INCOME AND HOUSING
IN
THE METROPOLITAN AREA OF LIMA, PERU
1970 - 1990

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Income and Housing from 1970 to 1990: A Preview

During the decade of the 1970's the value of output and housing in the Metropolitan Area of Lima grew primarily because of population growth and the rise in the labor force. Due to a variety of economic problems, output and housing did not grow faster than the number of households. If the median monthly income level grew from 7,000 soles in 1971-72 to 50,000 soles (US$ 175) in 1980, the change was almost entirely due to inflation. Both at the beginning and at the end of the decade, the typical dwelling had three rooms besides the kitchen and a floorspace of about 45 m^2. It was occupied by 5.5 persons. The nominal value of such a dwelling rose ten times from $100,000 to $1 million (US$ 3,500).

Housing was more unequally distributed than income. As one moves from the poorest to the richest households, the quality and value of housing rises faster than incomes. Higher income households spend a larger portion of their income on housing than poorer ones, or they have accumulated such housing with past expenditures. This pattern did not change during the 1970's. The concentration ratio (Gini coefficient: 1 = perfect inequality, 0 = perfect equality) remained higher for housing than for income. For income it fell slightly from .396 to .363. For housing it also fell, from .430 to .395, but those figures may be misleading.

Let us divide the households into six income ranges and call them F0, F1, F2, F3, F4, and F5. The middle income range of F2 and F3 families extends from incomes 56 percent of the median level, or $28,000, to 180 percent of the median, or $90,000 (US$ 316). During the decade the proportion of households within this range rose from 57.6 to 64.0 percent. Those above fell from 20.7 percent to 19.2 percent, and those below from 21.7 percent to 16.8 percent.

The housing stock can be divided into six similar ranges -- H0, H1, H2, H3, H4, and H5: temporary, substandard, minimal, basic, good, and excellent -- as will be described in more detail later. H2 and H3 housing are the sort that F2 and F3 households can afford to buy, build, or rent without subsidies. During the 1970's the share of H2 and H3 housing fell from 43 to 31 percent of the housing stock. While the rest of the stock nearly doubled during the decade, rising by 97.0 percent, H2 and H3 housing rose by only 13.2 percent. In terms of value, only about seven percent of net additions to the dwelling stock were in this range although it was appropriate for nearly two-thirds of the population. It is no wonder that prices and rents in the H2-H3 range had a tendency to rise 20 percent faster than the average of the housing stock.

Because of failure to encourage enough H2 and H3 building, the share of small temporary and substandard units, often without adequate public utilities, rose from 35.0 percent in 1970 to 42.9 percent in 1980. Value of such inadequate units in June 1980 was $600,000 (*US$ 2,100) or less, and they rented for $2,000 (*US$ 7) per month or less.

At the other end of the scale is housing worth more than $2.4 million (*US$ 8,400) or renting for over $8,000 (US$ 28) monthly. Such H4 and H5 units were built of bricks or reinforced concrete, had all public utilities, and at least four rooms beside a kithchen and bathroom or two. The share of such dwellings rose from 22 to 26 percent during 1970-80. Indeed, the rise was concentrated among units worth over $4.8 million.

Among many possible goals of housing policy, one option is to let households build, buy, or rent whatever they are willing to borrow or pay for without subsidies or controls. That would put the average F4 household

into H4 housing, F3 into H3, etc. How much of each housing type needs to be built by 1990 with this goal depends mainly on the growth rate of the number of households and their incomes. With plausible, perhaps slightly optimistic assumptions, 57.0 percent of households would still be in the F2-F3 income range and would need 757,000 H2 and H3 units. To make up for the lag of such construction during the 1970's, about 71 percent of all net additions to the housing stock would have to be in this range. Since these units costs half as much as H4 and H5 units, the cost would come to only 47 percent of net new residential buidlings. (See Tables 10 and 11).

It is likely that in 1990 around 10 percent of households will continue to earn less than $28,000 (US$ 98) monthly. In absolute numbers, this may be a slight decline from the 150,000 households in the lowest ranges in 1980. For them anything better than substandard housing would require an open or disguised subsidy. If that is not provided, many will have to replace part of the deteriorating substandard or temporary housing stock with equivalent new units. In the following sections, all these assertions will be supported with more detailed analysis and with data, primarily from the 1980 housing survey.

Distribution of the 1980 Housing Stock

The way the 1980 housing stock, divided into six major categories, was divided among Lima households according to six income categories is shown in Table 1, a "stock-user matrix." Each row shows what sort of housing was occupied by an income group, and each column shows how a housing type was distributed among different income groups. The assumption is that the 897,000 households of the Lima Metropolitan Area had the same division

Table 1. Distribution of the 1980 Housing Stock and Net Additions since 1970. (Thousands of units and percentages.)

Households Monthly Income \ Dwellings	H_0 Temporary	H_1 Sub-standard	H_2 Minimal	H_3 Basic	H_4 Good	H_5 Excellent	Σ_F	Index
Thousands of 1980 Soles F_0 15 or less	24.2 (2.7)	6.3 (.7)	4.5 (.5)	.9 (.1)			36.8 (4.1)	
F_1 15.1 - 28	63.7 (7.1)	21.5 (2.4)	16.1 (1.8)	10.8 (1.2)	1.8 (.2)	.9 (.1)	113.7 (12.7)	
F_2 28.1 - 50	113.0 (12.6)	64.6 (7.2)	67.3 (7.5)	45.7 (5.1)	30.5 (3.4)	10.8 (1.2)	332.8 (37.1)	
F_3 50.1 - 90	36.5 (4.1)	38.6 (4.3)	33.2 (3.7)	60.1 (6.7)	45.7 (5.1)	26.9 (3.0)	241.4 (26.9)	
F_4 90.1 - 162	11.7 (1.3)	5.4 (.6)	15.2 (1.7)	19.7 (2.2)	34.1 (3.8)	44.0 (4.9)	130.1 (14.5)	
F_5 Over 162			2.7 (.3)	2.7 (.3)	12.6 (1.4)	25.1 (2.8)	42.2 (4.7)	
Σ_H Total	249.5 (27.7)	136.3 (15.2)	138.1 (15.4)	139.9 (15.6)	125.6 (14.0)	107.6 (12.0)	897.0 (100.0)	
1970 Stock	96.3	102.0	119.0	124.6	79.3	45.3	566.5	
Net Addition, 1970 - 1980	153.2 (46.4)	34.3 (10.4)	19.1 (5.8)	15.3 (4.6)	46.3 (14.0)	62.3 (18.9)	330.5	

Source: Table 4 and a Survey of 1,167 household carried out during June 10 - July 3, 1980, by the Office of Technical Manpower Studies, Dirección General del Empleo, Ministerio de Trabajo, Lima.

Table 2. Distribution of Sample Observations of Rental Housing, Lima, June-July 1980

COUNT / ROW PCT / COL PCT / TOT PCT	H0	H1	H2	H3	H4	H5	ROW TOTAL
F0	10 71.4 11.6 2.9	3 21.4 3.7 .9	1 7.1 1.4 .3	0 0 0 0	0 0 0 0	0 0 0 0	14 4.1
F1	23 43.4 26.7 6.7	13 24.5 16.2 3.8	11 21.6 15.7 3.2	5 9.4 8.6 1.5	1 1.9 3.0 .3	0 0 0 0	53 15.5
F2	33 26.8 38.4 9.7	35 28.5 43.8 10.3	30 24.4 42.9 8.8	18 14.6 31.0 5.3	5 4.1 15.2 1.5	2 1.6 14.3 .6	123 36.1
F3	15 15.8 17.4 4.4	25 26.3 31.3 7.3	17 17.9 24.3 5.0	26 27.4 44.8 7.6	11 11.6 33.3 3.2	1 1.1 7.1 .3	95 27.9
F4	5 11.4 5.8 1.5	4 9.1 5.0 1.2	10 22.7 14.3 2.9	7 15.9 12.1 2.1	12 27.3 36.4 3.5	6 13.6 42.9 1.8	44 12.9
F5	0 0 0 0	0 0 0 0	1 8.3 1.4 .3	2 16.7 3.4 .6	4 33.3 12.1 1.2	5 41.7 35.7 1.5	12 3.5
COLUMN TOTAL	86 25.2	80 23.5	76 22.5	58 17.0	33 9.7	14 4.1	341 100.0

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

Table 3. Distribution of Sample Observations of Owner-occupied and Other Non-Rental Housing, Lima, June-July 1980.

COUNT / ROW PCT / COL PCT / TOT PCT	H0	H1	H2	H3	H4	H5	ROW TOTAL
F0	21 63.6 9.1 2.6	5 15.2 5.3 .6	5 15.2 4.7 .6	1 3.0 .8 .1	0 0 0 0	(1 (3.0 (.8 (.1	33 4.1
F1	58 62.4 25.0 7.2	14 15.1 14.9 1.7	10 10.8 9.3 1.2	9 9.7 7.4 1.1	1 1.1 .8 .1	1 1.1 .8 .1	93 11.6
F2	111 36.8 47.8 13.8	48 15.9 51.1 6.0	56 18.5 52.3 7.0	41 13.6 33.9 5.1	34 11.3 26.8 4.2	12 4.0 9.7 1.5	302 37.5
F3	32 15.0 13.8 4.0	24 11.3 25.5 3.0	25 11.7 23.4 3.1	51 23.9 42.1 6.3	48 22.5 37.8 6.0	33 15.5 26.6 4.1	213 26.5
F4	10 8.2 4.3 1.2	3 2.5 3.2 .4	9 7.4 8.4 1.1	18 14.8 14.9 2.2	32 26.2 25.2 4.0	50 41.0 40.3 6.2	122 15.2
F5	0 0 0 0	0 0 0 0	2 4.8 1.9 .2	1 2.4 .8 .1	12 28.6 9.4 1.5	27 64.3 21.8 3.4	42 5.2
COLUMN TOTAL	232 28.8	94 11.7	107 13.3	121 15.0	127 15.8	124 15.4	805 100.0

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

Note: Other non-rental housing includes hire-purchase (alquiler-venta) housing as well as some units that are occupied or lent without charge.

among tenants (29.8%) and others (70.2%) as we found in our survey. The way tenants were distributed is shown in Table 2, while others are found in Table 3. Table 1 is simply a combination of these tables plus two rows at the bottom that allow a comparison with housing in 1970.

The division of the housing stock into six categories -- temporary, substandard, minimal, basic, good, and excellent -- is a standard approach that has been used in studying the housing of Colombia, Mexico, Puerto Rico, Nigeria, Sri Lanka, and Tunisia. Physical characteristics of each housing type are given in the first seven rows of Table 4. They involve materials, space, and access to utilities. Within each category are a number of subtypes. For example, classified as "substandard" H1 are both adobe huts with latrines and with water from public standpipes as well as rooms in tenements for families that must share sanitary facilities with others. Note that temporary housing H0 is larger and on a bigger site than H1 housing. With inferior materials it is easier to build a bigger shack; and on the outskirts of the city families usually squat on a parcel large enough to accomodate a few chickens and goats. As others move in, some of the land is sold and a more solid but smaller house is built.

From housing category H1 through H4, floorspace rises by about 40 percent per category and cost per square meter by another 40 percent. As a result (1.4 x 1.4 = 1.96), cost per unit tends to double from one housing category to the next. Value and rent, however, are not only determined by the structure, but by the quality of the site and its location, as well as controls and market conditions that may affect different housing types in unlike ways. Consequently, the value range for each housing type extends well beyond its average construction cost (Table 4, row 13).

In general, value of the site made up between a quarter and a third of the total value of the dwelling. From the extreme northern, southern, or upland outskirts of Lima to the central business district, land values rose by a factor of a thousand -- from 200 to 200,000 soles (US$ 0.70 - $700) per square meter. Depending on location and access to public utilities, a value of 2,000 soles per m^2 was typical for such Pueblos Jóvenes as Independencia, Comas, and San Juan de Lurigancho in the north; Chorrillos and San Juan de Miraflores in the south; El Agustino to the east; and to the west in much of Callao and the nearby districts of La Perla and Carmen Legua. Anything from temporary and substandard huts to good housing was found in these areas, but the typical dwelling was expanded and upgraded to no more than the H2 minimal level.

Next to this outer ring came districts with land values between three and seven thousand soles per m^2 or a typical value of 5,000 soles (US$ 17.50). In this category were Rimac and San Martin de Porras, just north of the river; Barranco, Surco, and Surquillo to the south; Ate and San Luis to the east; Bella Vista toward the west; and La Victoria near the center. The range of dwellings built in these districts was as broad as the range of land values, but an H3 basic unit seems representative.

The other districts closest to the traditional center were Breña, Jesus Maria, Pueblo Libre, San Miguel, and Magdalena. A typical value per m^2 was 9,000 soles, give or take two thousand. Good H4 housing was the prevalent type.

Land worth less than 10,000 soles per m^2 was hard to find in Lince, San Isidro, and Miraflores; and much of it was closer to 20,000 soles. Most housing quality was H5: excellent.

To make sure that the right boundaries between value and rental ranges had been determined, the information in Table 5 was developed mainly on the basis of all units that could be classified simply, 47.5 percent of the sample. This table shows the average value, rent, and space for units with specified materials, utilities, and number of rooms. Thus we see that for H1 apartments, the value of $483,000 or monthly rent of $1,400 is in the middle of the range. In spite of overlap in the number of rooms per type, a similar pattern can be seen elsewhere.

Choice of the income ranges used in Table 1 and others must also be explained. If these ranges do not fit the housing categories in some logical way, the stock-user matrix will lack analytical signigicance. It will be merely a table. What gives significance is making each income range one that goes with willingness to buy, borrow, or rent a particular housing type. Households must be willing to spend enough of their income to make it profitable to build and to operate a particular housing type. In this sense, the opportunity cost of the owner's equity is treated as equivalent to mortgage or rental payments.

In Lima owner occupants at the F1 level, receiving about $19,000 (US$ 67) monthly, typically seemed willing to acquire H1 dwellings worth 20 times their income. The proportion gradually rose until households earning $167,000 (US$ 586) were willing to pay for dwellings worth 30 times their income. To make preferred housing double in value, rising 100 percent, income only had to rise 80 percent. The ratio of these two percentages is the income elasticity of demand, and for owners in Lima it seemed to equal 1.25.

Table 4 -- Characteristics of Major Housing Types

Housing Type	H0 Temporary	H1 Substandard	H2 Minimal	H3 Basic	H4 Good	H5 Excellent	Mean of Sample (median)
1. Wall materials	Many inferior: straw mats, adobe, quincha, refuse.	Some inferior: adobe, wood.	All good materials: fired bricks, reinforced concrete, concrete blocks, dressed stone.				
2. Roof materials	Same.	Wood, metal or asbestos sheets.	All good materials: reinforced concrete, clay tiles, some asbestos cement sheets.				
3. Water source	River, well, water wagon, standpipe, neighbor sells.	Public standpipe, tap shared with others.	All have piped water on the premises.				
4. Sanitary facilities	None or latrine.	Latrine, WC shared with others.	All have flush toilets connected to the sewerage system or modern septic tanks			Two or more bathrooms.	
5. Rooms, number	1-2	2-3	2-3	3-4	4-5	5 and more	3.5 (3.0)
6. Typical floor space, m^2	45	37	45	75	120	200	104
7. Typical value of structure per m^2. 1980 soles, thous.	Below 5	9	16	20	26	28	---
8. Typical value of structure without the site, 1980 soles, millions.	Below .3	.3	.7	1.5	3.1	5.6	---
9. Typical area of site, m^2	185	60	75	120	170	Over 200	148
10. Typical value of the site per m^2, 1980 soles, thousands.	Below 1	2.5	4	5	7	Over 10	---

Table 4 (cont'd) -- Characteristics of Major Housing Types

Housing Type	H0 Temporary	H1 Substandard	H2 Minimal	H3 Basic	H4 Good	H5 Excellent	Mean of Sample (median)
11. Typical site value, 1980 soles, millions	Below .1	.15	.3	.6	1.2	Over 2	---
12. Rental range, 1980 soles, thousands	Below 1	1-2	2-4	4-8	8-16	Over 16	4.8 (2.2)
13. Value range, 1980 million soles.	Below .3	.3-.6	.6-1.2	1.2-2.4	2.4-4.8	Over 4.8	2.8 (1.0)

Table 5

Average Rent, Value, and Other Characteristics
of Specified Dwelling Types, June-July 1980

I. Walls made of fired bricks. Roof: reinforced concrete. One bathroom with piped water connected to the sewerage system, except for H5 with two or more bathrooms. Kitchen is not counted in number of rooms.

1. Type	2. Number of Rooms	3. Value, 000 (N=)	4. Monthly Rent (N=)	5. Floor Space, m^2 (st. dev.)	6. Lot Area, m^2 (st. dev.)
H5	6.0	6,684 (19)	18,300 (3)	234 (149)	546 (1,138)
H4/5	5.0	5,160 (35)	7,800 (11)	145 (90)	186 (279)
H3/4	4.0	2,357 (78)	6,800 (13)	114 (49)	138 (67)
H3/4	3.0	2,803 (32)	6,600 (26)	90 (42)	108 (69)
H2	2.0	1,567 (7)	3,700 (29)	58 (28)	72 (48)
H1a: II. Same materials as I; 2-3 rooms; Tap or standpipe shared with others; Shared WC or latrine.		483 (23)	1,400 (110)	36 (30)	57 (182)
H1b: Same as H1a, but materials are wood, adobe, or quincha.		316 (5)	--	39 (12)	135 (32)
III. H0: Straw walls and roof; 1 or 2 rooms; latrine or no sanitary unit; Water from wagon.		286 (150)	700 (3)	83 (80)	187 (187)

Statistically the income elasticity of demand is determined by logarithmic regressions, as shown in Table 6. For all owners (including hire-purchase or alquilar-venta) it was 1.24 (line 3). Below the median income level, it was .86 and above, 1.31 (lines 8 and 13). For tenants the comparable elasticities are .90, .86, and 1.07. Size of the household did not raise spending on housing but, on the contrary, had a negative effect, especially above the median income level. Not important was the proportion of adults in the household. For owner occupants, this proportion had a mean of .66 and median of .63. The average household had 5.4 members: 3.6 adults and 1.8 children below the age of 18.

Behind such estimates are a number of rather bold assumptions. One is that the price of a house is proportional to the aggregate of housing services that it provides. If the price per unit of housing service or the component that yields this service varies from one part of the housing market to another, this assumption will be invalid.

Another assumption involves relating a durable structure that can be financed over years to the income of a single month. Households are more likely to relate such an expenditure to their income expectations over a period of years, to "permanent" not "current" income. If unexpected, transitory, or special funds are received, they are likely to be saved, and investment in housing is probably the leading form of saving for most households. The highly significant association of special income receipts with the value of occupied dwellings is shown in Table 6, column 4, lines 5, 10, and 15.

Table 6 — Logarithmic Regressions: Monthly Rent or Estimated Value on Income, Households Size, Proportion of Adults, and Special Income. Lima, 1980.

Sample		Coefficients of Independent Variables					
Log of Monthly Rent or Value		Log Income (s.e.)	Log nr. of occupants (s.e.)	ratio, adults to occupants (s.e.)	Special Income dummy (s.e.)	Constant (s.e.)	F ($\bar{R}^2$)
Total Sample							
Tenants n=341	1.	.896** (.088)				4.221** (.349)	102.6** (.231)
	2.	.946** (.104)	-.196 (.145)	-.043 (.297)		4.329** (.383)	35.2** (.232)
Owners n=724	3.	1.237** (.062)				8.913** (.252)	396.7 (.354)
	4.	1.224** (.067)	-.260* (.118)	.268 (.178)		9.229** (.309)	140.7 (.367)
	5.	1.271** (.129)			.480** (.133)	8.688 (.591)	58.3 (.249)
Monthly Income: $50,000 and less							
Tenants n=190	6.	.858** (.186)	--	--	--	4.370** (.642)	21.3** (.097)
	7.	.858** (.197)	-.014 (.198)	.086 (.439)		4.326** (.713)	7.1** (.088)
Owners n=377	8.	.799** (.143)				10.358** (.496)	31.4** (.075)
	9.	.811** (.150)	-.045 (.183)	.355 (.286)		10.189** (.566)	11.6** (.078)
	10.	.761** (.139)			.816** (.180)	10.368 (.484)	26.8 (.121)
Monthly Income: Above $50,000							
Tenants n=151	11.	1.070** (.222)	--	--	--	3.427** (.994)	23.3** (.129)
	12.	1.176** (.238)	-.477* (.224)	-.155 (.410)	--	3.801** (.999)	9.8** (.150)
Owners n=347	13.	1.308** (.131)				8.663** (.601)	100.2 (.223)
	14.	1.267** (.133)	-.409** (.152)	.146 (.222)		9.442** (.656)	39.0** (.248)
	15.	1.271** (.129)			.480** (.133)	8.688** (.591)	58.3 (.249)

Source: Survey of households, June 10-July 3, 1980.
** Significant at .01 * Significant at .05

The most important rule for setting up stock-user matrices, however, is to keep the categories the same from one period to another. If value categories double from one category to the next while income categories rise by 80 percent, the same proportions and boundaries should be kept for comparisons with earlier and future years. Otherwise, one may find households moving off the "ideal" of the matrix diagonal, not because of a failure of supply but simply because of a change in definitions. This rule will be applied to our comparisons of 1970, 1980, and 1990.

Trends in Housing Conditions

The stock-user matrix of Table 1 can be simplified to make comparisons with other years easier. Since household-dwelling combinations exist both above and below the diagonal of the matrix, one can consolidate these deviations to bring out the net effect. Some of the deviations are due to temporary fluctuations in household income such as a lost job or unexpected bonus. Others reflect possible over- or under-housing due to the stage in the life-cycle in which a family may be for a few years. Finally, there are random variations in taste. What matters is that 46.8 percent were below the diagonal in June 1980 while only 27.3 percent were above and that the downward or leftward deviations were bigger.

Household-dwelling combinations in Table 7 are consolidated in such a way that the sums of rows in column 7 and the sums of columns in row 7 are unchanged from those of Table 1. Consequently only F3 and F4 households are in housing better than the diagonal, and only F1, F2, and F3 households are in housing worse than the diagonal. Dwellings are assigned on the plausible, but not entirely correct, assumptions that poorer households do

Table 7. The 1980 Distribution of the Housing Stock: Simplified Representation. (Thousands of units and percentages.)

Dwellings / Households Monthly Income (1980 Soles) 000's	H_0 Temporary	H_1 Sub-standard	H_2 Minimal	H_3 Basic	H_4 Good	H_5 Excellent	Σ_F	Index
F_0 15 or less	36.8 (4.1)						36.8 (4.1)	-
F_1 15.1 - 28	113.7 (12.7)	-					113.7 (12.7)	50.0
F_2 28.1 - 50	98.7 (11.0)	136.3 (15.2)	97.8 (10.9)				332.8 (37.1)	57.3
F_3 50.1 - 90			40.4 (4.5)	139.9 (15.6)	61.0 (6.8)		241.4 (26.9)	104.3 / 116.9
F_4 90.1 - 162					64.6 (7.2)	65.5 (7.3)	130.1 (14.5)	125.2 / 151.4
F_5 Over 162						42.2 (4.7)	42.2 (4.7)	100
Σ_H	249.3 (27.7)	136.3 (15.2)	138.1 (15.4)	139.9 (15.6)	125.6 (14.0)	107.6 (12.0)	897.0 (100.0)	81.9 / 89.4
Remaining H_j								
Build, D_j								

Source: Table 1. The percentage distributions in column 7 and row 7 are unchanged. For comparability with the information on the 1970 housing stock, dwellings are assigned to cells on the principle that higher-income households will not occupy worse housing than poorer households.

The index is estimated in two ways. One rates household-dwelling combinations above the diagonal at 150 so that a unit above cancels out no more than one unit below, rated at 50. The other method rates combinations above at 200 because these units have double the value of those on the diagonal, rated as 100.

not live in better housing than richer ones. An index of housing quality relative to income can then be estimated by giving combinations on the diagonal a rating of 100, combinations to the left 50, combinations to the right 150, etc. F0 households in H0 housing are not counted. The overall index for 1980 was 81.9.

The distribution in Table 7 may be compared with that of Table 8, which has been set up in a similar manner to show a consolidated version of the way in which housing was distributed at the beginning of the 1970's. Note that the income ranges are nominally 1/7 as high, and that the median level is still at the boundary between the F2 and F3 ranges. Of course, there were only 566,500 households, compared with 897,000 in 1980. As in 1980, a certain number of F3 and F4 households lived above the diagonal, and many F1, F2, and F3 households lived below. Income distribution was worse than in 1980 with both more F5 households at the high end and more F1 and F2 households at the low end. But housing conditions were better: The index of housing was 84.9, compared with 81.9.

Considering the growth of the city, even keeping the index at 81.9 percent was an achievement. Not counting additional vacant units, the net addition to the housing stock had to be 330,500 units worth about 700 billion 1980 soles (US$ 2.5 billion). Table 9 shows the distribution of the additions. About one-third of the additions were good and excellent H4 and H5 housing and these represented 85 percent of the investment. Nearly half of the new housing was in the lowest H0 category and amounted to no more than 5 percent of the value built. Many of the new units were obtained by expanding or subdividing old units. Other new units were built to replace old ones that were demolished. The tables presented do not show these changes but only their net effect.

Table 8. The 1970-71 Distribution of the Housing Stock: Simplified Representation. (Thousands of units and percentages.)

Dwellings / Households Soles per month	H_0 Temporary	H_1 Sub-standard	H_2 Minimal	H_3 Basic	H_4 Good	H_5 Excellent	Σ_F	Index
F_0 2,200 and less	32.3 (5.7)						32.3 (5.7)	-
F_1 2,201 - 3,900	64.0 (11.3)	26.6 (4.7)					90.6 (16.0)	64.7
F_2 3,901 - 7,000		75.3 (13.3)	86.1 (15.2)				161.5 (28.5)	76.7
F_3 7,001 - 12,600			32.9 (5.8)	124.6 (22.0)	7.4 (1.3)		164.9 (29.1)	92.3 / 94.5
F_4 12,601 - 22,700					71.9 (12.7)	2.8 (.5)	74.8 (13.2)	101.9 / 103.8
F_5 Over 22,700						42.5 (7.5)	42.5 (7.5)	100.0
Σ_H	96.3 (17.0)	102.0 (18.0)	119.0 (21.0)	124.6 (22.0)	79.3 (14.0)	45.3 (8.0)	566.5 (100.0)	84.9 / 85.8

Sources: Dirección General del Empleo, Ministerio de Trabajo, Tabulaciones Sobre Vivienda en el Peru (Lima, 1972); Carlos Amat, Leon Chávez, Hector Leon, Estructura y Niveles de Ingreso Familiar en el Peru (Lima: Ministerio de Economía y Finanzas, 1977). The matrix is set up in accordance with W. Paul Strassmann, "Housing Priorities in Developing Countries: A Planning Model," Land Economics, August 1977, pp. 310-27.

Note: Income ranges have upper boundaries that are 80 percent higher than lower boundaries. Since the value of dwellings approximately double from one category to the next, the implication is that the income elasticity of demand for housing is 1.25. This is the value found for owner occupied housing in 1980. Boundaries between the different housing categories in thousands of soles are: 25, 50, 100, 200, and 400.

Table 9

Types, Number, and Cost of Dwelling Units that were Net Additions to the Occupied Housing Stock during 1970-1980.

Housing Type	Distribution of Additions (percent)	Net Additions (thousands)	Cost per Unit (1980 Soles)	Total Cost (1980 Soles, billions)	Distribution of cost (percent
H0	46.4	153.2	250,000	38.3	5.4
H1	10.4	34.3	500,000	17.1	2.4
H2	5.8	19.1	1,000,000	19.1	2.7
H3	4.6	15.3	2,000,000	30.6	4.4
H4	14.0	46.3	3,500,000	162.1	23.0
H5	18.9	62.3	7,000,000	436.1	62.0
Total	100.0	330.5		703.3	100.0

Note: Includes site preparation and infrastructure.

Source: See Tables 1, 4, and 8.

Housing Targets for 1990

With the 1980 distribution of Tables 1 or 7 as a base and some plausible judgements about trends, one can tell what sorts or housing will have to be built if reasonable targets are to be attained by 1990. One begins with population. If it grows at 4 percent annually, the Lima Metropolitan area will reach 7,342,000 in 1990. If average household size remains 5.53 persons, then 1,328,000 dwellings will be required in addition to vacant units that facilitate movement. If households "undouble" at a rapid pace, still more will be needed.

If housing is neither subsidized nor unduly taxed or controlled, whatever is built is what people will rent at market prices or buy with loans that cover inflation plus a competitive rate of interest. Together with the existing housing stock, it will put the average household on the diagonal of the stock-user matrix. What households will choose will depend on their incomes. If household incomes grow at 2.5 percent annually during 1980-1990, and if the distribution around the median remains unchanged, then families will fall into the categories shown in column 7 of Table 10. Only 10.6 percent will earn $28,000 or less (at 1980 prices), compared with 16.8 percent in June 1980. Over $90,000 will be earned by 32.4 percent, compared with the former 19.2 percent. Around sixty percent will remain in between, but that will be sixty percent of a much larger total. Row 7 shows the housing stock that will be needed for income at this level. Note that it is identical to column 7.

The housing that can be sold or rented is not the same as that which needs to be built since much of the existing stock will remain for another decade. Let us assume that <u>all</u> remains. For every dwelling that

Table 10. Hypothetical Distribution of Housing and Households in Metropolitan Lima in 1990. (Thousands of Units and Percentages).

Dwellings / Households Soles per month	H_0 Temporary	H_1 Sub-standard	H_2 Minimal	H_3 Basic	H_4 Good	H_5 Excellent	Σ_F	Index
6/1980 thousands								
F_0 15 and less	27.3 (2.1)						27.3 (2.1)	-
F_1 15.1 - 28		112.8 (8.5)					112.8 (8.5)	100
F_2 28.1 - 50			333.0 (25.1)				333.0 (25.1)	100
F_3 50.1 - 90				423.9 (31.9)			423.9 (31.9)	100
F_4 90.1 -162					273.7 (20.6)		273.7 (20.6)	100
F_5 Over 162						157.3 (11.8)	157.3 (11.8)	100
Σ_H	27.3 (2.1)	112.8 (8.5)	333.0 (25.1)	423.9 (31.9)	273.7 (20.6)	157.3 (11.8)	1,328.0 (100.0)	100
Remaining H_j	-	136?	138.1	139.9	125.6	107.6	651.3	
Build, D_j			194.9 (28.8)	284.0 (42.0)	148.1 (21.9)	49.7 (7.3)	676.7 (100.0)	

Note: The population of the Lima Metropolitan Area is projected to grow at 4.0 percent annually to 7.342 million. Average household size remains 5.53. Income per housheold grows at 2.5 percent annually, bringing the median level to 64,000 soles of 1980 (US$ 225) monthly. Distribution around the median is unchanged. The target is to have the average household in each income range on the diagonal of the matrix, which has been set up to reflect revealed preference for monthly payments of rent or investment in owner-occupied housing.

deteriorates, another is upgraded, so that what remains are net results. What has to be built, then, is the difference between demand and the remaining stock. Row 8 is subtracted from row 7 to yield row 9. A total of 676,700 units has to be built in the H2-H5 categories, meaning 51 percent of the total number needed. The following table shows the breakdown and cost of the needed construction.

Table 11 -- Types, Number, and Cost of Dwelling Units that Need to be Built during 1980-90 to Provide Housing Appropriate for Household Income Levels.

Housing Type	Distribution of Need (percent)	Number Needed (thousands)	Cost per Unit (1980 Soles)	Total Cost (1980 Soles, billions)	Distribution of Cost (percent)
H2	28.8	194.9	1,000,000	194.9	12.0
H3	42.0	284.0	2,000,000	568.0	34.9
H4	21.9	148.1	3,500,000	518.0	31.8
H5	7.3	49.7	7,000,000	347.9	21.4
Total	100.0	676.7		1,629.2	100.0

Source: See text and Table 10.

The total cost of 1.629 trillion soles or 163 billion annually for ten years -- US$ 572 million per year -- seems astronomical. It is 150 percent more than was spent on these housing types during 1970-1980. Government cannot hope to generate that much finance directly. Yet for a population of seven million, it comes to only some 11,000 monthly soles (US$ 39) per household -- one sixth of average income in 1980. It is an amount that is well in line with shares that households are willing to spend on housing as a convenience and an asset. Of course, maintenance

and operating expenses of the existing housing stock have to be added to these totals. Yet it is an amount that is so large that it will probably not be generated if anything impedes the development of new sites, the mobilization and security of savings, the chance to upgrade and expand old houses, and the right to rent or sublet at market prices. The scale of what is needed and what is possible is so large that government will be fully challenged in providing no more than the infrastructure, perhaps some core units, and in removing obstacles and insecurity everywhere else.

Failure to encourage enough building, as seemed to be the case during the 1970's, ironically does not mean that households will have more funds for other uses. A shortage of housing will drive up the price of the existing stock so that a larger share of income is paid for fewer housing services. Particularly affected during the 1970's were H2 and H3 housing for which the supply rose relatively less and prices relatively more. The higher prices did not stimulate a sufficient supply response for one reason or another, and a consequence of that was less construction employment, less income and multiplier effects, and finally less ability to pay for new housing.

Note that Table 10 is highly stylized. At each income level some households would prefer to have twice or half as much housing as would put them on the diagonal. The diagonal is merely a simplification which, if properly derived, reflects <u>average</u> taste. Deviations should cancel out. The aim is to illustrate the dimensions of the task as simply as possible. An alternative version is Table 12, which has 18.3 percent of households above the diagonal in a manner similar to the 1980 pattern of housing use.

Table 12. Hypothetical Distribution of Housing and Households in Metropolitan Lima in 1990. (Thousands of units and percentages.)

Dwellings / Households Monthly Income	H_0 Temporary	H_1 Sub-standard	H_2 Minimal	H_3 Basic	H_4 Good	H_5 Excellent	Σ_F	Index
Soles-June 1980 (thousands)								
F_0 15 or less	27.3 (2.1)						27.3 (2.1)	-
F_1 15.1 - 28		112.8 (8.5)					112.8 (8.5)	100.0
F_2 28.1 - 50			333.0 (25.1)				333.0 (25.1)	100.0
F_3 50.1 - 90				317.4 (23.9)	106.5 (8.0)		423.9 (31.9)	112.6 / 125.1
F_4 90.1 - 162					137.5 (10.3)	136.2 (10.3)	273.7 (20.6)	124.9 / 149.8
F_5 Over 162						157.3 (11.8)	157.3 (11.8)	100.0
Σ_H	27.3 (2.1)	112.8 (8.5)	333.0 (25.1)	317.4 (23.9)	244.0 (18.3)	293.5 (22.1)	1,328.0 (100.0)	109.3 / 118.7
Remaining H_j	-	136?	138.1	139.9	125.6	107.6		
Build, D_j	-		194.9 (28.8)	177.5 (26.2)	118.4 (17.5)	185.9 (27.5)	676.6 (100.0)	

Note: The cross-tabulation is based on a number of assumptions. The population of the Lima Metropolitan area is projected to grow at 4.0 percent annually to 7.342 million. Average household size remains at 5.53. Income per household grows at 2.5 percent annually, bringing the median level to 64,000 1980 soles or US$ 225 monthly. Distribution around the median remains unchanged. Deterioration of H2 to H5 dwellings matches upgrading. As in 1980, 18.3 percent of F3 and F4 households choose to live in "above-the-diagonal" housing. The target is to have all others on the diagonal.

Still more controversial is the situation of 140,000 households that are projected to have earnings less than 28,000 (1980) soles in 1990. Will that many households still need to be in temporary straw shacks, adobe hovels without water, or in overcrowded tenements? Considering that 385,000 such units are in use in 1980, there would appear to be an ample supply. Yet many of these units will be demolished and others will be upgraded to the H2 level or better as tenure is arranged and as public utilities are brought in. If all 140,000 households are provided with a serviced site, materials, and foundations for a core house, the cost would be very high and more than they could afford without an overt of implicit subsidy. At $400,000 (US$ 1,400) per site and core, the total comes to $5.6 billion annually or (US$ 196 million), and we are back among astronomical figures. The poorest 10 percent cannot be easily reached on a large scale as long as they are below the absolute level of $28,000 monthly. Nevertheless, if there are to be housing subsidies, this is where they should go and in a manner consistent with providing earning opportunities, not just housing. Certainly, housing or slum clearance should not be traded off against current access to jobs and incomes. This statement may apply most to settlements along the Rimac and in Callao.