PN-AAU-608
44326

HOUSING POLICY AND IMPROVEMENTS BY OWNER OCCUPANTS: A COMPARISON OF NEIGHBORHOODS IN LIMA, PERU

Report P-7a

By

W. Paul Strassmann
Professor of Economics and Principal Investigator
Housing in Development Unit
Michigan State University
East Lansing, Michigan

September 1981

The research has been sponsored by the Office of Urban Development, Bureau for Development Support, Agency for International Development, in accordance with Contract AID/DS-otr-C-0012.

HOUSING POLICY AND IMPROVEMENTS BY OWNER OCCUPANTS: A COMPARISON OF NEIGHBORHOODS IN LIMA, PERU

Housing policy in developing countries has moved toward support of what goes on naturally--building and improving by occupants.[1] Public support means not just tolerance, however, but provision of streets, lighting, water, drainage, schools, parks, and a variety of urban amenities and safeguards that are inherently collective goods. If more is spent on infrastructure, however, less is available for loans and subsidies (explicit or not) for dwellings. Since the 1960's governments in many countries have therefore shifted from building fully equipped three-room dwellings toward unfinished but expandable core houses and bare serviced sites. Also old slums are upgraded with utilities, and new squatter settlements are regularized and improved in a similar way.

How the alternative policies affect the home improvement activities of the occupants is the subject of this article. That insecure tenure means minimal improvement is already well-known, but how important are general characteristics of a neighborhood and the specific availability of infrastructure? How do they fit in with income levels, family size, stage in the life cycle, years of occupancy, and the like?

The answers are complex and may vary among countries, but willingness to improve seems more important than sheer economic ability. Willingness is particularly influenced by access to water and a sewerage system. Providing for core housing may at times be better than loans only for a serviced site.

---

[1]For helpful comments I am especially indebted to Jorge Bernedo, Michael Farbman, Alfredo Laraburre, Rodolfo Salinas, and Paul Vitale. They bear no responsibility for mistakes in the final draft. Nor does Paul Winder, our tenacious computer programmer. Financial support came from the Agency for International Development.

A Review of Housing Trends in Lima

These ideas and others were tested with a survey of 1,167 households in Lima, Peru, carried out during May and June, 1980.[2] The population of the Metropolitan Area of Lima had grown at 5.1 percent annually during 1940-1961, 5.4 percent during 1961-1972, and 4.8 percent during the late 1970's. Within Lima the share of squatters rose from less than 20 percent in the 1950's to 27 percent in 1980. Their annual rise was over 9 percent.

Since squatters mainly settle on public land, especially in the desert north and south of the city, the expansion of their Pueblos Jóvenes ("young towns") depends largely on official tolerance, perhaps even tacit encouragement. Tolerance was fairly high during the military regimes of Manuel Odría (1948-56) and Juan Velasco Alvarado (1968-75). Average annual settlement in new squatter areas came to over 25,000 people under Odría and to over 54,000 under Velasco, meaning a shift of 2.6 and 1.8 percent of the Metropolitan population each year. Migration to and expansion of older squatter areas are not included in these figures. During the intervening period of Presidents Manuel Prado and Fernando Belaunde (1956-68), new settlement formation was less--about 17,000 people annually or about 1.0 percent of the Metropolitan population.[3]

---

[2]The survey was conducted by the Technical Office for Manpower Studies, General Bureau of Employment, Ministry of Labor, under the supervision of Edgar Flores, Abel Centurión, Jorge Bernedo, and Norma Botero. For sampling efficiency a two-stage stratified cluster design was used. Of 5,800 classified subdistricts with about 120 dwellings in each, 203 subdistricts were chosen at random, yet in accordance with the stratification. All 24,400 dwellings in these subdistricts were then registered, and an average of 6.3 dwellings was selected at random from each for interviews. 162 losses occurred due to demolition, conversion, vacancy, refusal to respond, or repeated absence. 53 supplemental dwellings were added in accordance with a systematic procedure to allow for increased density of settlement. The original aim was 1,200 interviews. Exact dates of the survey were May 10-July 3, 1980. The stratification method is partially explained in the text.

[3]David Collier, Squatters and Oligarchs: Authoritarian Rule and Policy Change in Peru (Baltimore: Johns Hopkins University Press, 1976), p. 49. During 1962-63, partly during the Godoy-Lindley military government, an additional 35,200 people formed settlements.

During this period an attempt was made to have settlers acquire public utilities promptly with full-cost loans instead of subsidies that might further accelerate migration to Lima. In 1980, 73 percent of households had at least a water faucet and 62.5 percent had a toilet connected to the sewerage system.

Finance for building has been channeled through a variety of public agencies set up by successive governments. A national mortgage bank, Banco Central Hipotecario, dates back to President Augusto Leguía (1919-30). The Corporación Nacional de Vivienda (CNV) was set up under President Bustamente (1945-48) and built thousands of units. Pedro Beltrán, Prime Minister under President Manual Prado, fostered a system of mutual savings and loan associations and created an Instituto Nacional de Vivienda (INV) for encouraging private (expandable) housing as the solution to the nation's "number one problem." His newspaper, La Prensa, had earlier sponsored raffles of 2-room "Casas baratas que crecen" (La Prensa, January 13, 1955). The CNV and INV were combined in a Junta Nacional de la Vivienda (JNV) by the 1962-63 military government. A Banco de la Vivienda became the supervisor of and financial channel to the mutual associations. By 1967 appropriations to the JNV were cut by 89 percent from the 1963 level. Meanwhile some public housing projects were built that only the middle and upper middle class could afford. A Ministerio de Vivienda y Construcción was set up by Velasco in 1969 and given responsibilities for planning many aspects of the sector. Ten years later came the Fondo Nacional de Vivienda (FONAVI) which finances housing construction with funds obtained from a 4 percent payroll tax and matching contributions. Public housing is administered by the Empresa de Administración de Inmuebles del Peru (EMADI). In September 1980 a Banco de Materiales was set up to make loans for buying materials to low-income families who wish to build or to expand a small core house.

These Agencies rise and decline in accordance with the general monetary situation, the availability of international loans, and political priorities. Meanwhile the process of squatting and urbanization goes on, and so does the observation thereof. It was in Lima that John F. C. Turner and William Mangin made the pioneering studies that altered the world wide professional opinion of squatter settlements from negative to positive.[4]

Dwelling Improvements and Neighborhoods

Although our survey covered the entire Metropolitan Area of Lima, as shown in Tables 1 and 2, this article is concerned only with improvements in two types of neighborhoods primarily occupied by the poor: Popular Urbanizations and Pueblos Jóvenes. In 1980 43.4 percent of households lived in these two types. Pueblos Jóvenes are the squatter settlements, mainly in former deserts north and south of the original city and usually begun by well-organized "invasions" of several hundred families, as described above. Official recognition, land titles, and public utilities are expected but uncertain. Construction begins with shacks made of wooden posts and straw mats and proceeds to bricks and concrete. Popular urbanizations also provide land for organized low-income groups, such as cooperatives set up for the purpose, at times by the sellers of private land. Payment is a collective responsibility.

---

[4]Turner, however, gives much of the credit to the Peruvian architect-planner, Eduardo Neir, and to the anthropologist, José Matos Mar. See John F. C. Turner, "The Reeducation of a Professional," in Turner and Robert Fichter, eds., Freedom to Build (New York: Macmillan, 1972), pp. 122-147. See also William Mangin and John F. C. Turner, "The Barriada Movement," Progressive Architecture, May 1968; William Mangin, "Latin American Squatter Settlements: A Problem and a Solution," Latin American Research Review, Vol. 2, No. 3, 1967; Peter Lloyd, Slums of Hope? Shanty Towns of the Third World (London: Penguin, 1979). For a contrasting view, see Abelardo Sánchez León, Raul Guerrero de los Ríos, Julio Carderón Cockburn, Luis Olivera Cardenas, Tugurización en Lima Metropolitana Lima: Desco, Centro de Estudios y Promocion del Desarrollo, 1979.

Table 1 -- Characteristics of Dwellings by Type of Neighborhood,[a] Metropolitan Lima, May-June 1980

	1. Luxury Residential	2. Conventional	3. Standard Urbanization	4. Popular Urbanization	5. Pueblos Jóvenes	6. Substandard, Subdivided	7. All[b]
1. Floorspace m^2	246	100	98	109	87	65	104
2. Lot area m^2	301	107	144	173	152	120	148
3. Rooms, No.	5.79	3.49	3.90	3.68	2.97	2.72	3.51
4. Rooms added (owners)	.44	.99	.71	1.82	1.38	.54	1.20
5. Water tap or bathroom, percent of dwellings	96.1	75.5	87.5	74.4	60.6	67.2	73.0
6. Sewerage system connection, percent	94.7	73.6	79.6	66.0	36.2	58.6	62.5
7. Improvement types No. (owners)	3.3	5.4	3.0	5.5	4.4	4.4	4.5
8. Percent Owner-occupation	65.8	35.5	70.8	77.0	87.0	40.5	62.0
9. Value,[c] US$ (owners, n =)	35,800 (55)	13,100 (149)	10,400 (86)	8,400 (166)	2,600 (291)	5,100 (48)	9,200 (805)
10. Rent, US$ (tenants, n =)	39.30 (19)	16.40 (176)	11.75 (26)	15.00 (23)	8.80 (19)	9.05 (66)	15.50 (341)

Source: May - June 1980 Housing Survey.

Notes: a. For definition of the six neighborhood types, see footnote 5.
b. Includes 26 dwellings in unclassified neighborhoods.
c. No value was indicated by 21 households, including some of the 82 free users. US$1 = 285 soles.

Table 2 -- Characteristics of Households by Type of Neighborhood, Metropolitan Lima, May-June, 1980

	1. Luxury Residential	2. Conventional	3. Standard Urbanization	4. Popular Urbanization	5. Pueblos Jóvenes	6. Substandard, Subdivided	7. All[a]
1. Sample Distribution, number (%)	76 (6.5)	330 (28.3)	113 (9.7)	191 (16.4)	315 (27.0)	116 (9.9)	1,167 (100.0
2. Household size, No.	4.8	4.7	5.2	6.0	6.2	5.1	5.4
3. Adults, No.	3.8	3.2	3.3	3.2	3.2	3.1	3.2
4. Age of Head	52.4	47.0	44.1	42.5	43.6	45.7	45.3
5. Employed, No.	2.1	1.8	1.8	1.7	1.7	1.7	1.8
6. Income, monthly US$	500.7	273.0	254.4	200.7	153.0	187.0	235.1
7. Years at Site	12.2	12.5	7.6	9.5	10.4	13.8	11.0
8. Owners, no mortgage, %	48.7	26.4	29.2	62.8	84.8	31.0	50.3
9. Owner, mortgage, %	15.8	4.8	24.8	6.3	2.2	4.3	7.0
10. Hire-purchase, %	1.3	4.2	16.8	7.9	0	5.2	4.7
11. Renter, %	26.3	53.6	23.0	12.0	6.0	56.9	29.4
12. Lent free by family, %	3.9	3.6	3.5	9.4	4.1	.9	4.5
13. Other tenure, %	3.9	7.3	2.7	1.5	2.9	1.8	4.1
14. Improvements made with some self help labor, %	30.9	48.9	59.8	79.8	73.0	73.5	63.6

Source: May - June 1980 Housing Survey.

Note: a. Includes 26 unclassified households.

Construction begins with permanent housing made of bricks and concrete, and everything being legal, infrastructure is usually installed simultaneously. The prospect of collateral gives access to the organized credit system, such as savings and loan associations.[5]

The characteristics of dwellings and households in the six types of neighborhoods are given in Tables 1 and 2. Households in Popular Urbanizations and Pueblos Jóvenes are more likely than others to have added a room to the original structure, 1.8 and 1.4 rooms, respectively (Table 1, line 4). Adding rooms was the main type of improvement throughout the city and the one that is most easily quantified. The other 16 types of improvement, such as adding a fence or plastering walls, are simply registered as having been carried out or not. Households in Pueblos Jóvenes, for example, made 4.4 types of improvement, about the same number as the average owning household. Those in Popular Urbanizations made 5.5 types of improvement, substantially more than any other group except those in conventional neighborhoods who made 5.4 (Table 1, line 7). What those types of improvement were and the extent to which they were made by owner-occupants in the various neighborhoods is shown in Table 3.

---

[5]The six categories of neighborhoods are in standard use by researchers in Lima such as the Office of Technical Manpower Studies, the Centro de Estudios y Promoción del Desarrollo (DESCO), and others. "Substandard and subdivided" is my term for quintas, callejones, corralones, and rancherías. These are old subdivided mansions or apartment buildings and small individual units around a common patio. Most are rented.

"Luxury Residential" neighborhoods consist primarily of large (250 m^2, 6 rooms besides kitchen and baths), detached dwellings with garages. In "conventional" neighborhoods dwellings are smaller, not detached, and if not apartments, they were usually built to order for the original occupant. "Standard urbanizations" are neighborhoods in which developers had a number of blocks equipped with public utilities before allowing construction of middle class housing (4 rooms, 100 m^2). They differ from the "conventional" mainly in being newer and laid out on a larger scale.

Table 3 -- Percentage of Owner-occupants Making Different Types of Improvements in Different Types of Neighborhoods, Lima, 1980.

	1. Luxury Residential	2. Conventional	3. Standard Urbanization	4. Popular Urbanization	5. Pueblos Jóvenes	6. Substandard, Subdivided	7. All[a]
A. Basic	%	%	%	%	%	%	%
1. Reconstruct the house	6.0	9.4	10.0	37.4	49.3	12.8	30.2
2. Room(s) added	24.0	31.6	25.0	55.1	51.5	21.3	41.9
3. Wall materials changed	6.0	13.7	8.8	38.8	32.8	19.1	25.3
4. Roof materials better	4.0	12.8	8.8	30.6	17.9	8.5	17.0
B. Utilities							
1. Water facilities better	12.0	14.5	12.5	32.0	33.2	21.3	25.4
2. Toilet better	24.0	27.4	18.8	33.3	25.9	21.3	26.7
3. Kitchen improvements	22.0	23.9	26.2	40.8	21.2	12.8	26.0
C. Finishes							
1. Interior plastering and painting	56.0	50.4	43.8	47.6	25.2	38.3	39.4
2. Floor improvements	22.0	28.2	17.5	44.9	30.3	17.0	30.1
3. Windows and doors improved	26.0	29.1	27.5	41.5	24.8	23.4	29.4
4. Outside plastering	6.0	23.1	10.0	25.9	20.1	19.1	19.6
5. Interior ceiling	4.0	10.3	11.2	23.1	28.9	2.1	11.5

Table 3 (cont'd) -- Percentage of Owner-occupants Making Different Types of Improvements in Different Types of Neighborhoods, Lima, 1980.

	1. Luxury Residential	2. Conventional	3. Standard Urbanization	4. Popular Urbanization	5. Pueblos Jóvenes	6. Substandard, Subdivided	7. All[a]
D. Site Changes							
1. Grading	2.0	1.7	2.5	20.4	39.8	4.3	20.2
2. Adding fill	2.0	.9	2.5	13.6	23.7	4.3	12.6
3. Fence or wall	12.0	13.7	21.2	10.2	6.6	6.4	10.4
4. Garden	14.0	12.0	13.7	16.3	5.8	--	9.9
E. Other	4.0	0.9	1.2	2.7	0.4	--	1.2

Our objective is to explain why households in Popular Urbanizations made more improvements than those in Pueblos Jóvenes. Were they sufficiently different or were they provided with different opportunities?

Demographically, the two groups were very similar. Household size for Popular Urbanization averaged 6.0 and for Pueblos Jóvenes, 6.2. Both had 3.2 members 18 years old or more and 1.7 members employed. Age of the average head was 42.5 and 43.6 years. The average household in Popular urbanizations had lived there for 9.5 years, while those in Pueblos Jóvenes had been there 10.4 years. Compared with the rest of the city, households in both groups were larger, younger, and newer to their neighborhood (Table 2, lines 2-5).

Income Versus Opportunity

Income levels were 31 percent higher in the Popular Urbanizations, $201 monthly compared with $153. (Table 2, line 6.) Regression analysis showed that income was significantly (.01 level) associated with the number of improvement types for households below the median monthly income level of 50,000 soles or US $175. But it explained only 2.1 percent of the variation. Above the median income level, income played no part in explaining home improvement. In general, as income rises so does the ability to make improvements, but with better housing the need to do so falls. The large difference in improvements between households in Popular Urbanizations and those in Pueblos Jóvenes is therefore not explained by income. The greater use of selfhelp labor (79.8 compared with 73.0 percent) in making improvements in Popular Urbanizations also suggests that what made the difference was not ability but willingness, perhaps inspired by opportunity.

Opportunity and its perception can take many forms and easily lead us into intangible speculations. Most plausible is that improvements will seem

more worthwhile if one's lot is large, securely owned, and well equipped with water, sewerage lines, and other infrastructure. Lots in Popular Urbanizations were only 14 percent larger than in Pueblos Jóvenes (Table 1, line 2), probably not enough to make much difference. Tenure matters, but for the average squatter with 10.4 years at a site the chance of eviction around Lima was known to be low.

That leaves the big difference in infrastructure. The proportion of sites with piped water in Popular Urbanizations was 74.6 percent compared with 60.6 percent in Pueblos Jóvenes; and the share with sewerage system connections was 66.0 percent compared with a mere 36.2 percent. If a dummy variable for a sewerage connection is introduced in the regression to explain the number of improvements, it is significant at the .01 level and more than doubles the explained variation. It also brings down the coefficient for income and lowers its significance to the .05 level.

A different way of assessing the extent of improvement is with Logit analysis. In Lima 18.4 percent of households made no improvements and 25.8 percent made 6 or more types of improvements. Below the median income level, the two percentages were 17.0 and 23.9 percent. As Table 4 shows, with a sewerage system connection, the probability of having made 6 or more improvements more than doubles.

Differences in Value

Another difference between the two types of neighborhood is in average dwelling value (Table 1, line 9). Those in Popular Urbanizations are worth $8,400, as assessed by the occupants,[6] and those in Pueblos Jóvenes were

---

[6]The interview question was, "If you were going to sell your dwelling today, at what price do you believe that you could sell it?" Housing researchers have found this method accurate throughout the world, meaning a small variation from actual sales prices or values assessed by appraisers.

Table 4 -- Probability of Having Made 6 or More Improvements, Percent

		Sewerage System Connection	No Connection
Household size:	6		
Years in place:	11.1	30.7	15.2
Household size:	4		
Years in place:	5	22.8	10.6

Source: Data from a survey of 1,167 households, May-June 1980. The logit equation is: Log of the odds = -2.709 + .1054 (household size) + .03192 (years in place) + .909 (sewer system dummy variable). T statistics are 3.05 or higher.

valued as less than a third as much, or $2,600. There is a difference of 21 m^2 in lot size and 22 m^2 in floorspace that goes with a variation of 0.7 rooms. With a hedonic (double logarithmic) analysis we can assess the separate contributions to value of these factors as well as age of the dwelling, type of materials, finish of plaster and paint, water access, type of sanitation, availability of electricity, and travel time to work. The conclusion is that with all those held constant, a dwelling would still have a value 52 percent higher if located in a Popular Urbanization instead of a Pueblo Joven. The value of a $2,600 house would rise to $3,952. Access to the sewerage system and the installation of a complete bathroom would raise the value of this dwelling by a further 96.6 percent to $7,770. Of course, $3,818 (the difference) is far more than the plumbing installation would actually cost. Partly it shows the additional improvements and embellishments that confident owners would make on a structure of given size, location, and type of materials.[7]

The difference in value is not just due to the number but also to the kind of improvements that owners in the two types of neighborhood make. Table 3 shows that those in Pueblos Jóvenes are more likely to grade the land, add fill, and to reconstruct the house entirely (usually substituting permanent materials for straw mats and scrap wood). By contrast, dwellings in Popular Urbanizations will already have all those qualities, and owners are more likely to improve their kitchens, floors, windows, doors, and to plaster and paint the interior. They are ready to go beyond the barest essentials although their incomes are not much higher but encumbered by more loans and subject to more taxes.

---

[7]Using Pueblos Jóvenes as the base, the dummy variable for a Popular Urbanization had a coefficient of .420 and was significant at the .01 level. For the sewerage system connection the coefficient was .410 (standard error .166) and for one complete bathroom it was .266 (standard error .143). See Table 5.

Cost

An analysis of the benefits of piped water and sewerage systems is incomplete without a comparison of costs. In Lima water vendors have charged 16 to 25 times more per liter than the public utility. Those who have to buy water from the vendors use less but still pay about 2.5 percent of their income for water, compared with about 0.5 percent for others.[8] In 1980 the capital cost of equipping a lot with a water connection was $116: $80 for the street lines and $36 for the domestic connection.[9] According to the World Bank, communal standpipes would cost less than half as much as individual connections, depending on density, although "it is almost impossible to generalize."[10] In any case, compared with the effect on attitudes and improving activities by the occupants, the extra cost of an individual connection is low.

The case for waterborne sewerage systems is weaker. The cost of a connection is likely to be 2 to 5 times that of piped water, depending partly on the slope and character of the terrain. In the level or gently sloping areas around Lima, the network of street lines would cost $145 per lot in 1980 and the domestic connections $70: Total, $215.[11] This amount is about half as much as the $400.3 cost per site per year estimated as typical for poor countries by a 1978 World Bank study. At that rate a household with

---

[8] Vinod Thomas, "The Measurement of Spatial Differences in Poverty: The Case of Peru," World Bank Staff Working Paper 273 (Washington, 1978), p. 78, cited in Johannes Linn, "Policies for Efficient and Equitable Growth of Cities in Developing Countries," World Bank Staff Working Paper No. 342 (Washington, July 1979), pp. 248-249.

[9] This estimate applies to the cost per lot if 500 lots with an average area of 116.2 m^2 are equipped. Cost data were supplied by the Peruvian Ministry of Housing and Construction and by the Lima office of the Agency for International Development.

[10] Robert Saunders and Jeremy Warford, (Baltimore: Johns Hopkins University Press for the World Bank, 1976), p. 125.

[11] See footnote 9.

a $90 monthly income would have to spend 46 percent to finance the connection over 20 years at 8 percent interest.[12] At the Lima cost of $215 and average income in Pueblos Jóvenes of $153, the share of income needed would be 15 percent, still high but at least worth considering together with modest subsidies. The alternative sanitation methods are communal toilets, bucket cartage, vaccuum truck cartage, pit latrines, composting toilets, and certain novel low-cost septic tanks that may cost $20 to $70 per year.[13] The problem is to make these methods seem so good and permanent to occupants that they will not wait for or move to sewerage-system-connected lots before making improvements.

Conclusion

Resources are allocated to urban infrastructure and housing, not only for their immediate utility, but also to generate various indirect benefits. One of these benefits is the expansion and improvement of dwellings by owner occupants. In poor countries low-income housing must in any case be built in this manner. To assess the effectiveness of any policy, one should therefore know how much improving and adding would have gone on without the policy and also which particular facet of the policy had the most stimulating effect.

Popular urbanizations in Lima differ from the far less organized growth of Pueblos Jóvenes in numerous ways. The critical policy facet, however, that makes households in Popular Urbanizations more energetic improvers is the

---

[12] John Kalbermatten, DeAnne Julius, and Charles Gunnerson, "Appropriate Sanitation Alternatives: A Technical and Economic Appraisal," (World Bank, mimeographed, 1978) Tables 4.1 and 4.12, cited by Linn, op. cit., p. 255.

[13] R. F. Carroll, Affordable Sanitation for Developing Countries, Building Research Establishment Note, N 147/80 (Garston Watford, November 1980).

earlier provision of piped water and a sewerage system. It doubles the probability of making six or more types of improvement. Length of time at a site and size of the household also matter, but in these respects settlers in both types of neighborhood were very similar. Differences in income mainly determine which type of improvement households choose to make. The correlation of income with the amount of improvement is very low. Even high-income households in luxury neighborhoods made 75 percent as many types of improvement as owner occupants in the poorest districts. For few households in Lima was security of tenure much of an issue by 1980 so we could not test for the importance of that factor.

These results for Lima can be compared with those of similar studies that we have made on a smaller scale in five other cities: Lusaka, Zambia; Medellín, Colombia; Nairobi, Kenya; Rawalpindi, Pakistan; and Tunis, Tunisia. In each we compared the amount of expansion and improvement by 40-80 households on sites that had begun as core housing with improvement in pure squatter settlements. In two cities--Lusaka and Medellín--we found that the amount of improvement in both types of settlement was about the same. In three cities--Nairobi, Rawalpindi, and Tunis--occupants of core houses had added and improved to a far greater extent.

A closer look at the two types of settlements in the five cities suggests why there was that contrast--much difference in upgrading in three cities and little difference in two. In the three cities in which the core house occupants had improved more than squatters, they also had more access to waterborne sewerage systems. In Nairobi it was 98.7 percent connected compared with no access. In Rawalpindi 78.3 percent in core houses had flush toilets, but only 8.5 percent of squatters had them. All core houses in Tunis had flush toilets, compared with 44 percent of squatters.

In both Lusaka and Medellín, core house dwellers had about the same access to piped water and a sewerage system as squatters: None in Lusaka and the vast majority in Medellín. Thus in Lusaka both core housing and squatter settlements had 95 percent of dwellings equipped with pit latrines. In Medellín complete bathrooms had been installed by 93 percent of core house recipients and by 87.5 percent of squatters, showing that the authorities had extended the water and sewerage systems to their areas.[14]

The conclusion is not that pit latrines and neighborhood standpipes are never appropriate. The poorest countries simply cannot afford more than that. Innovations that make outhouses and standpipes more functional and attractive should be welcomed. At the same time it should be clear that families throughout the world think much more of their dwelling if it has piped water and a flushing toilet. They regard it as a much better investment and a more tolerable habitat, and they will work evenings and weekends to add a room, to plaster and plant, to install better windows and doors, and to plant a garden. Thus infrastructure investment kindles employment and brings forth housing.

W. Paul Strassmann
Professor of Economics
Michigan State University

---

[14] In the summer of 1979 the survey of Lusaka was conducted by Manenga Ndulo; that of Medellín by Norma Botero; Nairobi by Davinder Lamba and Suresh Amlani; Rawalpindi by Ehsan Ahmed; and Tunis by Ridha Ferchiou. They generally selected specific neighborhoods, not the entire city at random, as was done in the case of Lima. In 1978 some 293 households were surveyed with similar results.

See also, W. Paul Strassmann, The Transformation of Housing: The Experience of Cartagena, Colombia (Baltimore: Johns Hopkins University Press for the World Bank, forthcoming).

Table 5 -- Determinants of Dwelling Value: Hedonic (log - log) Regression Coefficients, Lima, 1980.

Variable	Total Sample n = 805	Total Sample, District Dummies n = 805	Low Range: HO-H3 n = 554	High Range: H3-H5 n = 372
1. Age of dwelling	.076 (.040)	.066 (.040)	.121** (.046)	-.047 (.043)
2. Floorspace	.261** (.068)	.269** (.068)	.180* (.086)	.222** (.064)
3. Number of rooms	.346** (.092)	.306** (.089)	.260* (.111)	.323** (.101)
4. Walls made of bricks, concrete blocks, or reinforced concrete	.621** (.102)	.666** (.099)	.613** (.103)	.292 (.252)
5. Roof made of tiles or reinforced concrete	.746** (.104)	.654** (.103)	.551** (.110)	-.008 (.147)
6. Exterior plastered and painted: finished	.169* (.078)	.082 (.078)	.133 (.087)	.111 (.094)
7. Water access (dummies)				
a. Own tap, no shower	.033 (.104)	.059 (.102)	.077 (.105)	-.136 (.247)
b. One complete bathroom	.374** (.145)	.266 (.143)	.297* (.151)	.155 (.238)
c. Two or more bathrooms	.839** (.176)	.624** (.176)	.020 (.477)	.550* (.248)
8. Sanitation (dummies)				
a. Latrine	.068 (.138)	.032 (.133)	.097 (.137)	.014 (.627)
b. Shared flush toilet	.517* (.242)	.147 (.243)	.435 (.248)	.345 (.792)
c. Septic tank	.176 (.220)	.183 (.213)	.052 (.225)	.253 (.631)
d. Sewerage system connection	.481** (.171)	.410* (.166)	.413* (.172)	.052 (.583)

Table 5 -- (continued)

Variable	Total Sample n = 805	Total Sample, District Dummies n = 805	Low Range: H0-H3 n = 554	High Range: H3-H5 n = 372
9. Electricity (dummies)				
a. Monophase	-.061 (.114)	-.081 (.111)	-.036 (.116)	-.044 (.285)
b. Triphase	.340* (.172)	.124 (.178)	.319 (.322)	.364 (.299)
10. Site area	.274** (.058)	.272** (.057)	.233** (.069)	.112 (.058)
11. Travel time to work, average, all workers	-.136** (.044)	-.108* (.043)	-.079 (.050)	-.164** (.050)
12. Income of neighbors (dummies)				
a. Higher than own	.029 (.110)	-.024 (.108)	-.122 (.131)	.115 (.119)
b. Lower than own	-.271 (.149)	-.200 (.146)	-.151 (.160)	-.251 (.183)
13. District				
a. Luxury		.831** (.172)		
b. Conventional		.621** (.120)		
c. Standard urbanization		.501** (.126)		
d. Low-cost urbanization		.420** (.091)		
e. Substandard, subdivided		(.394)* .160		
f. Unclassified district		.272** (.057)		
g. Pueblos jóvenes		base		

Table 5 -- (continued)

	Variable	Total Sample n = 805	Total Sample, District Dummies n = 805	Low Range: HO-H3 n = 554	High Range: H3-H5 n = 372
14.	Constant	9.531** (.359)	9.395** (.355)	9.836** (.427)	12.910* (.801)
15.	Adjusted R^2	.746	.761	.532	.483
16.	F Statistic	93.69	77.38	25.23	14.47
17.	Mean value of dwelling, million soles	2.537	2.537	.696	5.100

Source: Survey of 1,167 households, June 10 - July 3, 1980.

Note: Statistical significance at the .01 level is indicated by two stars and that at the .05 level by one star. Standard errors are given in parentheses. US $1 = 285 soles.

The low range includes all dwellings worth 2.4 million soles or less. The high range includes all dwellings worth more than 1.2 million soles. Value was determined by asking, "If you were going to sell your dwelling today, at what price do you believe that you could sell it?"