Sites and Services—and Subsidies: The Economics of Low-Cost Housing in Developing Countries

Stephen K. Mayo and David J. Gross

Sites and services projects represent a major innovation in shelter policy in developing countries and have been sponsored by international aid agencies for somewhat more than a decade. Such government projects 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 preexisting 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 article 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 assumptions with 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 article concludes with suggestions for ways to improve the project design process and reform housing sector policies to increase the efficacy of the sites and services paradigm.

This is an article about a major innovation in delivering shelter and related services to the poor in developing countries: “sites and services” projects. Sites and services projects are government-sponsored packages of shelter related services, which range from a minimal level of “surveyed plot” to an intermediate level of “serviced sites” to an upper level of “core housing” complete with utilities and access to community-based services. The level of services depends on the ability and willingness of beneficiary populations to afford them. Typically, such projects represent a sharp break with preexisting government shelter policies in


Copyright © 1987 by the International Bank for Reconstruction and Development / THE WORLD BANK.
that they attempt, in principle, to focus directly on lower-income groups and to deliver shelter and services with small or no subsidies.

The earliest sites and services schemes (in Chile, Kenya, and the Union of South Africa) were undertaken in the 1940s and 1950s, largely without external assistance. It was not until the late 1960s and early 1970s that international agency assistance began in earnest. Large numbers of sites and services and slum upgrading projects have since been implemented. The World Bank alone, for example, initiated sixty-eight projects through 1984, each benefiting more than 25,000 households on average. After a decade of experience with such projects, it is useful to look closely at how they have worked and to determine what can be learned from their successes and failures.

After we describe the background of the sites and services concept and review some recent evaluations and critiques of these projects, we will present the results of an analytical model of how the provision of sites and services is likely to influence household behavior. Relevant areas of impact are housing consumption and investment, consumption of nonhousing 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, the subsidies that are required to achieve selected project outcomes (such as housing that meets minimum project design standards), and the welfare losses to society associated with subsidy elements.

In a period in which most developing country governments face severe budget constraints, their ability to subsidize housing on a wide scale is limited. If subsidies are fiscally possible, and are desired to serve equity, efficiency, or project impact criteria, they should be explicitly set and rationalized to allow for full budgetary control. We approach the issue of pricing sites and services projects with an understanding that for many governments such projects will only be feasible if they involve minimal or no subsidies.

The analytical framework indicates that having a firm grasp of housing demand parameters in developing countries is critical for understanding project effects. After discussing the analytical model, we review recent evidence on housing demand in developing countries based on ongoing research projects at the World Bank. Implications of that research for sites and services projects are then described. This discussion is followed by a review of several major project outcomes of sixty-eight World Bank sponsored sites and services projects. That review suggests that failure to incorporate correct information on housing demand behavior into project design has resulted in problems which seriously threaten some of the fundamental goals of sites and services projects. The most serious of these are conditions that lead to either large subsidies, budgetary constraints, and hence poor prospects for widespread replication or to smaller subsidies with benefits going to relatively higher-income groups. The final section of the article presents conclusions and some recommendations for improv-
ing both the design of sites and services projects and the choice of housing policy instruments in developing countries.

I. 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. 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 lower standard housing, 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) reported that from one-third to two-thirds of urban populations could not afford the least expensive public housing unit in the six developing country cities he studied. Subsidy levels were high enough to create serious budgetary pressures that virtually guaranteed 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 (Abt Associates 1982, which is available from Mayo). When squatter settlements were removed, hydraulike they returned, sometimes nearby but often in the same place.

By the 1970s, Turner (1972), Mangin (1970), and others espoused an approach more in harmony with the natural processes of shelter acquisition and development of the poor themselves. It was proposed that public programs capitalize on the untapped energies and resources of the poor through “progressive development” schemes which simply serviced housing sites or provided housing that was 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 was noted in a World Bank policy paper (1975, p. 5): “This can be achieved, in the first instance and most rapidly, by reducing standards; per-
mitting 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."

It was also seen to be important to deal with problems which were assumed to restrict the level of housing investment among low-income households. These included shortages of urban infrastructure, uncertain and insecure land tenure, lack 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 being essential to mobilize household resources for upgrading shelter and infrastructure beyond initial affordable but minimal levels.

It was also 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 also generate a modest surplus that could be recycled to replicate projects on 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 household and commercial sites to reduce 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). This implied that prices should be sufficient to recover costs and entail small or no subsidies, and that the housing and infrastructure provided were both affordable and were those for which poor households were willing to pay.

These principles were 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, the U.S. Agency for International Development (USAID), regional development banks (for example, the Asian Development Bank and 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, which involved total Bank lending of more than $1 billion and were 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 1975).

Evaluations of such projects are beginning to emerge. Citing examples of policy changes consistent with the sites and services approach in a number of countries, Ayres (1983, pp. 176–77) concluded: "The most obvious manifestation of the [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."
In addition to the effect of the sites and services approach on policy, Ayres noted that the 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 1982, p. xiv).

In a recent evaluation study of four early World Bank projects jointly sponsored by the Bank and the International Development Research Center (IDRC), Keare and Parris (1982, p. v), stated: “The experiment embodied in the first generation of Bank-supported urban shelter projects [has] been remarkably successful.” As evidence, they cited (1) increased production of housing and infrastructure, (2) construction of higher quality housing than had been expected, (3) continued investments by beneficiaries in both housing and community facilities, (4) allocation of plots as low as the twentieth income percentile, (5) residential turnover no greater 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.

These accomplishments 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.” The effect was 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 1984, p. 217).

Nevertheless, a number of reservations and criticisms have been expressed about sites and services, including claims that (1) shelter provided is not affordable by the poor, (2) benefits accrue disproportionately to better-off households, (3) cost recovery is poor, (4) subsidies persist at unsustainable levels, and, because of the above, (5) it is not budgetarily possible to reproduce projects, as they are now designed and implemented, on a large scale.

Cost recovery has been noted as a problem by several reviewers, although evidence suggests that the experience has been mixed. While Keare and Parris (p. xii) cite cost recovery as a problem in three out of the four early World Bank projects they review, it appears that cost recovery in more recent projects is a less serious problem.

Evidence that projects have not proved affordable, either for the target residents, or, in the longer term, for the government, is less ambiguous. For example, Ayres asserts that affordability assumptions on which project designs were based were “over optimistic” (p. 193); Payer (1982, pp. 336–37), that they were “highly unrealistic” and resulted in slow housing consolidation, inability of some households to pay, and other problems such as the leakage of benefits to better-off households and poor cost recovery. Incidences of benefit leakage have been noted by Chana (1984), Cohen (1983), and Keare and Parris (1982). Chana, for
example, in reviewing the experience of a sites and services 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 sold, presumably to members of higher-income groups (p. 52). Keare and Parris found that sites and services participants "tend to be more representative of median income groups than of the poorest urban households" (p. 12).

In some cases, however, affordability seems to have been purchased with subsidies that are considerably higher than the minimal levels envisioned by the original architects of the sites and services paradigm. Land price writedowns and interest rate subsidies are common in sites and services projects and can constitute from 50 to 90 percent of the true resource cost of the shelter or land provided in a project. In a project in the Arab Republic of Egypt cofinanced by the British Overseas Development Agency, for example, land was priced at LE2.25 per square meter while the market price was LE10–LE15, and a 5 percent interest rate was charged when the prevailing rate was about 11 percent (Davidson 1984, p. 142). 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.

Lowering standards and reducing subsidies has often proven to be extremely difficult for designers of sites and services projects. Little thought appears to be given in project planning to subsidies: their form, magnitude, distribution among different sorts of households, or their impact on either the behavior of beneficiaries (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.

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.

II. 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 Mayo and Gross (1985). That model is based on the standard neoclassical 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 model 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; it is sometimes assumed to vary for different target groups.

3. A target housing expenditure level (rent) is set; \( R_s = a y_0 \).

4. Project standards such as lot size, location, infrastructure type and quality, and shelter size and quality are established such that units are built with a cost, \( C \), set just equal to \( R_s \).

Such units are then offered to target-income-group households at a price, \( R_s \), which fully recovers costs. The amount of housing offered is equal to \( H_o \), which is assumed to be greater than the amount originally consumed by the household \( (H_0) \), but it is offered at a lower price per unit \( (p_s) \) than the market price, \( p_m \). The project price 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 the borrowing costs of the lending institution); water may be supplied at a price less than the 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 and its price. 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 rules and restrictions governing the ability of households to profit by selling out or subletting.

The model analyzes the complex incentives and disincentives that are set in motion when the standard sites and services paradigm is implemented. Among the more important findings are the following.

1. Economic benefits result from lowering the effective market price of shelter and services, relaxing market restrictions, or both. The magnitude of potential benefits depends on the household preferences for housing vis-à-vis other goods, on housing market features (especially the existence and magnitude of market imperfections and expectations concerning inflation in prices and income), and on project design features.

2. Potential benefits are determined by the standards of shelter and services, prices charged, the type and level of subsidies, and whether subletting and resale are permitted.

3. These factors affect consumption (and investment) in shelter and other goods, and incentives to invest further in project-provided units, to resell or sublet, and to default on project-related loans.

4. “Affordability” criteria for project design and pricing are of particular importance. Our earlier paper (Mayo and Gross 1985) indicates that there is

¹. For a model of the “cost” of tenure security to urban households, see Jimenez (1984) and Friedman, Jimenez, and Mayo (1985).
some arbitrariness in establishing the percentage of income households are willing to spend on housing and hence in setting design standards so that incentives for household participation vary among households and projects. 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 requires subsidies, and benefits will be lower than is true for others. Consequently such households may have significant incentives to sell out to higher-income groups, to sublet part of their space, and to default. 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. 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 they would generate budgetary problems if replicated on a large scale.

III. Affordability Criteria: Housing Demand, Subsidy, and Design

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. Here we review recent research on household demand for housing in developing countries and present some of the major implications of that research for both the design and pricing of and the target groups to be reached by sites and services projects.

Housing demand

Until recently, few comparative studies of housing demand in developing countries existed. Most such studies were based on specialized data bases, which were not usually collected to estimate housing demand relationships. Different analyses used different variable definitions, functional forms, and stratification variables, which made the comparison of results 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 sixteen cities in eight countries (Colombia, Egypt, El Salvador, Ghana, India, Jamaica, the Republic of Korea, and the Philippines) and were used to estimate housing demand relationships using relatively comparable definitions of variables and identical functional forms and stratifying variables. For comparative purposes, identical models were estimated for two U.S. cities, Pittsburgh and Phoenix. A description of much of that research is contained in Malpezzi, Mayo, and Gross (1985).

2. For a review of the pre-1984 literature, see Malpezzi, Mayo, and Gross (1985).
In that study, a simple log-linear model of housing expenditures in each of the sixteen cities is estimated:

\[ \ln R = b + \epsilon_y (\ln y) + cH + dH^2 + u \]

where \( R \) is rent; \( \epsilon_y \) is the estimated income elasticity of demand; \( y \) is income; \( H \) is household size; \( b, c, \) and \( d \) are regression coefficients; and \( u \) is an estimated disturbance term. 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 (1) owner imputations of net rent, (2) estimates applying renter-based hedonic price equations to owners' housing characteristics,\(^3\) or (3) the product applying a fixed amortization ratio (from 1 to 1.5 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.\(^4\) 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 statistics are in the 0.1-0.3 range (the minimum is 0.06; the 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. Half of the point estimates lie between 0.4 and 0.7. For nine of the fourteen cases for which comparison is possible, estimated developing country owner income elasticities are greater than those of renters; this parallels findings in the literature for developed countries (Mayo 1981).

Comparing expenditure equations across countries reveals practically no systematic variation of income elasticities (\( \epsilon_y \)) with country or city income level or population size but considerable variation in dollar-adjusted intercepts (\( b \) in equation 1) which are positively related to average city income. Rent-income ratios therefore decline systematically as income rises within cities but increase with average income across cities. It should also be noted that the relative variation in rent-income ratios is higher at low-income levels than at high-

\(^3\) The hedonic price equation statistically relates rent to housing characteristics. The coefficients of a simple hedonic price equation, \( R = f(Z) \), (where \( R \) is rent and \( Z \) is housing features) would provide estimates of the rental "price" of each of the characteristics studied.

\(^4\) Malpezzi, Mayo, and Gross (1985) discuss findings concerning household size; here we focus only on income elasticity and intercept estimates.
Table 1. *Estimated Parameters of Housing Expenditure Functions*

<table>
<thead>
<tr>
<th>Country/city</th>
<th>Constant</th>
<th>Log <code>income</code></th>
<th>Household size</th>
<th>R Squared / N</th>
<th>Constant</th>
<th>Log <code>income</code></th>
<th>Household size</th>
<th>R Squared / N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renters</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Owners</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Colombia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bogota (1978)</td>
<td>1.11</td>
<td>0.66</td>
<td>0.09</td>
<td>-0.006</td>
<td>0.77</td>
<td>0.75</td>
<td>0.00</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.03</td>
<td>0.03</td>
<td>0.003</td>
<td>1.016</td>
<td>0.03</td>
<td>0.04</td>
<td>0.003</td>
</tr>
<tr>
<td>Cali (1978)</td>
<td>2.81</td>
<td>0.44</td>
<td>0.13</td>
<td>-0.006</td>
<td>0.27</td>
<td>1.25</td>
<td>0.69</td>
<td>-0.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.06</td>
<td>0.07</td>
<td>0.007</td>
<td>257</td>
<td>0.06</td>
<td>0.07</td>
<td>0.005</td>
</tr>
<tr>
<td><strong>Egypt</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cairo (1981)</td>
<td>0.25</td>
<td>0.46</td>
<td>-0.17</td>
<td>0.010</td>
<td>0.16</td>
<td>0.89</td>
<td>0.17</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.06</td>
<td>0.09</td>
<td>0.008</td>
<td>303</td>
<td>0.12</td>
<td>0.21</td>
<td>0.019</td>
</tr>
<tr>
<td>Beni Suef (1980)</td>
<td>-1.20</td>
<td>0.51</td>
<td>0.38</td>
<td>-0.047</td>
<td>0.25</td>
<td>-0.09</td>
<td>0.42</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.14</td>
<td>0.28</td>
<td>0.029</td>
<td>63</td>
<td>0.13</td>
<td>0.14</td>
<td>0.010</td>
</tr>
<tr>
<td><strong>El Salvador</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Santa Ana (1980)</td>
<td>0.37</td>
<td>0.48</td>
<td>0.13</td>
<td>-0.014</td>
<td>0.16</td>
<td>-2.50</td>
<td>1.11</td>
<td>-0.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.11</td>
<td>0.08</td>
<td>0.007</td>
<td>131</td>
<td>0.11</td>
<td>0.12</td>
<td>0.009</td>
</tr>
<tr>
<td>Sonsonate (1980)</td>
<td>0.79</td>
<td>0.50</td>
<td>-0.10</td>
<td>0.007</td>
<td>0.16</td>
<td>0.39</td>
<td>0.79</td>
<td>-0.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.12</td>
<td>0.09</td>
<td>0.007</td>
<td>83</td>
<td>0.15</td>
<td>0.17</td>
<td>0.012</td>
</tr>
<tr>
<td><strong>Ghana</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kumasi (1980)</td>
<td>0.82</td>
<td>0.33</td>
<td>0.02</td>
<td>0.000</td>
<td>0.11</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.04</td>
<td>0.03</td>
<td>0.002</td>
<td>814</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>India</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangalore (1975)</td>
<td>0.66</td>
<td>0.58</td>
<td>-0.08</td>
<td>0.003</td>
<td>0.18</td>
<td>2.84</td>
<td>0.43</td>
<td>-0.17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.04</td>
<td>0.04</td>
<td>0.002</td>
<td>1,041</td>
<td>0.08</td>
<td>0.06</td>
<td>0.004</td>
</tr>
<tr>
<td>Location</td>
<td>Year</td>
<td>Coefficient</td>
<td>SE</td>
<td>T-stat</td>
<td>P-value</td>
<td>Coefficient</td>
<td>SE</td>
<td>T-stat</td>
</tr>
<tr>
<td>--------------</td>
<td>-------</td>
<td>-------------</td>
<td>----</td>
<td>--------</td>
<td>---------</td>
<td>-------------</td>
<td>----</td>
<td>--------</td>
</tr>
<tr>
<td>Jamaica</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kingston</td>
<td>1975</td>
<td>-0.12</td>
<td>0.70</td>
<td>0.16</td>
<td>-0.012</td>
<td>0.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seoul</td>
<td>1979</td>
<td>5.04</td>
<td>0.45</td>
<td>0.07</td>
<td>-0.004</td>
<td>0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Busan</td>
<td>1979</td>
<td>6.26</td>
<td>0.31</td>
<td>0.05</td>
<td>-0.001</td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taegu</td>
<td>1979</td>
<td>4.95</td>
<td>0.44</td>
<td>0.03</td>
<td>-0.003</td>
<td>0.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kwangju</td>
<td>1979</td>
<td>2.70</td>
<td>0.62</td>
<td>0.09</td>
<td>-0.002</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1979</td>
<td>3.33</td>
<td>0.54</td>
<td>0.04</td>
<td>0.002</td>
<td>0.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philippines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Davao</td>
<td>1979</td>
<td>-1.60</td>
<td>0.88</td>
<td>0.00</td>
<td>-0.002</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manila</td>
<td>1983</td>
<td>1.27</td>
<td>0.56</td>
<td>0.01</td>
<td>-0.002</td>
<td>0.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pittsburgh</td>
<td>1975</td>
<td>3.07</td>
<td>0.26</td>
<td>-0.02</td>
<td>-0.002</td>
<td>0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phoenix</td>
<td>1975</td>
<td>3.68</td>
<td>0.18</td>
<td>0.12</td>
<td>-0.015</td>
<td>0.13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Not available.

a. The first of each pair of numbers is the coefficient; the second, the standard error.
income levels, a result that has implications for the degree to which self-selection problems such as those noted in section II will occur within sites and services projects with high standards (see Malpezzi 1984 for evidence). These relationships are shown graphically in figure 1 for renters in four representative cities. Relationships for owners are similar, although average rent-income ratios are invariably higher; owners’ housing consumption is roughly 80 percent greater than that of renters at given incomes within particular markets.

It is important to recognize factors which suggest that these income elasticities are lower-bound estimates. In developing countries in which poorer families would prefer to purchase only the most rudimentary shelter goods and services, the absence of such packages in commercial markets means that measures of demand for conventional housing will not include this element of housing demand. Sites and services projects, however, may provide such an optimal package to meet the effective demand of the poor. Similarly, lack of access to credit for housing purchases may reduce demand for housing as income grows to some relatively high threshold level of income. Typically, sites and services projects include just such small increments of housing credit. Further, data currently available do not allow us to capture the transfer of families from renter to owner status as household income rises. Yet there is sometimes a major increase in housing consumption with income because of tenure shifts—another element of income elasticity which is not incorporated into our model. All these factors suggest that our present measure of the benefits of sites and services projects must be regarded as to some degree understating the actual rewards to participants.

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 in average rent-income ratios at different income levels within a country are markedly smaller than are between-country differences at various average income levels. Malpezzi, Mayo, and Gross (1985) explore alternative theoretical explanations for these results and then test a series of cross-country housing expenditure models, which are designed to analyze presumably long-run cross-country housing demand relationships. They also estimate models for a pooled sample of U.S. and developing country cities. The simplest cross-country model they test is similar to the log-linear within-country model described above, but with the addition of a price term, the relative price of housing, which is constructed using data from Kravis, Heston, and Summers (1982).

Following this approach, and defining $p_o$ as the relative price of housing, we estimate models for renters and owners in developing countries.

For renters:

\[
\ln R = -5.39 + 1.60 \ln y + 0.15 \ln p_o
\]

\[
(0.18) \quad (0.29)
\]
Figure 1. *Rent-Income Ratios by Income for Renters*

Key:  
A average for each city at its average income  
B Bogota  
C Cairo  
M Manila  
S Seoul
For owners:

\( R^2 = 0.90 \)
\( \text{d.f.} = 13 \)

\[
(3) \quad \ln R = 3.57 + 1.38 \ln y + 0.65 \ln p_o
\]
\[
(0.35) \quad (0.50)
\]
\( R^2 = 0.76 \)
\( \text{d.f.} = 11 \)

In both models, the dependent variable, rent, and income are city means and are converted to 1981 U.S. dollars.\(^5\)

The implications of these models, which are confirmed with alternative specifications, are straightforward: in the very long run, housing consumption is income-elastic, a result that conforms to recent findings of Kravis, Heston, and Summers (1982). 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, owner and renter consumption patterns increase at a similar pace, all other things being equal. 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 an area's economic development, the relative price of housing, and tenure (whether residents own or rent). Thus it is inappropriate to use any single affordability ratio (housing expenditure to total income) 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.

\(^5\) 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 \(-0.85\) for renters and \(-0.35\) for owners.
Minimum Subsidies Necessary to Induce Participation

Mayo and Gross (1985) develop a general procedure for estimating minimum subsidies (benefits) necessary to induce participation by households whose normal housing equilibriums are below those implied by project standards. We have made that procedure operational by assuming a particular utility function, the parameters of which can be approximated using our empirical results, and have examined the impact on required subsidies as they vary with alternative affordability planning assumptions. (The application of this procedure is described in the appendix.)

Figure 2 presents the results of such a procedure based on the actual housing expenditure equations estimated in Malpezzi, Mayo, and Gross (1985) 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 thirty-fifth percentile of the income distribution. 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. To the extent that renters' average propensities to consume housing increase after they become owners, all other things being equal, the estimates of minimum subsidies required for participation will be overstated.

The horizontal axis of figure 2 is monthly household income in 1981 U.S. dollars and the vertical axis is the minimum subsidy necessary to induce participation as a percentage of the market value of the housing provided in a project. The curves shown are subsidy levels required for various values of \( a \), the design affordability ratio. For reference, estimated monthly household incomes 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 and Nigeria and Zambia; and those above $400 included Caribbean, Latin American, and East Asian countries such as the Bahamas, Brazil, Jamaica, Korea, Mexico, and Panama.

The figure indicates clearly the effect that project standards (as derived from design affordability levels) have on target group households' incentive to partici-

---

6. Our research indicated that on average, income at the thirty-fifth percentile was about 43 percent of city average income. The preproject rent, \( R_0 \), was estimated in two steps, first at average city income using equation 2 and second using the within-city expenditure equation for \( y = 0.43 \times (\text{assuming } \epsilon = 0.5) \) and calculating the corresponding value of \( R_0 \).
Figure 2. Minimum Subsidies Necessary to Induce Participation of Thirty-Fifth Percentile Households at Alternative Values of the Design Affordability Ratio (a)
pate, 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 a 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 thirty-fifth percentile of the income distribution to participate. In Burundi, with monthly household income of only about $70 in 1981, a subsidy of roughly 85 percent would be required to induce thirty-fifth-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.

By contrast, in higher-income developing countries a 20 percent affordability standard may be entirely appropriate. For example, for countries (cities) with an 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 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 60–70 percent rather than the range of 20–25 percent. Depending on whether subsidies of the required magnitude are forthcoming or 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.

**Income Levels of Participants at Zero-Subsidy or upon Resale by Initial Occupants**

A general procedure for inferring the income level of households that would participate in a project and their place in the income distribution if they pay the full unsubsidized price of the package of services is outlined in the appendix. 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 standard and its associated market rent.

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. A within-city income elasticity of 0.5

7. 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 thirty-three developing countries. Details are provided in Mayo and Gross (forthcoming).
Figure 3. Income Percentile of Participating Households with No Subsidy at Alternative Design Affordability Ratios
was assumed, and it was assumed that the design standard was based on the product of income of the thirty-fifth-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 (for example, $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 eightieth 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 sixty-fifth percentile in the absence of 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, which suggests 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.⁸

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.

IV. DESIGN AND OUTCOMES OF SITES AND SERVICES PROJECTS

The previous sections have emphasized the important role played by planning parameters in influencing outcomes in sites and services projects. In this section we briefly review important aspects of planning practice in sixty-eight 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 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

---

8. This is obviously a simplification in that the goals of projects are numerous and the choice of a design standard must reflect a number of compromises among the 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 a limited social welfare function, with the design standard being chosen to maximize such a function.
amounts disbursed. The implications of these findings for achieving 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 of these factors for sixty-eight World Bank–financed sites and services projects initiated between 1972 and 1984, along with median values of three macroeconomic variables that indicate general market conditions. The results are disaggregated by region, by the time period of project initiation, and by 1983 per capita gross domestic product (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 European, Middle Eastern, 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, which indicates a concern with reaching relatively farther down the income distribution. Median target groups (not shown here) tend to be at about the thirty-fifth percentile of the income distribution.

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 preproject 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 substrata 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 Europe, the Middle East, and North Africa to a high of 12 percent in South Asia, East Asia, and the Pacific. 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
Table 2. Median Values of Project Planning and Economic Variables for World Bank–Financed Shelter Projects, 1972–84

<table>
<thead>
<tr>
<th>Category</th>
<th>Minimum target group income (U.S. dollars per month)</th>
<th>Percentage down payment</th>
<th>Affordability ratio</th>
<th>Project interest rate</th>
<th>Rate of inflation</th>
<th>Per capita GDP</th>
<th>Percentage held by lowest income quintile</th>
<th>Number of projects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Region</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East 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>West Africa</td>
<td>131</td>
<td>10</td>
<td>20.0</td>
<td>9.25</td>
<td>9.0</td>
<td>765</td>
<td>6.1</td>
<td>7</td>
</tr>
<tr>
<td>East Asia and the 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>South Asia</td>
<td>27</td>
<td>10</td>
<td>20.5</td>
<td>12.00</td>
<td>12.0</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>9.6</td>
<td>944</td>
<td>5.1</td>
<td>8</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>78</td>
<td>5</td>
<td>20.0</td>
<td>10.00</td>
<td>15.1</td>
<td>1,763</td>
<td>2.9</td>
<td>18</td>
</tr>
<tr>
<td><strong>Period</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1972–76</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>1977–80</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>1981–84</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>
<tr>
<td><strong>Per capita GDP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 600</td>
<td>32</td>
<td>5</td>
<td>20.0</td>
<td>9.00</td>
<td>14.2</td>
<td>296</td>
<td>5.2</td>
<td>25</td>
</tr>
<tr>
<td>601–1200</td>
<td>75</td>
<td>10</td>
<td>20.0</td>
<td>10.00</td>
<td>9.4</td>
<td>835</td>
<td>5.2</td>
<td>23</td>
</tr>
<tr>
<td>Over 1200</td>
<td>109</td>
<td>10</td>
<td>25.0</td>
<td>11.00</td>
<td>18.0</td>
<td>1,833</td>
<td>3.2</td>
<td>20</td>
</tr>
</tbody>
</table>

a. The fraction of income households are willing and able to pay for shelter.
b. In year of appraisal report.
c. Expressed in 1983 U.S. dollars per year.
in projects and inflation rates has narrowed appreciably over time, which indicates 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, the scattering of triangles indicates for each project its design affordability ratio in relation to estimated average household monthly income expressed in 1981 dollars. Second, the curve indicates how rent-income ratios are estimated to vary with income for typical target groups (assumed to be in the thirty-fifth percentile of the income distribution) based on the cross-country and within-city econometric results presented in section III. The curve is derived from the transpose of the cross-country housing expenditure equation for renters (equation 2), assuming a 0.5 within-city income elasticity of housing demand, and that income at the thirty-fifth-percentile was about 43 percent of average city income (see footnote 6). The figure may be interpreted as follows: if the target group is assumed to have been households at the thirty-fifth income percentile, then the curve shown on the figure indicates our estimate of their actual willingness to pay for housing as a fraction of income.

The figure clearly suggests that affordability, and by implication project design standards, are systematically overestimated in low-income countries. On the assumption that thirty-fifth percentile households represent the lowest-income target group in sites and services projects, then the majority of projects in countries with average household monthly incomes below $400 appear to have been designed with affordability ratios that were higher than typical ratios of housing expenditures to income—many by substantial margins.9

Some of the implications of setting project standards too high have been discussed in section III; 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 I presented anecdotal evidence that such outcomes have in fact been observed in many sites and services projects. However, 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 1982).

This apparent paradox in the range of outcomes can be partly explained by the existence of subsidies. As section II discussed, subsidies can mitigate a number of possible project problems, in effect purchasing project feasibility at the

9. Were households at the twentieth percentile assumed to have been the lowest-income target group, affordability and design standards would appear to be overstated in countries with monthly incomes below about $150.
Figure 4. World Bank Sites and Services Projects: Assumed Willingness to Pay versus Empirically Estimated Willingness to Pay for Thirty-Fifth Income Percentile

Key: ▲ project assumptions on willingness to pay
       — empirically derived willingness to pay

Note: Based on project appraisal reports. The affordability ratio is that given for the minimum income target group. Income is estimated by adjusting GDP per capita figures to get household disposable income expressed in 1981 U.S. dollars.
Table 3. Cost and Subsidy Elements in Sites and Services Projects

<table>
<thead>
<tr>
<th>Cost element</th>
<th>Subsidy element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site preparation and housing construction</td>
<td>Cross-subsidies from higher- to lower-income households within project, or</td>
</tr>
<tr>
<td>+ Land acquisition</td>
<td>government-provided cost writedowns</td>
</tr>
<tr>
<td>+ Off-site infrastructure and project administration</td>
<td>Government or expropriated private land at below 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 x (1 + economic rate of return)</td>
<td>Prices set to recover schedule costs, not resource costs</td>
</tr>
<tr>
<td>= Total resource costs x market rate of interest</td>
<td>Subsidized interest rates</td>
</tr>
<tr>
<td>= Annualized resource costs</td>
<td></td>
</tr>
</tbody>
</table>

expense of longer-term budgetary obligations. To examine the magnitude of subsidies that have actually been provided in World Bank–financed sites and services projects 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 expenditures, these must be valued 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 table 3. These sorts of subsidies are prevalent in many donor-financed sites and services projects and in 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 2 to 3 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 generally 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 seven 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 12 percent per year rate of interest 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 seven countries.

The resulting calculation measures the economic subsidy as distinct from the financial subsidy in a project. In financial terms, subsidies would be zero if actual project costs were covered by project charges, regardless of whether land prices were written down, interest rates were below the market rate, or units were priced below market selling prices. But in economic terms, subsidies could be considerable even if financial costs were fully covered. By pricing project units so as to recover costs as incurred rather than to recover resources or opportunity costs, project authorities forgo potential revenue and hence decrease opportunities for accumulating surpluses that could be used to replicate projects more broadly.

It could be argued that, from the standpoint of implementing agencies, the best pricing strategy to follow would be one that resulted in no financial subsidy (for example, full recovery of actual costs) but a modest economic subsidy. This latter subsidy would be justified in order to attract participants and to send a
Table 4. Subsidy Estimates and Interest Rates in Sites and Services Projects

<table>
<thead>
<tr>
<th>Country</th>
<th>Subsidy as percentage of annualized resource cost</th>
<th>Interest rate charged in the project (percent)</th>
<th>Compound inflation rate (1973–78) (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Economic</td>
<td>Financial</td>
<td></td>
</tr>
<tr>
<td>Botswana</td>
<td>72</td>
<td>61</td>
<td>8.0</td>
</tr>
<tr>
<td>Côte d'Ivoire</td>
<td>68</td>
<td>49</td>
<td>13.0</td>
</tr>
<tr>
<td>India</td>
<td>20</td>
<td>-10</td>
<td>12.0</td>
</tr>
<tr>
<td>Indonesia</td>
<td>18a</td>
<td>18b</td>
<td>5.0</td>
</tr>
<tr>
<td>Jamaica</td>
<td>62</td>
<td>42</td>
<td>8.0</td>
</tr>
<tr>
<td>Senegal</td>
<td>55</td>
<td>46</td>
<td>7.0</td>
</tr>
<tr>
<td>Tanzania</td>
<td>67</td>
<td>47</td>
<td>6.0</td>
</tr>
</tbody>
</table>

a. Assumes market interest rate of 12 percent.
b. Subsidy estimate not including pricing of units below market value (for example, using cost-based pricing rather than market-based pricing; see text).
c. Project units were priced at market value; hence, economic and financial subsidies are equal.

The message to the private housing sector that shelter solutions for low-income households are capable of both cost recovery and excess demand, leading to profits, thereby stimulating private sector participation in low-income household shelter provision.

Table 4 presents the estimated economic subsidy level as a percentage of annualized resource costs (assuming an opportunity interest rate of 12 percent). With the exception of the Indonesia project, which features market level pricing for all components (but has a subsidized interest rate), and the India (Madras) project, the subsidies range from roughly half to three-quarters of project resource costs. These subsidies have several sources: all projects, except the India project, 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 lower the price charged to low-income households without affecting total project revenue, were implemented only in India and Indonesia.

It should be emphasized that while these subsidy estimates comprise a large part of project costs they probably underestimate 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 exceptions among the seven early projects are the Côte d'Ivoire and India projects, for which the interest rates are either close to or above the market rate.

What should be made of subsidies of the magnitudes in evidence here? The analytical model of section II (elaborated on in the appendix) suggests a number of implications. 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 thirty-fifth-
percentile) target groups suggests that subsidies were probably instrumental in inducing many low-income households to participate that might not otherwise have done so.

Conversely, 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 the 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); and 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 I 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 (1983) that "replicability [can] no longer mean doing more of the same thing." The most obvious concern is that due to budgetary constraints large subsidies will undermine the ability of governments to replicate projects on a large scale and thereby cause them to fail to meet the immense needs of the poor for shelter and services. 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, subsidies are likely to be inefficient, sometimes inequitable, and harmful to the long-term viability of the subsidy-granting institutions.

V. SUMMARY AND CONCLUSIONS

This article has reviewed evidence on the performance of sites and services projects. 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 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 indicates 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 magnitude of the subsidies required to reach typical target groups in World Bank projects (roughly the thirty-fifth percentile of the income distribution) is as high as 80 or 90 percent of project costs in low-income countries with planning standards that are derived from the rule of thumb that households can spend 20–25 percent of income for housing. Alternatively, if no subsidies are provided, households with incomes in the eightieth percentile or above might be the most likely project participants. It was found, 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.

Our review of actual planning practice in World Bank sites and services projects found that all of the projects had significant subsidy elements, with a median subsidy equal to about 62 percent of total resource cost. Sources of subsidies included (1) failure to account for all project costs at their true resource cost (for example, the 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 researchers 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 financial ability of the government to replicate projects on a large scale. Thus 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 and little consideration given to their impact 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 critical 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, 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. We consider each in turn.

The analysis above indicated clearly that project standards are too high in
most low-income developing countries. 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 about affordability. Actual patterns can be
established on the basis of either the sorts of research findings presented in
section III 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 (Mayo and Gross, forthcoming). In the case of
the latter, materials have been developed by Malpezzi, Bamberger, and Mayo
(1982) 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 toward bringing standards down to an appropriate level in many
countries.

To reduce subsidies, pricing policies for sites and services projects must also 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 organiza-
tions 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. Procedures should be established for identifying
subsidy elements, quantifying them, and estimating their incidence and impact
on project beneficiaries and their consequences for institutions responsible for
them. Subsidies should, to the extent possible, be rationalized to serve equity,
efficiency, and project impact criteria.

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 trade-offs made by
households among different elements of the housing and infrastructure bundle
(for example, relative preferences for size and location of plot, size and quality
of structure, proximity to community facilities, and quality and type of infra-
structure), 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 would do for currently available commercial housing, 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 trade-offs in developing countries has been conducted recently by Quigley (1982), Follain and Jimenez (1985), and with particular reference to the demand for secure tenure, by Jimenez (1984) and by Friedman, Jimenez, and Mayo (1985). Related work by Gross (1984) looks not only at the trade-offs 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 trade-offs 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. Government shelter and services policies for other than sites and services projects 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, because there are often severe limits to the extent of reform that can be accomplished at the project level. 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 or 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, an approach that would appear warranted on grounds of both equity and efficiency. Evidence that just such a shift has already begun is presented by Ayres (1983, 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."

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, to create 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. 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, cannot 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.

APPENDIX

Estimation of Minimum Subsidies

We use a Stone-Geary utility function (discussed in depth in Phlips 1974) to approximate household preferences:

\[ U = (H - \Theta_h)^{b_h} (X - \Theta_x)^{b_x} \]

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 Mayo and Gross (1985), 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, \( S_{min} \):
\[ H_{\text{min}} = \left( \frac{y - R_0 - \Theta_x}{y - R_0 - \Theta_x} \right)^{b_x/b_h} (H_0 - \Theta_h) + \Theta_h \]

and

\[ S_{\text{min}} = p_h H_{\text{min}} - R_o \]

where \( R_0 \) = initial preproject rent, \( R_o \) = within-project rent, \( H_s \) = within-project housing, and \( p_h H_{\text{min}} \) = market value of shelter and services provided in the project.

If the project is designed according to the typical sites and services paradigm, within-project rent reflects the design affordability ratio, \( a \), and hence \( R_o = a y \).

Thus, equations 5 and 6 become:

\[ H_{\text{min}} = \left( \frac{y - R_0 - \Theta_x}{y(1 - a) - \Theta_x} \right)^{b_x/b_h} (H_0 - \Theta_h) + \Theta_h \]

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 \( a \). This approximation requires knowing the price elasticity of demand, \( e_p \), the income elasticity of demand, \( e_y \), and the rent-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

\[ R = \Theta_h (1 - b_h) P_h + b_h y - b_h \Theta_x \]

and the expressions for \( e_y \) and \( e_p \), \( e_y = b_h y/R \) and \( e_p = -e_y \frac{y - \Theta_x}{y} \), to solve for \( \Theta_h, \Theta_x, b_h, \) and \( b_x \).

**Estimation of Participant Income Levels**

The participant income level and rent for a project can also be estimated. By manipulating across-country and within-city expenditure functions, we can derive the income level, \( y \), of households that would freely enter a project at its full unsubsidized 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 thirty-fifth income percentile, \( y_{35} \):
where \( \epsilon_y \) is the within-city income elasticity of demand, \( \bar{y} \) is average city income, and \( (R/\bar{y}) \) is the rent-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 \( \bar{y} \) is found by integrating the estimated income density function to an upper limit of \( \bar{y} \).

**References**


