1) that often it is "homeless" or renter households that represent the designated sites and services project-target group; (2) owners' current consumption relative to current income reflects on average greater longevity and thus more chance to have upgraded housing services relative to renters; and (3) in some markets, owners current housing consumption reflects both windfall price appreciation and possible overconsumption due to high transactions costs of moving.
The figure indicates clearly the effect that project standards (as derived from "design affordability levels") have on target group households' incentive to participate, and on the need to provide subsidies to induce participation when standards are set too high. For example, suppose that it were assumed that households in a typical African country, say Kenya, with 1981 household income of roughly $100 per month would be willing to pay for a unit designed to cost 20 percent of income. According to Figure 2, a subsidy of roughly 60 percent of the market value of such a unit would have to be provided in order to induce households in the 35th percentile of the income distribution to participate. In Burundi, with monthly household income of only about $70 in 1981, a subsidy of over 90 percent would be required to induce 35th percentile households to participate if the design standard is based on an affordability assumption of 20 percent of income. Subsidies of these levels are, of course, a reflection of the low average propensities to consume housing indicated by the cross-country expenditure functions presented above.

In higher-income developing countries by contrast, a 20 percent affordability standard may be entirely appropriate. For example, for countries (cities) with average household monthly income above about $175, subsidies of less than 20 percent would appear to be adequate to induce target groups to participate. Required subsidies are, however, extremely sensitive to the choice of design standards. While the difference between 20 percent and 25 percent of income may not sound like much to a project planner, such a difference represents a 25 percentage point difference in monthly shelter costs and can easily mean the difference between required subsidies in the range of 60 to 70 percent rather than the range of 20 to 35 percent. Depending on whether subsidies of the required magnitude are forthcoming or
FIGURE 2
MINIMUM SUBSIDIES NECESSARY TO INDUCE PARTICIPATION
OF 35TH PERCENTILE HOUSEHOLDS AT ALTERNATIVE
DESIGN AFFORDABILITY RATIOS

AVERAGE MONTHLY HOUSEHOLD INCOME IN 1981 U.S. DOLLARS
not, target income groups may not even participate or, if they do, they may have strong incentives to sell out to higher-income groups. It is useful to examine now the influence of planning standards on the income levels of participants if subsidies are not provided or, alternatively, if initial allottees sell out to higher-income households at the full market price.

c. Income levels of participants at zero-subsidy or upon resale by initial occupants

The discussion concerning Equations (8) and (9) in Section 3 presented a general procedure for inferring the income level of households that would participate in a project and their place in the income distribution were they obliged to pay the full unsubsidized price of the bundle of shelter and services provided in a project. The expenditure functions that describe across-country and within-city behavior can be used to solve for the income level consistent with a stipulated project design standards and its associated market rent. Thus, for example, the following expression (which is derived by manipulating across-country and within-city expenditure functions) may be used to derive the income level, $y$, of households that would freely enter a project at its full subsidized price, where the latter is set equal to the assumed affordability ratio, "a", multiplied by the income of the typical target group, defined here as income at the 35th income percentile, $y_{35}$:

$$
\frac{1}{\epsilon} \left[ \ln a y_{35} - \left( \ln \left( \frac{x}{y} \right) - (\epsilon - 1) \ln y \right) \right]
$$

(9)

$$
y = e^y
$$

where $\epsilon_y$ is the within-city income elasticity of demand, $\bar{y}$ is average city income, and $(R/y)$ is the rent-to-income ratio evaluated at average city income (which is estimated using the cross-country expenditure relationship,
Equation (2)). The percentile of the income distribution associated with \( y \) is found by integrating the estimated income density function to an upper limit of \( y \).

Figure 3 illustrates the estimated impact of alternative design standards on the income of households that would participate with no subsidies or that would be likely to purchase from original allottees. The calculations underlying the figure are based on a generalized or average income distribution in developing countries that was estimated by fitting a fourth degree polynomial to Lorenz curve data presented in Kakwani (1980) for a sample of 33 developing countries. A within-city income elasticity of 0.5 was assumed, and it was assumed that the design standard was based on the product of income of the 35th percentile households and various assumed affordability levels, ranging from 10 to 30 percent of income.

The figure clearly illustrates the effect of alternative design standards of unsubsidized projects on the income of probable participants. Not only does increasing the design affordability ratio increase the income level of likely participants, but it does so with particularly dramatic effect at various thresholds. For example, for households in low-income countries (e.g., \( y = \$100 \) per month), setting the design standards on the basis of an assumption that households are willing to spend 20 percent of income on housing implies that households in approximately the 80th percentile of the income distribution could afford to participate without subsidies. Dropping the standard to one based on 15 percent of income has only a modest effect, inducing participation down to the 65th percentile in the absence of

\[ 1/ \] Details of the derivation will be provided by the author on request.

\[ 2/ \] Details will be provided on request.
FIGURE 3
INCOME PERCENTILE OF PARTICIPATING HOUSEHOLDS WITH NO SUBSIDY AT ALTERNATIVE DESIGN AFFORDABILITY RATIOS

AVERAGE MONTHLY HOUSEHOLD INCOME IN 1981 U.S. DOLLARS
subsidies. Dropping the standard still further to one based on just 10 percent of income permits reaching even below the original target group, all the way down to the 15th percentile. Similar thresholds exist at each level of income, suggesting that dramatic improvements can be realized in the ability to reach the poor through sites and services projects by finding the "correct" design standard—the one that reflects true willingness-to-pay by low-income groups. 1/

Having examined the behavioral evidence on developing country housing demand and having explored some of the implications of that evidence for sites and services project planning, it is useful now to consider the actual planning practice and some of the project outcomes of typical sites and services schemes. Planning practice can be evaluated in terms of its consistency with external evidence on household behavior, and project outcomes can be interpreted in part in light of discrepancies between planning assumptions and actual behavior.

5. Sites and services project design practice and project outcomes

The previous sections have emphasized the important role played by planning parameters in influencing outcomes in sites and services projects. In this section we review briefly important aspects of planning practice in 68 World Bank-financed sites and services projects, particularly affordability assumptions, and examine the consistency of planning parameters with external evidence on willingness-to-pay for housing. In addition, we look at the

1/ This is obviously a simplification in that the goals of projects are numerous and choice of a design standard must reflect a number of compromises among the ability to satisfy various program objectives. A highly simplified way of doing this might be to view the minimum required subsidy to reach the intended target group and the income group percentile likely to be attracted at unsubsidized prices as arguments in the context a limited social welfare function, with the design standard being chosen to maximize such a function.
magnitude of subsidies that have been provided in a subset of Bank-financed sites and services projects—those which have been completely implemented with all loan amount disbursed. Implications of these findings for the ability to achieve the nominal goals of sites and services are then evaluated.

Among the most important planning criteria in sites and services projects are the income levels of the principal target groups, the affordability ratio, the percentage downpayment, and the interest rate to be charged on project financing. Table 2 presents median values of each for 68 World Bank-financed sites and services projects initiated between 1972 and 1984, along with median values of three variables that indicate market conditions. Results are disaggregated by region, by the time period of project initiation, and by 1983 per capita GDP.

Consider each project design variable in turn. First, the minimum income level intended to be reached by sites and services projects varies considerably among regions, ranging from a low of $27 per month in South Asian projects to a high of $141 in Europe, Middle East, and North African projects. Much of this variation is a result of differences among regions in GDP per capita; the minimum income level of target groups ranges from $40 per month in countries with per capita GDP less than $600 per year to $112 per month in countries with GDP per capita greater than $1,200 per year. Planned minimum target group incomes have fallen slightly over time, indicating a concern with reaching relatively farther down the income distribution. Median target groups (not shown here) tend to be at about the 35th percentile of the income distribution.
<table>
<thead>
<tr>
<th>Region, Region and Period, Per Capita GDP</th>
<th>Minimum Income</th>
<th>Percent Downpayment</th>
<th>Affordability Ratio</th>
<th>Project Interest Rate</th>
<th>Rate of Inflation</th>
<th>Per Capita GDP</th>
<th>Income Held by Quintile</th>
<th>Number of Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sites &amp; Services Projects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. Africa</td>
<td>$49</td>
<td>0%</td>
<td>20.0</td>
<td>9.00%</td>
<td>15.7%</td>
<td>$339</td>
<td>4.5</td>
<td>15</td>
</tr>
<tr>
<td>W. Africa</td>
<td>131</td>
<td>10</td>
<td>20.0</td>
<td>9.25</td>
<td>9.00</td>
<td>765</td>
<td>6.1</td>
<td>7</td>
</tr>
<tr>
<td>E. Asia &amp; Pacific</td>
<td>60</td>
<td>10</td>
<td>25.0</td>
<td>12.00</td>
<td>15.7</td>
<td>779</td>
<td>5.7</td>
<td>13</td>
</tr>
<tr>
<td>S. Asia</td>
<td>27</td>
<td>10</td>
<td>20.5</td>
<td>12.00</td>
<td>12.00</td>
<td>249</td>
<td>7.0</td>
<td>7</td>
</tr>
<tr>
<td>Europe, Middle East, and North Africa</td>
<td>141</td>
<td>10</td>
<td>20.0</td>
<td>7.00</td>
<td>9.60</td>
<td>944</td>
<td>5.1</td>
<td>8</td>
</tr>
<tr>
<td>Latin America and Caribbean</td>
<td>78</td>
<td>5</td>
<td>20.0</td>
<td>10.00</td>
<td>15.1</td>
<td>1763</td>
<td>2.9</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BY PERIOD: *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1972-1976</td>
<td>74</td>
<td>5</td>
<td>22.5</td>
<td>8.00</td>
<td>16.0</td>
<td>730</td>
<td>3.4</td>
<td>13</td>
</tr>
<tr>
<td>1977-1980</td>
<td>62</td>
<td>10</td>
<td>20.0</td>
<td>10.00</td>
<td>13.5</td>
<td>835</td>
<td>4.8</td>
<td>29</td>
</tr>
<tr>
<td>1981-1984</td>
<td>60</td>
<td>10</td>
<td>21.3</td>
<td>11.00</td>
<td>11.1</td>
<td>741</td>
<td>5.3</td>
<td>26</td>
</tr>
</tbody>
</table>

** Defined as year of appraisal report.

** Expressed in 1983 US$ per annum
Downpayments in sites and services projects have generally been minimal. No region has had a median downpayment greater than 10 percent of the sales price. There are only weak positive associations between downpayment percentages and time and GDP per capita. Further investigation reveals that 79 percent of World Bank projects required downpayments of 10 percent or less. It might be noted that such low downpayment requirements reflect an implicit assumption that the ability to accumulate pre-project assets through savings is negligible. In contrast to this, as is discussed below, project designers appear to assume that within-project savings propensities, in the form of mortgage loan repayments, are quite high. The two assumptions do not appear to be consistent.

Affordability ratios reflect assumptions concerning the fraction of income that households are willing to pay for shelter and related services. As Table 2 indicates, there is strikingly little variation by region, time, or GDP per capita in the affordability ratios embodied in sites and services project designs. Medians for all sub-strata are from 20 to 25 percent. Further investigation reveals that 74 percent of all projects initiated by the World Bank have assumed affordability ratios of 20 to 25 percent, with 17 percent below those levels and 9 percent above. This comes close to the very definition of a rule of thumb.

Median interest rates charged for project-related loans have ranged from a low of 7 percent in the Europe, Middle East, and North Africa region to a high of 12 percent in the South Asia and East Asia and Pacific regions. Interest rates have increased systematically over time and are highest among countries with the highest GDP per capita. It should also be noted that the spread between interest rates charged in projects and inflation rates has
narrowed appreciably over time, indicating a rise in real interest rates on project loans.

It is useful now to examine in more detail how the planning assumptions inherent in sites and services projects, particularly affordability ratios, correspond to empirical evidence on actual willingness-to-pay for shelter and services. Figure 4 superimposes two pieces of information concerning World Bank-financed sites and services projects. First, a scatter of points is presented which indicates for each project its design affordability ratio in relation to estimated average household monthly income expressed in 1981 dollars.\(^1\) In addition, Figure 4 also presents three curves that relate estimated rent-to-income ratios to income, which are based on the cross-country and within-city econometric results presented in Section 4.\(^2\) Curves are shown for city average income and for households at the 20th and 35th percentiles of the income distribution. The figure may be interpreted as follows: if the target income group is assumed to have been households at city average income, then the lowest curve indicates our estimate of their actual willingness-to-pay for housing as a fraction of income; if the target group is assumed to have been the 35th or the 20th income percentile, then the two higher curves represent estimates of their willingness-to-pay as a fraction of income. Recall that because the income

\(^1\) The scatter diagram is constructed on the basis of information in project appraisal reports. The affordability ratio is that given for the minimum income target group. Income is estimated by adjusting GDP per capital figures to get household disposable income expressed in 1981 dollars. Details will be furnished on request.

\(^2\) Equation (2), for renters, is used as the basis of the average city income relationship. Other curves are based on the assumption that the within-city income elasticity of housing demand is 0.5, and that income levels at the 20th and 35th percentiles are related to average income levels based on the generalized developing country income distribution discussed in Section 4.
Figure 4
Assumed willingness to pay in World Bank sites and services projects in relation to empirically estimated willingness to pay
elasticity is less than one, lower income implies higher rent-to-income ratios. The figure clearly suggests that regardless of the relative income of the target group, affordability and, by implication, project design standards are systematically overestimated in low-income countries. If it is assumed, for example, that 20th percentile households represented the lowest income target group in sites and services projects, then the majority of projects in countries with average household monthly incomes below about $150 appear to have been designed with affordability ratios that were higher than typical ratios of housing expenditures to income, many by substantial margins.

Some of the implications of setting project standards too high have been discussed in Section 4; among these are exclusion of intended target income groups and participation by higher-income groups, relatively slow consolidation or upgrading of housing and plots beyond initial standards, creation of incentives for subletting or resale by initial allottees, and making subsidies necessary in order to reach intended beneficiaries. The critiques of sites and services projects summarized in Section 2 presented anecdotal evidence that such outcomes have in fact been observed in many sites and services projects. On the other hand, other evidence suggests that many of these problems may have been isolated and that project implementation and downstream performance have, by and large, been successful (see for example Keare and Parris).

This apparent paradox in the range of outcomes can be partly explained by the existence of subsidies. As Section 3 and the appendix for example discuss, the existence of subsidies can mitigate a number of possible project problems, in effect purchasing project feasibility at the expense of longer-term replicability. Thus it is useful to examine the magnitude of subsidies that have actually been provided in World Bank-financed sites and
services projects. This requires first having an understanding of the components of project cost and the sources of potential subsidy elements; these are illustrated in Table 3. The table indicates that "total development and operating costs" are made up of a number of discrete elements, most notably land acquisition costs, site preparation and housing construction, off-site infrastructure and project administration, and recurring costs such as utilities and maintenance. For a proper accounting of resource costs, these must be costed at their full opportunity cost; for example, even though government land may be provided at small or no cost, its market value is the proper resource cost measure. The total resource cost of a project, however, should account for the market value of the "finished product." Thus the market value of the project, which is equal to the capitalized value of resource costs, is equal to the total development and operation costs multiplied by a factor equal to one plus the project's economic rate of return. The annualized resource cost is then equal to the total resource cost multiplied by the market rate of interest.

Associated with each cost element is a possible subsidy element. These are indicated in the table and take the form of cross-subsidies from higher- to lower-income project participants; government capital cost writedowns; low-cost or free government or expropriated land; exclusion of all or part of off-site infrastructure, project administration, or recurring costs; pricing to recover only "scheduled" costs rather than full resource costs; and subsidized interest rates. These sorts of subsidies are prevalent in many World Bank-financed sites and services projects and are present as well in similar projects not under World Bank auspices—both sites and
## Table 3

Cost and Subsidy Elements in Sites and Services Projects

<table>
<thead>
<tr>
<th>Cost elements</th>
<th>Subsidy elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site preparation and housing construction</td>
<td>Cross-subsidies from higher- to lower-income households within</td>
</tr>
<tr>
<td>project or government-provided cost writedowns</td>
<td></td>
</tr>
<tr>
<td>* Land acquisition</td>
<td>Government or expropriated private</td>
</tr>
<tr>
<td>land at below cost</td>
<td></td>
</tr>
<tr>
<td>* Off-site infrastructure and project administration</td>
<td>Ignored or charged at less than marginal cost</td>
</tr>
<tr>
<td>* Recurring costs (utilities, maintenance)</td>
<td>Ignored or charged at less than marginal cost</td>
</tr>
<tr>
<td>* Total development and operation costs * (1 + economic rate of return)</td>
<td>Prices set to recover scheduled costs, not resource costs</td>
</tr>
<tr>
<td>* Total resource costs</td>
<td></td>
</tr>
<tr>
<td>* Market rate of interest</td>
<td>Subsidized interest rates</td>
</tr>
<tr>
<td>* Annualized resource costs</td>
<td></td>
</tr>
</tbody>
</table>
services projects sponsored by other aid organizations and government housing schemes that predated the sites and services paradigm.

Consider, for example, only one subsidy element, but an extremely widespread and significant one—interest rate subsidies. As Table 2 indicates, median interest rates charged on sites and services project loans ranged from about 7 to 12 percent across regions. At the same time, inflation rates among those regions ranged from 9 to about 16 percent at the time of project appraisal. Assuming that the market rate of interest is, conservatively, from two to three percentage points above inflation, median interest rate subsidies appear to have ranged from roughly 20 to 55 percent of annual market interest charges in the six World Bank administrative regions. Were one to calculate real interest rates in World Bank sites and services projects as nominal interest rates less the rate of inflation in the year of project appraisal, 61 percent of Bank projects are estimated to have had negative real rates of interest at the time of project appraisal. Such subsidies are often part of a general pattern of subsidized interest rates that pervade public sector interventions in developing countries, and are thus difficult to eliminate or control at the level of planning an individual sites and services project.

Other subsidy elements, which are more amenable to project-level control, can also be significant however. Pricing policies for land, off-site infrastructure, administrative costs, utilities, and maintenance are all more subject to project-level negotiation than are interest rate policies. Also decisions about whether or not to price sites and services at a level that recovers full resource costs or simply scheduled costs can be made within the project planning context.
In order to estimate the rough order of magnitude of subsidies in Bank projects, a simplified version of the cost-accounting framework presented in Table 3 was applied to six of the earliest Bank projects, for which it was possible to examine actual pricing policies rather than the hypothetical projections contained in initial project appraisals. Subsidies were calculated as the difference between a measure of the annualized resource cost and actual charges to project beneficiaries. Annualized resource costs were estimated based on reported project development costs not including community facilities and not including recurring costs. These generally include, but are not limited to, stated development costs, land acquisition costs, pro-rata shares of off-site infrastructure, and project administration. These development costs are then increased by a percentage equal to the project's projected economic rate of return to get an estimate of the market value of the project. This market value is then multiplied by a rate of interest equal to 12 percent per year to get an annualized resource cost; as is discussed below, this represents in general a conservative estimate of the opportunity cost of money in each of the six countries.

Table 4 presents the estimated subsidy level as a percentage of annualized resource costs (assuming an opportunity interest rate of 12 percent). Also shown in the table are the interest rate charged within the project, the actual inflation rate in each country in the year of project appraisal and the annual compound rate of inflation for the year 1973-1978, approximately the first five years of operation of each project. With the exception of the Indonesia project, which features market level pricing for all components (but has a subsidized interest rate), the subsidies range from roughly one-half to three-quarters of project resource cost. These subsidies
Table 4

Estimated Subsidies in Sites and Services Projects
(percent of annualized resource costs)

<table>
<thead>
<tr>
<th>Country</th>
<th>Subsidy as a percent of resource costs*</th>
<th>Interest rate charged in the project (percent)</th>
<th>Inflation rate in year of project appraisal</th>
<th>Compound inflation rate (1973-1978)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botswana</td>
<td>72</td>
<td>8.0</td>
<td>19.3</td>
<td>12.7</td>
</tr>
<tr>
<td>Indonesia</td>
<td>16</td>
<td>5.0</td>
<td>33.0</td>
<td>14.4</td>
</tr>
<tr>
<td>Ivory Coast</td>
<td>68</td>
<td>13.0</td>
<td>5.5</td>
<td>10.5</td>
</tr>
<tr>
<td>Jamaica</td>
<td>62</td>
<td>8.0</td>
<td>16.0</td>
<td>17.1</td>
</tr>
<tr>
<td>Senegal</td>
<td>55</td>
<td>7.0</td>
<td>2.9</td>
<td>10.7</td>
</tr>
<tr>
<td>Tanzania</td>
<td>67</td>
<td>6.0</td>
<td>18.8</td>
<td>25.0</td>
</tr>
</tbody>
</table>

* assuming market rate of interest - 12 percent
have several sources: all six projects have subsidized interest rates and 
beneficiaries are in general charged less than the market price for their 
land, building materials, or completed dwellings. Cross-subsidies, which can 
higher the price charged to low-income households without affecting total 
project revenue, were implemented only in Indonesia.

It should be emphasized that while these subsidy estimates comprise 
a large part of project costs they are probably underestimates of the true 
subsidy. This is particularly true as concerns interest subsidies. As 
Table 4 indicates, for example, interest rates charged to project 
beneficiaries are generally considerably less than inflation rates and, of 
course, less than market interest rates. The only exception among the six 
early projects is the Ivory Coast where the project interest rate is in fact 
close to a market rate.

What should be made of subsidies of the magnitudes in evidence 
here? The analytical model of Section 3 and elaborated on in the appendix 
suggests a number of implications. First, it is clear that the subsidies 
provided in early World Bank projects were large enough to have overcome many 
of the potential problems that might have resulted from upward biased 
affordability assumptions and project standards. Comparing the actual 
subsidies provided with the estimated "minimum subsidies necessary to induce 
participation" by typical (say 35th percentile) target groups, suggests that 
subsidies were probably instrumental in inducing many low-income households to 
participate who might not otherwise have done so. On the other hand, 
subsidies were sufficiently large for many project beneficiaries (those that 
were induced to distort their shelter consumption by consuming at overly 
ambitious project standards) that large relative welfare losses must certainly 
have occurred. That is, for many households whose participation in sites and
services projects required them to spend more out of pocket than before entering the project (even after accounting for subsidies) the net benefit of participation must certainly have been worth considerably less than the resource cost of the subsidy. Also, for such households, incentives to sell out to higher-income households and propensities to default in the face of income shocks would have been substantial. Housing upgrading would have been limited in early years of the project for such households unless subsidies were generous enough (as for example in the case of heavily subsidized building loans) to permit continued housing investment at low cost. The one possibly beneficial side effect for such households and for the housing market in general would have been the encouragement of providing additional space for low-income renters through subletting.

At the same time, many households participated in the projects who would probably have done so without subsidy, either higher-income households or households with stronger than average housing preferences. Each such group would have had incentives to invest in upgrading their units beyond initial standards. For the former group, receipt of large subsidies is inequitable; for the latter group, it is inefficient.

By and large, however, sites and services projects have appeared to have worked as intended—target groups have been reached; affordability by target groups has generally been evident, indeed some groups have been observed to be spending even more than initial affordability targets; reported defaults on account of "affordability problems" have not been overwhelming. The comparatively small scale of many projects has also worked in favor of project success, since households with relatively stronger preferences for the bundle of shelter and services offered by projects tend to enter projects via
a process of self-selection. Indeed much of the evidence concerning project impacts cited in Section 2 appears to paint just such a picture.

Even while project-by-project assessments indicate the appearance of success, much of it purchased at the expense of significant subsidies, a broader view of the sites and services experience is consistent with Cohen's view cited above that replicability does not mean doing more of the same thing. The most obvious concern is that large subsidies will frustrate the ability to replicate projects on a large scale, thereby failing to meet the immense needs for shelter and services of the poor. Another concern is that the subsidies that are provided are not particularly rational. The types of subsidies provided, their magnitude, their distribution among potential beneficiaries, and their impacts on either beneficiaries or subsidy-granting organizations are rarely addressed in a thorough way when projects are designed. As a result the subsidies that are provided are likely to be inefficient, sometimes inequitable, and harmful to the long-term viability of the subsidy-granting institutions.

6. Summary and conclusions

This paper has reviewed evidence on the performance of sites and services projects, observing that while projects have been successful in many ways, as implemented, there are limits to their effectiveness as a strategy to meet the needs of the poor in developing countries. The single most serious problem in extending the breadth of application of the sites and services paradigm is the existence of subsidies that are simply too high to permit large-scale replication of projects.

Reasons for the existence of such subsidies are complex, in part due to the inertia of previous government shelter and services policies that
Established even larger subsidy amounts. To a considerable degree, however, subsidies are a reflection of overly ambitious planning standards which require that large subsidies be maintained to make projects affordable by intended beneficiaries. In many cases these standards are the result of the inappropriate application of a rule of thumb that households can spend from 20 to 25 percent of their incomes for shelter and related services. As a general rule, this one is wrong.

The empirical analysis of housing demand in developing countries that was presented in Section 4 indicated that the actual fraction of income that households are willing to pay for shelter varies with household income, a country's level of economic development, the relative price of housing, tenure status, and a number of other variables. The fraction actually spent on housing generally falls with income within cities but increases with average income across cities, relationships that parallel those observed by Kuznets regarding the way that consumption varies within and across countries.

When one compares actual spending patterns with the "affordability assumptions" used in World Bank sites and services projects as the basis for project design standards, it is apparent that there has been a systematic upward bias in affordability and hence in design standards. This is acute for low-income countries, but largely disappears for better-off developing countries. The implications of setting overly ambitious standards are explored theoretically in the appendix which is summarized in Section 3 and which presents an analytical framework for understanding the impacts of sites and services projects on household behavior. While the incentives created by such projects are complex and affect different households differently, two implications of "too high" standards stand out. Either subsidies have to be provided to induce target groups to participate or groups with higher income
than the target group will find their way into the project (either initially or as initial allottees sell out).

Section 4 explored empirically the magnitude of the subsidies required to reach typical target groups of World Bank projects (roughly the 35th percentile of the income distribution), and also the likely incomes of project participants if subsidies are not provided. Each outcome was examined in relation to alternative affordability assumptions and hence planning standards. There it was shown that subsidies as high as 80 or 90 percent of project costs might be required to induce typical target groups to participate in low-income countries with planning standards that are derived from the rule of thumb that households can spend 20 to 25 percent of income for housing. Alternatively, if no subsidies are provided, households with incomes in the 80th percentile or above might be the most likely project participants. It was indicated however that required subsidies and income levels of likely participants are highly sensitive to the level of standards (and hence pricing) of project units. Thus by choosing standards judiciously, at levels consistent with empirical evidence on housing demand, it should be possible to reach the intended beneficiary groups with small or no subsidies—a clear prerequisite for large-scale replicability in most countries.

A review of actual planning practice in World Bank sites and services projects (Section 5) focused on planning parameters such as affordability ratios, downpayment requirements, and interest rates charged to project beneficiaries. Actual subsidies in six early projects were also analyzed. It was found that all of the projects had significant subsidy elements, with a median subsidy equal to about 65 percent of total resource cost. Sources of subsidies included (1) failure to account for all project costs at their true resource cost (e.g. use of written down government land),
(2) pricing units at or below cost rather than at market value, and (3) charging below market interest rates. The latter is widespread, with 61 percent of projects analyzed estimated to have been charging interest rates below the inflation rate during the year of project appraisal. It appears however that the real rate of interest being charged in World Bank projects has risen over time, perhaps in response to an explicit goal to rationalize project design policies.

Subsidies of the magnitude of those found in early Bank-financed projects (which are not atypical of similar projects sponsored by other aid organizations) appear to be sufficiently high to have induced target group households to participate, despite requiring them to spend more for shelter and services than they would normally be expected to do. Thus subsidies have mitigated potential problems from overly ambitious planning standards, namely, high levels of defaults, slow rates of housing consolidation or upgrading, turnover among project beneficiaries with higher-income households replacing initial allottees, and lack of participation by intended target groups. While some authors have noted the existence of these problems in sites and services projects, it seems certain that they have been less severe than might have been the case, since high subsidies in effect purchase the participation and cooperation of project beneficiaries.

There are costs to such subsidies however, the most severe of which is that they defeat the goal of cost recovery within projects and hence imperil the ability to replicate projects on a large scale. Thus in effect they perpetuate some of the problems inherent in the pre-sites and services public housing policies of many developing countries. In addition, the subsidies that are provided are not particularly rational; there is little explicit consideration given in much project planning to the magnitude, type,
or distribution of subsidies; little consideration given to their impacts on beneficiaries or subsidy-generating institutions. As a result, while subsidies do buy a measure of small-scale success in sites and services projects, they do so at the expense of replicability, equity, and efficiency.

Despite what may seem a somewhat hair-shirted view of sites and services projects, it is clear that straightforward means exist, at least in principle, to fix many of the problems noted above. For example, the discussion has noted the inimical role played by large subsidies in reducing prospects for large-scale replication of sites and services projects. There are several ways to reduce subsidies: one is to reduce project standards and hence project costs; another is to change pricing policies to better reflect true resource costs; another is to provide a bundle of sites and services that increases household willingness-to-pay while leaving project costs unchanged. Consider each in turn.

The analysis above indicated clearly that project standards are too high in most low-income developing countries, the result in part of having assumed that households would pay 20 to 25 percent of incomes for housing when in fact normal expenditures are far less. In better off developing countries, however, this latter assumption is entirely appropriate. The solution to this problem is simple—start planning on the basis of actual housing demand patterns rather than on the basis of inappropriate rules of thumb. Actual patterns can be established on the basis of either the sorts of research findings presented in Section 4 or local housing surveys. In the case of the former a forecasting model has been developed by the authors that uses easily available macroeconomic data (or, if it is available, household survey data) to establish rough willingness-to-pay estimates in developing countries (details are available on request). In the case of the latter materials have
been developed by Malpezzi, Bamberger, and Mayo (1984) and by Malpezzi (1984) that discuss how to design and analyze urban housing surveys. Simply getting the "affordability assumption" straight can go a long way to bringing standards down to an appropriate level in many countries. This necessarily implies affordability standards that vary considerably among countries depending on their level of development and that vary among population groups depending on household income and other variables.

Reducing standards to an appropriate level is not sufficient to reduce subsidies, however. Pricing policies for sites and services projects must be revised to reflect true resource costs. This means costing project elements (land, building materials, infrastructure, administration, and recurring costs) at their full resource costs and then charging accordingly. Loans to beneficiaries should also be made at market rates of interest in order to allow loan-granting organizations to generate a sufficient surplus to ensure their institutional viability and growth.

If there are to be departures from resource cost based pricing in order to subsidize some households, these should be explicitly recognized, analyzed, and discussed by project planners. Subsidies, rather than being treated in the ad hoc or accidental ways that now characterize their use should be explicitly justified and should, to the extent possible, be rationalized to serve equity, efficiency, and project impact criteria. Procedures should be established for identifying subsidy elements, for quantifying them, and for estimating their incidence and impacts on project beneficiaries and their consequences for institutions responsible for them.

Another way to reduce subsidies is to provide households with a bundle of shelter and services that maximizes the perceived benefit for a given level of cost of provision. For example, if information is available on
the tradeoffs made by households among different elements of the housing and infrastructure bundle (e.g. relative preferences for size and location of plot, size and quality of structure, proximity to community facilities, quality and type of infrastructure, etc.), it may be possible to design packages of shelter and infrastructure characteristics for which households are willing to spend a good deal more than they normally do while costing no more to provide than shelter they already occupy. In some cases, dealing with capital market and land market imperfections by making available long-term finance or secure tenure may induce significant changes in household willingness-to-pay for shelter. Research on such tradeoffs in developing countries has been conducted recently by Quigley, Follain and Jimenez, and with particular reference to the demand for secure tenure, by Jimenez and by Friedman, Jimenez, and Mayo. Related work by Gross looks not only at the tradeoffs made by households among shelter and infrastructure attributes, but also at the influence of providing different bundles of characteristics on groups most likely to participate in a project. More empirical research into the nature of such tradeoffs and their implications for project design could be of great benefit.

The analysis presented here has implications at the level of housing sector policy as well as at the level of project planning and design. The emphasis here on reducing and rationalizing subsidies in order to improve the equity, efficiency, and replicability of sites and services projects is useful advice at the sectoral level as well. Government shelter and services policies for other than sites and services can benefit from more vigorous attempts to reduce standards to truly affordable levels, to modify pricing policies to improve cost recovery, and to attempt to package shelter and services in ways that maximize their attractiveness to potential
beneficiaries. It is particularly important to rationalize subsidy policies at the sectoral level, for while subsidy policies can in part be addressed at the project level, there are often severe limits to the extent of low-level reform that can be accomplished. This is particularly true in the case of interest rate policies, for which the legacy of subsidized rates for higher-income households makes it politically difficult to charge unsubsidized rates in sites and services projects; similarly, pricing policies for urban services must often be addressed at a sectoral level before project-level reform can occur successfully.

Two directions in shelter policy that follow from the observation that standards have been upward-biased in low-income countries are (1) to do relatively more upgrading projects than sites and services and (2) to focus policies relatively more on improving the supply of rented housing rather than focusing predominantly on owner-occupied housing. While upgrading and sites and services are and will remain useful complements in shelter policy, it seems clear that the task of reducing standards to affordable levels is often more easily accomplished within the context of slum upgrading projects than in sites and services projects. Particularly in low-income countries, a product mix more heavily oriented toward upgrading would appear warranted on grounds of both equity and efficiency. Evidence that just such a shift has already begun is presented by Ayres (p. 158), who indicates that the World Bank has increased emphasis of slum-upgrading "partly because some of the earlier sites and services projects proved too costly for the urban poor, partly because the number of beneficiaries in sites and services projects tended to be small, [and] partly because it fit better with the Bank's emphasis on realism and lower standards." This tendency to undertake such changes based on the
lessons of experience deserves further encouragement on the basis of the analysis presented here.

Reduction in standards can also be attained by emphasizing production of private rental housing rather than focusing largely on production of housing for owner occupancy. A reasonable strategy would be to encourage existing property owners to intensify development of their properties, creating additional dwelling units for rental occupancy by either horizontal or vertical expansion. Incentives for such development can be created by many of the same instruments used in upgrading schemes, particularly infrastructure investment and tenure regularization. In many cases, particularly in cities with large and growing fractions of renters it is logical to explore housing strategies that are consistent with general market trends. Such strategies have the potential in many cities to accommodate larger portions of the low-income population in adequately serviced housing than do those that emphasize higher standards, lower densities, and owner occupancy.

In conclusion, it must be noted that the innovative approach of sites and services as a way of improving the lives of poor households in developing countries remains a valid one. The approach has in fact delivered a great deal of shelter and related services to households that might not otherwise have attained them, has by and large reached lower-income households than were typically served by other government-sponsored housing projects, and, despite still-significant subsidy levels, has probably reduced average subsidy levels per household below levels of previous programs. As importantly, the process of undertaking sites and services projects has served as a catalyst and focal point for discussions of housing and land policies, institutional roles and capacities, and training needs, the outcome of which
have stimulated reform that goes well beyond the boundaries of the projects themselves.

These real accomplishments, however, can not yet be seen as having achieved the goal of large-scale replicability that is so much the object of the sites and services paradigm. For upgrading and for sites and services to move beyond the level of demonstration projects, reforms must be undertaken at the level of both the project design process and sectoral policy. In most cases, simultaneous reform is necessary in order for standards to be set appropriately, for pricing and subsidy policies to be rationalized, and for resource mobilization and cost recovery goals to be met. This will not be easy. But, as experience has shown, a great deal can be accomplished by applying technical skills and political will in support of a well-founded sites and services strategy to serve the shelter needs of the poor in developing countries.
REFERENCES


. The Demand for Housing Characteristics in Developing Countries. Urban Studies (forthcoming).


APPENDIX

An Analytical Model of Sites and Services Projects

This appendix develops a simple analytical framework for examining the major impacts of sites and services projects on beneficiaries. The models presented are based on the standard neo-classical economic paradigm, and are presented in terms of comparative statics models of behavior. While some considerations of household choice in a dynamic context are discussed, no formal dynamic model is developed.

The principal outcomes of interest are housing consumption and investment, consumption of non-housing goods and services, incentives to sublet or sell out to higher-income groups, and incentives to default on mortgages. In addition, I examine the economic benefits that accrue to households that participate in a project, the welfare losses attributable to certain types of project restrictions (such as requiring households to consume housing of certain minimum standards), and the subsidies necessary to induce certain households to participate in sites and services projects. In addition, I indicate how to determine the income groups that are most likely to participate in projects if subsidies are minimized or, alternatively, the groups most likely to attempt to purchase shelter from original allottees if transfer of ownership is permitted.

a. A simple case: the representative consumer

Households in the absence of opportunities to participate in sites and services projects are assumed to maximize a utility function \( U(H, X) \) with two arguments, housing \( H \) and non-housing goods and services \( X \), subject to a linear budget constraint \( y = p_H H + p_X X \) involving the price of housing.


$p_H$ and of other goods and services ($p_X$).\(^1\) Maximization yields optimal quantities of each good $X_o$ and $H_o$ which are chosen such that:

\[
\frac{\partial u}{\partial H} = \frac{p_H}{p_X}
\]

at the point $(H_o, X_o)$. At this point, expenditures on housing are $p_H H_o$ and the "rent-to-income ratio" is given by $p_H H_o / y = a$. This proportion of income spent on housing, "a", is a critical variable in the design of sites and services projects and is sometimes called the "affordability ratio."

Consider now how the standard sites and services paradigm impinges on the household. A highly simplified notion of the sites and services design process is as follows:

1. The project designer picks a target income group whose income is $y_o$.
2. An assumption is made concerning the fraction of income households are willing and able to pay for shelter; this fraction is "a" the affordability ratio.
3. A target housing expenditure level (rent) is set; $R_o = a y_o$.
4. Project standards such as lot size, location, infrastructure type and quality, shelter size and quality, etc. are established and units are built with a cost, $C$, set just equal to $R_o$.

Such units are then offered to target income group households at a price $R_o$ which fully recovers costs. The amount of housing offered is equal to $H^*$, an amount assumed to be greater than the amount originally consumed by the

\(^1\) It is assumed that $p_H$ is equal to the "user cost of capital" for housing which should, in long-run equilibrium be equal for renters and owners. This in part permits us to treat housing consumption and housing investment as essentially the same phenomenon.
household \( (n_o) \), but offered at a lower price per unit \( (p_h) \) than the market price \( p_h \). The price per unit of housing services offered in the project may be lower than the market price for a number of reasons, many having to do with removing supply-side constraints. For example the project may offer long-term housing finance at a rate of interest below that of the informal money market (yet still at a level sufficient to cover borrowing costs of the lending institution); water may be supplied at less than its cost from private vendors; secure tenure can be offered at less than the differential cost of securing legal housing in the marketplace.

The economic benefit to households of participating in the project depends on the amount of shelter and services received in the project and what is required to be paid for it. Formally, one may calculate the "income equivalent" or "cash equivalent value" of participation based on manipulating the utility function in the following way (Murray, pp. 163-4): First, calculate the maximum level of utility attainable with given income and prices; this defines the indirect utility function:

\[
U^* = U (y, p_h, p_x)
\]

This function may be solved to give an inverse that expresses the minimum income necessary to attain \( U^* \):

\[
y^* = U^{-1} (p_h, p_x, U^*)
\]

\[
y^* = U^{-1} (p_h, p_x, U (n^*, X^*))
\]

---

1/ For a model of the "cost" of tenure security to urban households, see Jimenez (1984) and Friedman, Jimenez, and Mayo (forthcoming).
where $H^*$ and $X^*$ are quantities of housing and other goods provided in the project.\(^1\) The income equivalent measure of the benefit participating in the project is then simply the difference between the quantity $y^*$ and initial pre-participation income:

\[
3 = y^* - y_o = u^{-1}(p_H, p_X, u(H^*, X^*)) - y_o.
\]

As long as $B$ is greater than zero, and assuming that transactions costs of moving into a project are zero, households will have an incentive to participate in a project.

Figure A.1 illustrates graphically this simple archetypical case. In the figure, the household is shown initially consuming $H_0$ of housing and $X_0$ of other goods and services and is able to attain utility of $U_0$. At this point, normalizing the price of $X$ to one, the household is spending $y - X_0 = R_0$ on housing so that its rent-to-income ratio is $R_0/y_o = a$. A typical sites and services project establishes project standards at a level $H^*$ such that at the project cost (price) per unit of shelter and services, $p_H^*, p_H^* = ay_o$, or $H^* = ay_o/p_H$. The bundle of shelter services $H^*$ may be seen as a take-it-or-leave-it offer, obliging the household to consume $H^*$ or not enter the program. In the case illustrated, it is clearly in the interest of the household to do so, since by consuming $H^*$ (and continuing to consume

---

\(^1\) Note that $X^* = (y - p_H^* H^*)/p_X^*$. 

Appendix
Page 4 of 20
$X_0$), the household is able to attain greater utility, $U^*$, than before.\(^1\) At this point, the minimum income necessary to produce $U^*$ at the original market prices is $y^*$, the income equivalent of the bundle $(H^*, X_0)$; the benefit to the household of participating is $B = y^* - y_0$. As constructed, the household has no incentive to invest further in shelter once having entered the project. It does, however, have a modest incentive to sublet some of the housing received in the project since it can rent housing at the market price $p_H$ to subletters, thereby arbitraging back along the budget line $y^*$ to a higher level of utility than $U^*$. As drawn, this incentive is quite small, though in general the incentive can at times be significant, as I discuss further below.

b. The representative consumer in a market with imperfections

An alternative view of the nature of the sites and services intervention is that rather than simply changing the effective price paid for shelter and services from the market level to a lower, more efficient, level, that it acts by removing constraints in the marketplace that restrict households to suboptimal levels of consumption. In such a case, the analytics of the sites and services intervention are depicted by Figure A.2. The existence of a market imperfection is represented by a kinked budget line. Many imperfections can be modeled as if the consumer faced different prices for different quantities of the good in question (see Deaton and Muellbauer for elaboration). In the figure, the household is assumed to be constrained

\(^1\) Note that for households to be consuming equal quantities of $X$ and spending the same amount for housing before and after program participation implies that the price elasticity of demand is equal to $-1$. In other words the affordability ratio must be a constant equal to the pre-program rent-to-income ratio at all prices. If instead, the price elasticity is less than one, households' housing expenses as a fraction of income would fall in the face of lower prices.
Figure A.1
The representative consumer in a sites and services project

Figure A.2
The representative consumer in a market with imperfections
to consuming the quantities $H_0$ and $X_0$. Kinked budget lines can exist for a variety of reasons. For example, capital market imperfections can restrict low-income households from borrowing against future income; in such a case, households might be able to finance housing consumption up to $H_0$ out of current income (or drawdowns of assets) at a relatively low price, but be obliged to borrow on the high-cost informal money market beyond that point. In Figure A.2, the effect of relaxing the constraint as part of a sites and services project, as for example by making formal housing finance available at the same price as that implicitly paid by households for equity financing for amounts of housing above $H_0$, would be to cause households to move into equilibrium at $H^*$. In doing so the household would increase its utility from $U_0$ to $U^*$. The income equivalent benefit of the change is equal to $B = y^* - y_0$, where $y_0$ is lower than the household's initial nominal income because, in effect, real income is depressed by the constraint. That is, the shadow price of the constraint is equal to the income equivalent of its removal.

Depiction of the sites and services paradigm in the case of Figure A.2 presents one significant problem, however. That is, if project design standards are to be based on the pre-program affordability (rent-to-income) ratio, then it is clear that they will be understated, since a constrained household will wish to allocate a higher fraction of income on housing after participating in the project than it would in the constrained position. The pre-program budget share for housing would be $\frac{y^* - X_0}{y^*}$, while the within-program budget share would be $\frac{y^* - X^*}{y}$. While in theory it would be possible to estimate within-program optimal budget shares and desired

---

1/ Note that if the household is initially in equilibrium below $H_0$, it is unconstrained and thus an intervention that relaxes the constraint will have no effect on its behavior. If it is initially in equilibrium above $H_0$, the household’s situation is identical to that depicted in Figure 1.
housing consumption using knowledge of household demand parameters and the degree to which households are initially constrained in housing consumption, this is never done in practice. Instead, guesses are often made about the appropriate design standard, presuming that households would be willing to spend somewhat more than pre-program amounts to have secure tenure, financing, infrastructure and the other benefits of sites and services projects. Depending on how close the guess is to $H^*$, the level that would be freely chosen by the household at the unconstrained prices, benefits will be greater or smaller. If the design standard is set at $H_0$, assuming that households will spend no more in the program than before, benefits are zero. At the same time if the design standard is set too high, say at $H_{\text{max}}$, benefits will also equal zero since at that point the unconstrained budget line ($y^*$) intersects the original level of utility, $U_0$. At such a point households will in effect have been asked to sacrifice too much in terms of other consumption in order to receive the shelter and services benefits offered by the project. If the standard is set still higher, beyond $H_{\text{max}}$, utility would actually be reduced by participating; clearly then households would choose not to participate.

There is one exception to this latter outcome. If households are permitted under program rules to sublet or resell units, then they may be able to arbitrage back along the budget line $y^*$; for example, by allocating $H^*$ to themselves and subletting $H^*-H^*$ where $H^*$ is the amount of housing set by the design standard. They will not, however, be able to raise benefits above $B = y^*-y_0$; even in the case of maximizing benefits, net benefits may be
sublet, upgrade, or participate which may or may not accord with socially or economically desirable outcomes.

The real world is yet more complicated, particularly because potential project beneficiaries are not made up of "representative consumers." Distributions of beneficiaries' tastes and preferences contribute to further potential hazards in applying the sites and services paradigm.

c. Multiple consumers with different preferences

When sites and services projects are designed, it is not possible to match the tastes and preferences of each potential project beneficiary in even a narrowly defined target group. Instead design standards are set for some average household in hopes that preferences and willingness-to-pay for the offered bundle of shelter and services will result in participation of the intended beneficiaries. Setting the design standard on the basis of a representative or average household, however, creates different incentives for different members of the intended target group, depending on their preferences.

Figure A.3, for example, portrays the case of two households, each with the same resources but with different preferences for housing relative to other goods. Household 1, whose initial level of optimal housing consumption is \( R_0^1 \), has weaker preferences for housing than household 2, whose initial optimum is \( R_0^2 \). If a sites and services project design standard is set on the basis of average affordability (the average rent-to-income ratio of the two households), a standard such as \( R^* \) will be established. If the project changes the effective price of shelter and services from \( p_H \) to \( p_H^* < p_H \), the two households will respond completely differently to the offer of project participation. Household 2, whose utility would increase from \( U_2^1 \) to \( U_2^* \) were
Appendix
Page 11 of 70

it to participate and consume \( R^* \) at the price \( p^*_H \), would not only choose to participate, but would wish to further increase housing consumption by investing up to the point \( H^2 \). Household \( 1 \) would, by contrast, choose not to participate since at \( R^* \) its utility would fall from \( U^1_1 \) to \( U^*_1 \). Only if the standard were set below \( H^1_{\text{max}} \), the point at which the within-program budget line intersects the pre-program utility level, would household \( 1 \) choose to participate.

This dichotomy in possible outcomes illustrates the process of self-selection in sites and services projects. Clearly projects that establish take-it-or-leave-it offers on the basis of designs that reflect average affordability levels will have a natural sorting effect, with households having stronger preferences for shelter and services choosing not only to participate but also to wish to further upgrade, while those with weaker preferences will not participate. It should be obvious that the smaller is the scope of a project relative to the size of the potential beneficiary population, the greater the chance that self-selection can create the appearance of a successful project when, in fact, standards may have been set too high for many potential beneficiaries. Further, as noted in the next section, the greater the variance in preferences within a given target group, the more likely is the chance that self-selection among beneficiaries in small-scale projects will disguise potential problems of large-scale replicability.

In actual practice, several factors may however permit even households with relatively weak preferences to participate in sites and services schemes with reasonably high standards. These include the existence of subsidies, and the possibility of either subletting or selling out to
higher-income groups. The subsection below explores these possibilities and also looks at the phenomenon of default.

d. Subsidies, subletting, and selling out

As indicated above, the somewhat arbitrary process by which project design standards are set, drawing as it does on guesses concerning appropriate affordability levels, can lead to situations in which some portion of a target group has little or no incentive to participate. The higher the project standard is set, given that prices are set at a level designed to recover costs, the lower is the incentive for many households to participate. These disincentives can, however, be ameliorated if households are able to either sublet part of their dwelling to others or to sell out to those with stronger housing preferences once having entered a project. Alternatively, household incentives to participate can be increased by subsidies that lower the cost of participating; such subsidies may, however, increase the likelihood that initial beneficiaries will either sublet or sell out. These possibilities are explored below.

Consider the case of households such as household 1, portrayed in Figure A.3 for whom project standards are set too high, that is, at a level for which participation would entail a decrease in utility from the pre-program level. Figure A.4 presents the situation of such a household. In the figure, the household is assumed initially to be in equilibrium at $X_0$, $H_0$ with income of $y_0$. Assume that participation in a sites and services project is offered with project standards set at $H^*$ and at the original market price, $p_H$, such that the household would be obliged to increase spending on shelter from $p_H H_0 = R_0$ to $p_H H^* = R^*$ in the project. The project design standard is set assuming that the proper “affordability ratio” is $a^* = R^*/y_0$. In such

1/ The assumption that prices are the same both within and out of the project is made for analytical convenience; it is relaxed below, with the within-project price, $p_H^*$, assumed to be below $p_H$. 

Figure A.3
Multiple consumers with different preferences

Figure A.4
Consumer behavior with subsidies, subletting, and selling out
a case, the household would choose not to participate since \( U^* < U_o \). If the household is offered a large enough subsidy however, it will participate. The minimum subsidy necessary to induce participation can be derived as follows. First, consider the minimum amount of shelter and services \( R_{\text{min}} \) that must be offered in the project in order to induce the household to freely spend a given fraction of its income, \( a^* \), on shelter and services. This amount can be derived by setting pre-project and within-project utility levels and solving for the quantity \( R_{\text{min}} \). That is, setting:

\[
U_o = U(R_o, y_o - R_o) = U(R_{\text{min}}, y_o - a^* y_o)
\]

and solving for \( R_{\text{min}} \) gives:

\[
R_{\text{min}} = U^{-1}(U_o, y_o (1 - a^*)).
\]

The minimum subsidy necessary to provide \( R_{\text{min}} \) is equal to the market value of \( R_{\text{min}} \), \( p_R R_{\text{min}} \), minus the amount paid by the household, \( a^* y_o \):

\[
S_{\text{min}} = p_R R_{\text{min}} - a^* y_o.
\]

This level of subsidy will leave the household indifferent between participating or not and is thus the minimum necessary to induce participation.\(^1\) The two quantities \( R_{\text{min}} \) and \( S_{\text{min}} \) are shown in Figure A.4.

---

\(^1\) Note that if the effective price of shelter provided in the project is \( p_R^* < p_R \), the initial unsubsidized amount of shelter that the household could afford would be \( (p_R/p_R^*) (a^* y_o) \) and thus the minimum subsidy would be lowered to \( S_{\text{min}} = p_R R_{\text{min}} - (p_R/p_R^*) (a^* y_o) \).
Were the project standard set at $H_{min}$ and a subsidy greater than $S_{min}$ to be granted, the household would have a clear incentive to participate.

Several of the consequences of such subsidies should be noted. First, because the subsidy is in effect a bribe to households to increase their spending on shelter from a fraction $a$ to a fraction $a^*$ of income, resources mobilized by project participants for shelter increase as a result of project participation as does housing consumption. These increases in resource mobilization, however, are not without cost. For example, given the way in which $H_{min}$ was derived, as the minimum amount of shelter to induce participation by a household required to spend $a^*$ of its income on shelter, the net benefit to the household consuming $H_{min}$ for a price $a^* y - R^*$ is zero; thus the net value to the household of the subsidy is zero, and the "deadweight loss" to society of providing the subsidy is exactly equal to the subsidy amount. Depending upon society's preferences concerning the benefits associated with increasing shelter consumption by subsidized households, the cost to society could easily outweigh the benefits associated with increased household resource mobilization for shelter.

Another implication of subsidies is that they can leave households in danger of defaulting on project-related loans, despite appearing to have created substantial benefits. For example, households who are induced to enter a project consuming $H_{min}$ paying $a^* y_0$ may be only tenuously attached to the project. If their income falls below $y_0$, and they are obligated to continue payments of $a^* y_0$, their utility in the project will fall below $U_0$. Depending on the shape of household indifference curves, households could well be better off by moving out of the project into housing more closely resembling their pre-project housing than that provided by the project. Of course subsidies above the minimum level $S_{min}$ will create in effect a cushion, which insulates project beneficiaries from unforeseen income shocks and may
leave them preferring to remain in a project even after an income reduction. Propensities to default depend on other factors as well. For example, to the degree that households are able to sublet some of their project-provided space, they can provide the same sort of cushion to income shocks afforded by greater-than-minimal subsidies. Depending on whether or not resale is permitted, or whether or not households that default are entitled to the liquidation proceeds of their dwellings, and depending on expectations about future income and/or property values, incentives to default or not can become quite complex. While this paper cannot explore the full range of possibilities, it is useful to look in more detail at incentives to sublet and to sell out and at how they may be connected to propensities to default.

Consider again the case of the household portrayed in Figure A.4, who is consuming $H_{min}$ and paying $R^*$. Such a household could improve its welfare were it permitted to either sublet part of its space or to sell out at the market price $p_H$. Thus, while the project provides shelter and services at a price per unit of $p_H < p^*_H$, by providing a subsidy, the household can resell or sublet its incremental benefits at the going market price $p_H$, thereby arbitraging itself back up the budget line $y_1$. If the household decides to sell out or sublet, its optimal consumption is attained at $H_1$, which is above its pre-program consumption but below $H_{min}$.

If the household sells out, it is confronted with significant transactions costs, first those associated with moving to the project and then those associated with searching for and finding $H_1$. If the household sublets, the latter costs are obviated, but the household may surrender some welfare in that it loses some privacy. The reverse could also be true in some developing countries however, in that having additional persons (subletters) on-site may provide an additional sense of security. In addition, subletting part of one's space rather than selling out in effect creates an option to
reoccupy the full space should income or tastes later change to make $H_{min}$ optimal. Another option for the household is to nominally take possession of the project-provided unit with the intention of continuing to occupy the pre-program unit and leasing the entire project-provided unit. In such a case, the household attains a lower level of gross utility than under partial subletting but does not incur the welfare cost of reduced privacy; at the same time, the household retains the option to occupy the project unit in the future.

The choice between subletting and selling out is thus complex. It may be further complicated by the price structure of housing. In particular, it has been observed that small amounts of housing space often rent for higher prices per unit of space than do large amounts. For example, hedonic price studies of housing often find that a log-linear or a semi-logarithmic equation relating rent or value to interior space is more appropriate than a linear equation. Each of the former functional forms, given typical parameter values, implies that the price per unit of space declines with the absolute amount of space. In such cases households that sublet are able to price small amounts of space that they sublet above the average market price of space. Thus, households that sublet may be able to arbitrage back along a budget line such as $y_3$ which reflects the declining marginal price structure of sublet space; in so doing they would be able to attain $u_2$, a level of utility above that consistent with any position that can be attained by selling out. Such a possibility would create a strong presumption of subletting over selling out in cultures with a tradition of doubling up or sharing units. Also, because of the option value of reoccupying the full space that subletting affords, subletting would tend to be preferred over selling out in economies with rapidly changing real incomes.
The foregoing discussion has suggested that subsidies and subletting both provide insurance against having to default in the face of income shocks. On the other hand, selling out to households with stronger housing preferences represents another alternative that will be attractive to certain households. The ability to sublet or sell out confers economic advantage on project participants; hence, restricting either activity will result in welfare losses for at least some participants. Thus, unless some overriding public interest exists, such restrictions should be viewed as inappropriate.

One question to ask, however, concerning the phenomenon of selling out is which income groups are most likely to purchase sites and services project units if they are sold by their original occupants (or surreptitiously occupied by higher-income households who understate incomes to meet initial eligibility criteria), for to the degree that subsidy elements are built into project, they may be passed on to higher-income groups with inequitable distributional consequences. This may be addressed as follows: suppose that housing expenditures are described in terms of an expenditure function \( g(y) \) and that a project is designed with standards such that shelter expenditures in a project, \( R^* \), are set based on the assumption that households can spend the proportion \( a^* \) of their income \( y_o \) on housing. In that case we can solve for the income level for which \( R^* \) would obtain were there no subsidies, that is, the level for which \( R = g(y) = R^* = a^* y_o \). This is simply:

\[
(8) \quad y = g^{-1}(a^* y_o).
\]

To find out the percentile in the income distribution with which this income is associated requires knowledge of the density function of household income, \( f(y) \). Integrating over \( f(y) \) to the limit given by Equation (8) gives:
\[ f(y) = \int_{y_0}^{y} f(y) \, dy \]

Thus clearly the level of income of households to whom project units will be sold depends on the project standard as it is determined by the assumed affordability ratio \( a^* \); the higher the standard the higher the income of the group that would normally consume housing of the level provided in a project.

e. Recapitulation

This appendix has indicated a number of the complex incentives and disincentives that are set in motion when the standard sites and services paradigm is implemented. Among the more important lessons to take from the foregoing are the following:

1. Sites and services projects create economic benefits for potential participants by either lowering the effective market price of shelter and services or relaxing market restrictions or both. The magnitude of potential benefits varies depending on the household preferences for housing vis-a-vis other goods, on housing market features (especially the existence and magnitude of market imperfections and, although only touched on here, expectations concerning inflation in prices and income), and on project design features.

2. Among the project design features that affect potential benefits are the level of standards of shelter and services, prices charged within a project, the type and level of subsidies, and whether or not subletting and resale are permitted.

3. Among the outcomes affected by project designs and other factors noted above are consumption (and investment) in shelter and other goods, incentives to invest further in project-provided
units, incentives to resell or sublet, and incentives and propensities to default on project-related loans.

4. Of the factors influencing project outcomes, the choice of project design standards and pricing standards based on "affordability" criteria are of particular importance. The section indicated that there is some degree of arbitrariness in the application of affordability calculations to project design and pricing, with the result that differential incentives are created for households to participate in projects and to attain outcomes of interest. For many potential beneficiaries, participation can be purchased only at the cost of subsidies. For those households induced by subsidies to participate, benefits will be lower than is at first apparent; consequently such households may have significant incentives to sell out to higher-income groups and to sublet part of their space, and they may be subject to high default rates in spite of subsidies. Whether or not such propensities are in fact observed will depend critically on how well design standards and pricing mirror the effective demand or willingness-to-pay of potential beneficiaries. If standards are too high because effective demand has been overestimated, project problems as noted above will occur. 1/

1/ As noted in the text, however, large subsidies and strong self-selection by beneficiaries (the latter particularly a problem when project scale is small) can disguise the existence of project problems. Thus, entirely "successful" small-scale projects with hidden subsidies can be implemented, but which would have problems being replicated on a large scale.