DETERMINANTS OF HOUSING IMPROVEMENTS IN THE CITY OF KARACHI

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Abstract. This study is an analysis of factors that lead to improvements and consolidation of homes in the city of Karachi, both in the Planned Areas and unauthorized *Katchi Abadis*. Data is taken from a city wide socio-economic survey of over 6000 households spatially distributed throughout the city. The results show that in spite of financial constraints faced, households manage to make substantial improvements in their homes relying on their own resources. Length of stay in the home, income, education and type of job of the head, all significantly affect housing improvement and consolidation; owners also make more improvements in their homes compared to renters.

I. INTRODUCTION

Most large cities in developing countries are experiencing housing shortage arising out of rapid growth of population as a result of natural increase as well as migration from other urban and rural areas. The Authorities in these countries have failed to provide adequate housing to the growing population especially to the urban poor. Upgrading programmes have had mixed success in most developing country cities and often elude the target population. Efforts to deal with the problem are also frustrated by the failure to understand the factors which influence the upgrading process.

It has now been recognized that the contribution made by the individual households themselves, in improving and upgrading their dwellings, to the housing stock is a key element in dealing with the shelter crises in cities of developing countries. Experts also agree that support for housing improvements should be organized in ways which compliment the building efforts of the low income settlers and that the Authorities should embody this process into their planning policies. But despite the importance attached

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to improvements and consolidation relatively less attention has been given to the subject in the literature on housing.

Karachi is the largest city of Pakistan accommodating some 10 million people. It is one of the fastest growing metropolis in the world and as a consequence suffers from the usual problems of lack of proper accommodation, low level of provision of services, overcrowding and congestion as the city is ill-equipped to deal with the rapid increase in its population. Due to an acute shortage of housing in the city the process of improvement and consolidation of the existing stock has become important and crucial to the planning process but despite this, few studies have examined the issue in any depth. Existing literature on the subject is limited to case studies in specific low income areas and is concerned with either supporting or rejecting Turner's hypothesis or determining the success or failure of upgrading projects.

This research is devoted to an analysis of factors that lead to such improvements. It analyzes the determinants of improvements for the city as a whole and separately for the Planned Areas and low income areas (*Katchi Abadis*) of the city as preferences of households may be different in the two areas. The resources that are available for construction and renovation of houses may also be different in the two areas of the city. Finally, the purpose of the research is to relate the findings to framing of housing policies in the country.

The study is organized in the following way. Section II gives a brief review of the existing literature on the subject. Data description and methodology are provided in Section III. Results of the analysis and their implications are discussed in Section IV while Section V outlines the policy implications that arise out of the analysis.

II. REVIEW OF LITERATURE

The subject of determinants of housing improvements has received relatively less attention in the literature on demand for housing. A large proportion of the earlier literature that exists deals with theoretical models of the landlords' decision to choose an optimal path for maintenance in developed countries (Lowry, 1960; Sweeney, 1974; Ingram and Oron, 1977; and Margolis, 1981). The empirical evidence on the subject also comes from a limited number of articles. Moorhouse (1972) and Mayer (1981) investigate the determinants of landlords housing rehabilitation decisions using capital stock adjustment models of profit maximization. Mendelsolin (1977) focuses on maintenance and improvements by single

family homeowners. Ozanne and Struyk (1976) estimate changes in the quantity of housing services over the decade 1960-70 for owner occupied and rental units.

Relatively less literature exists on the subject in developing countries. Most studies relate to the self help or upgrading programmes and are aimed at assessing their success or failure in squatter areas of large developing country cities. Very little attention is devoted to studying the determinants of the consolidation and improvement process. Studies that have analyzed these determinants are mostly for Latin American cities. One fact that is established is that households make considerable structural improvements to their dwellings at a pace and through methods dictated by their own tastes and resources.

Burns and Shoup (1981) in their study for El Salvador conclude that a greater degree of security results in more households undertaking improvements. Strassman (1980) shows that owner occupiers in Cartegena, Colombia add a room or undertake three or more types of improvements after 1.5 years at a particular site. Improvements also depend on income, the provision of public services in the area, household size and the age of the head of household.

Jimenez's study (1983) for Manila concludes that self help housing projects have been successful in stimulating investments in housing and raising average dwelling quality in the area. The study also concludes that squatters are able to generate enough resources to make substantial improvements even in the absence of a formal and effective mortgage market. It shows that a one percent increase in income can be expected to lead to an improvement of 0.7 percentage in housing.

Ward (1981) in his study has examined upgrading and consolidation process of squatter settlements in Mexico city. Factors which relate to income and the creation of income surplus appear to be most important in explaining the levels of improvements that may be achieved. Other factors which are included in the analysis are type of employment, job security and fringe benefits.

III. METHODOLOGY AND DATA COLLECTION

DATA

Data for the analysis comes from a city wide socio-economic survey carried out in 1987-88 by the Applied Economics Research Centre, University of Karachi, Karachi. A sample of over 6000 households, spatially distributed

throughout the city was selected on the basis of multi-stage sampling procedure. (*See* Appendix A for sampling methodology and details of data collection.)

METHODOLOGY

The heterogeneity of the improvement process makes it difficult to measure. While some improvements like number of rooms are easily measurable improvements especially in quality cannot be easily assessed either in physical or value terms. Two measures of improvements are used in the study, money spent on Improvements in the last five years and an index measuring consolidation (for *Katchi Abadis* households who came to live in the area after 1979). The index is based on Ward's work (1983) in Mexico and is computed by assigning different scores to addition of rooms; building material used for walls and roof; availability of services like water, electricity, gas etc. (*see* Appendix B for details).

Stepwise regression analysis which automatically selects the independent variable with the highest coefficient of determination for the dependent variable is used.[1]

The following regression equation is estimated:

$$D \; = \; F \, (Y, H, R, O, E, T, A, D, F) \tag{1}$$

where

Y	=	measure of income
H	=	household size
R	=	period of residence in house (years)
O	=	dummy variable for owner, owner = l, 0 otherwise
E	=	education of head of household (years)
T	=	type of job of head of household (permanent = 1, temporary = 0)
A	=	age of the head of household
D	=	Dummy for type of area (Planned areas = 1, *Katchi Abadis* = 0)
F	=	source of finance of improvements (savings, institutional loans, personal loans)

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[1]Once entered a series of partial coefficients are generated that best explain the remaining variation so that the next variable entered has the highest partial coefficient as measured by the F-statistic. The step by step process continues until all variables have been incorporated or until a set tolerance level is reached.

IV. RESULTS AND INTERPRETATION

The results of the analysis are presented in this section. First types and patterns of improvement undertaken by the households are presented. The Stepwise regression on determinants of Improvements are subsequently discussed.

TYPES OF IMPROVEMENTS

Table 1 gives details of improvements undertaken by households. Results indicate that 65 percent of all households in the city have undertaken some improvements in their homes. The percentage of households making improvements is more or less the same in the *Katchi Abadis* and the Planned Areas of the city (approximately 65 percent). A more detailed breakup of the amount spent on improvements also shows that the patterns of improvements are more or less the same in the two areas of the city. Around 54 percent of the households have spent 2000 rupees or less in the last five years, the percentage of household spending large amounts of 20,000 or more is around 4 percentage. This indicates that in spite of a limited amounts of loans available for financing housing, especially in the low income areas of the city, households in the Planned Areas and *Katchi Abadis* manage to spend more or less equal amounts on improvements of

TABLE 1

Distribution of Expenditure on Home Improvements
(% of Households)

Improvement Expenditure	All Households	Planned Areas	Katchi Abadis
1 - 500	19.79	18.70	21.21
501 - 1,000	16.37	15.55	17-44
1,001 - 2,000	18.01	18.75	17.05
2,001 - 3,000	9.66	10.42	8.66
3,001 - 5,000	16.82	17.13	16.42
5,001 - 10,000	10.95	11.21	10.60
10,001 - 20,000	5.05	5.17	4.90
20,001 - 40,000	2.03	1.84	2.28
40,001 - HI	1.31	1.22	1.43
Total	100.00	100.00	100.00

their homes. If taken as a proportion of income the households in the lower income groups are spending more on the improvement and consolidation of their houses.

A more detailed analysis of the types of improvements only for the more recent arrivals to *Katchi Abadis* are presented in Table 2. The results indicate that the most popular improvement undertaken by recent arrivals to the city is improvement in the quality of wall with over 38 percent of households improving their walls from Katcha structures to unplastered or pucca plastered structures. Addition of the rooms are undertaken by 20 percent of the recent arrivals to the city which indicates that households in *Katchi Abadis* add substantially to their house within 5 years of arrival. Table 2 also indicates that only a small proportion of households (around 11 percent) improve the quality of their roofs which is expected as the costs of improving the roof are high and are not on priority list of households in *Katchi Abadis*. Another type of improvement is converting a katcha floor to a pucca one and is done by around 20 percent of the households.

TABLE 2

Distribution of Households by Type of Improvements
(% of Households)

Added a Room or more	20%
Improved Wall	38%
Improved Roof	11%
Improved Floor	21%
Improved Water Supply	15%
Improved Supply of Electricity	21%

Improvements in services does not seem to be as popular amongst the recent arrivals to the city. Only 15 percent of households go for investing in piped water supply to their homes and around 21 percent invest in obtaining electricity.

DETERMINANTS OF HOME IMPROVEMENTS

Results of the double-log Stepwise regressions analysis are presented here.[2] Two sets of results are presented. One where the dependent variable is the amount spent on improvements by households in the last five years and the

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[2]Linear regressions were estimated but the double-log specifications gave the best results. Other set of results are available with the authors on request.

other where the dependent variable is a consolidation index. Table 3 presents results for all households in the city. Table 4 and Table 5 report results for the Planned Areas and *Katchi Abadis* respectively.

The major determinants of improvements are:

1. Length of Stay

Length of stay (LPERRES) is the single most important variable affecting housing improvement and consolidation. It enters first in the overall and the Planned Areas Stepwise regression. The variable enters second in the *Katchi Abadi* regression in Table 5. These results are according to expectations as upgrading and improvement is a process which occurs gradually and with the passage of time. The results are also consistent with those for other large cities of developing countries.

2. Owner/Renter Dummy

The OWNRNT variable (taking value of 1 for owner occupied, 0 for renters) is the dominant variable in the regression for *Katchi Abadis* in Table 5. It enters second in Table 3 for overall households. The variable has a large positive coefficient indicating that owners make substantially more improvements in their houses than do renters. The owner effect on improvement is less powerful for planned areas and the variable enters fourth on the Stepwise regression in Table 4.

3. Education and Type of Job of Head of Household

The education of the head of household (LEDUC) is the next in terms of importance. The difference in the numbers of years of education of the household signify attitudinal changes amongst them which is reflected in the improvements they undertake in their houses. Education of head of household, however, is not a significant determinant of improvements in the *Katchi Abadis*.

Results of the analysis also indicate that the type of job of the head of household determines whether improvements in the homes are made or not. A positive and significant coefficient means that a permanent job signifies more improvements. As opposed to the education variable the type of job variable enters high in the Stepwise regression for *Katchi Abadis*.

4. Total Household Income

Total household income is another variable affecting housing improvement and consolidation. This means that whenever an investment surplus is created or the income level of the household is enhanced due to either the

TABLE 3

Determinants of Home Improvement in Karachi
Stepwise Regression Coefficients
(t statistics in parenthesis)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LPERRES	2.77 (28.98)***	2.14 (21.66)***	2.24 (22.72)***	2.23 (22.77)***	2.27 (23.08)***	2.29 (23.30)***	2.31 (23.45)***
OWNRNT	—	5.58 (19.15)***	3.74 (10.79)***	3.85 (11.18)***	3.88 (11.26)***	3.69 (10.61)***	3.70 (10.62)***
SAVING		—	2.48 (9.67)***	2.34 (9.11)***	2.34 (9.14)***	2.34 (9.16)***	2.35 (9.21)***
LMTTINC			—	1.12 (8.21)***	0.94 (6.56)***	1.01 (6.96)***	0.99 (6.87)***
LEDUC				—	0.07 (4.03)***	0.07 (4.32)***	0.07 (3.75)***
LOANPER					—	1.18 (3.42)***	1.17 (3.39)***
TYPJOB						—	0.74 (3.17)***
INST							0.02 (1.77)*

LHHSIZE							0.02 (1.34)
LAGE							0.02 (1.59)
DUMMY							0.02 (1.35)
CONSTANT	−5.37 (−21.72)	−8.45 (−29.23)	−8.60 (−29.93)	−17.37 (−15.71)	−15.90 (−13.67)	−16.43 (−14.01)	−16.92 (−14.32)
R^2	0.12	0.17	0.18	0.19	0.19	0.20	0.20
$\bar{R}^2$	0.12	0.17	0.18	0.19	0.19	0.20	0.20
# CASES	6148	6148	6148	6148	6148	6148	6148
FSTAT	840.18	628.42	456.40	362.83	294.23	247.57	213.95

*   Significant at the 90% level.
**   Significant at the 95% level.
*** Significant at the 99% level.

TABLE 4

Determinants of Home Improvement in Planned Areas of Karachi
Stepwise Regression Coefficients
(t statistics in parenthesis)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LPERRES	3.46 (26.63)***	3.23 (25.14)***	3.30 (25.66)***	3.11 (23.27)***	3.12 (23.45)***	3.17 (23.62)***	3.18 (23.72)***
SAVING	–	3.65 (12.89)***	3.74 (13.23)***	2.66 (7.58)***	2.56 (7.27)***	2.49 (7.06)***	2.52 (7.13)***
LEDUC		–	0.13 (5.31)***	0.13 (5.31)***	0.10 (3.94)***	0.10 (3.75)***	0.09 (3.37)***
OWNRNT			–	2.26 (5.12)***	2.30 (5.22)***	2.12 (4.76)***	2.13 (4.78)***
LMTTINC				–	0.72 (3.90)***	0.63 (3.35)***	0.62 (3.29)***
INST					–	1.15 (2.63)***	1.14 (2.63)***
TYPJOB						–	0.72 (2.33)**
LAGE							0.03 (1.71)*

HHSIZE							0.01 (0.39)
CONSTANT	-6.64 (-20.29)	-8.23 (-24.01)	-8.36 (-24.42)	-9.08 (-24.61)	-14.96 (-9.65)	-14.28 (-9.10)	-14.76 (-9.33)
R^2	0.17	0.21	0.22	0.22	0.23	0.23	0.23
$\bar{R}^2$	0.17	0.21	0.22	0.22	0.22	0.23	0.23
# CASES	3441	3441	3441	3441	3441	3441	3441
FSTAT	709.17	446.66	314.89	244.46	199.43	167.64	144.65

* Significant at the 90% level.
** Significant at the 95% level.
*** Significant at the 99% level.

TABLE 5

Determinants of Home Improvement in Low Income Areas Katchi Abadis of Karachi Stepwise Regression Coefficients
(t statistics in parenthesis)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
OWNRNT	9.66 (21.06)***	8.16 (16.71)***	8.05 (16.61)***	6.60 (11.93)***	6.58 (11.91)***	6.30 (11.08)***
LPERRES	–	1.19 (8.27)***	1.08 (7.50)***	1.20 (8.27)***	1.22 (8.42)***	1.26 (8.64)***
LMTTINC		–	1.67 (6.68)***	1.61 (6.44)***	1.58 (6.31)***	1.61 (6.41)***
SAVING			–	1.98 (5.34)***	1.97 (5.31)***	1.95 (5.27)***
TYPJOB				–	0.80 (2.35)**	0.80 (2.46)**
LOANPER					–	0.82 (2.13)**
LHHSIZE						0.03 (1.30)
LAGE						0.01 (0.68)

LEDUC						0.02 (1.25)
CONSTANT	−7.36 (−17.40)	−8.92 (−19.46)	−21.17 (−11.20)	−20.84 (−11.08)	−21.16 (−11.23)	−21.43 (−11.35)
R²	0.14	0.16	0.18	0.18	0.19	0.19
R̄²	0.14	0.16	0.18	0.18	0.18	0.19
# CASES	2707	2707	2707	2707	2707	2707
FSTAT	433.37	261.41	191.96	152.58	123.37	103.69

* Significant at the 90% level.
** Significant at the 95% level.
*** Significant at the 99% level.

head increasing his income or additional workers working improvements are undertaken. Just the income of the head alone was not important in determining the level of improvements. This suggests that in Karachi, members of a household tend to pool their incomes together.

5.   Sources of Finance

In spite of the increasing number of housing schemes that provide housing facilities on an installment basis access to credit for financing housing remains a major constraint for a considerable proportion of the population in the city. Three variables are used to see the effect of sources of finance on improvements and consolidation. A dummy variable taking value of 1 if household has used its savings to finance either the construction or improvement of their homes, 0 otherwise (SAVING); a dummy variable if the household has used personal loan from a friend or relative to finance construction or improvement of the house, 0 otherwise (PERLOAN); and a dummy variable if the household has taken a loan from institutional sources like House Building Finance Corporation, Commercial Banks, 0 otherwise (INST).[3]

The results indicate that SAVING has an important influence on home improvements. It is significant both in the *Katchi Abadis* as well as in the Planned Areas. SAVING enters second in the regression for Planned Areas indicating that households generally upgrade their homes relying on their own resources. Institutional sources of finance are a significant but a less important determinant of improvements. Personal loans contribute to housing improvements and consolidation in the *Katchi Abadis* as shown in Table 5.

6.   Other Variables

The age of the head of household is a significant variable affecting improvements and represent life-cycle effects. The coefficient is positive and significant at the 99 percent level of significance indicating that the older the households the more improvements they are likely to undertake in their homes.

Results for the overall regression also indicate that the size of the household is not a significant variable indicating that pressures for more space do not necessarily lead to more improvements.

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[3]Since institutional loans are almost non-existent for *Katchi Abadis* and very few households borrow from friends and relatives in Planned Areas separate regressions are estimated for the two areas.

**DETERMINANTS OF HOME IMPROVEMENT
FOR RECENT ARRIVALS TO KATCHI ABADIS**

Table 6 presents results where the dependent variable is the constructed consolidation index. The analysis is limited to *Katchi Abadi* dwellers who came to live in the area after 1980 therefore it is a sample of recent arrivals to low income areas. The results indicate that the OWNRNT dummy is again the single most important determinant of improvements. Availability of funds as represented by the income variable enters next. The space needs generated by the household size have a positive coefficient and therefore lead to improvement and consolidation. The *Katchi Abadi* dwellers depend on funds from personal sources, *e.g.* relatives and friends for consolidation in the early years. They do not usually finance these improvements from their savings at this time. Period of residence and type of job and age of the head are also significant determinants of housing improvements while education of the head does not significantly affect the improvement process.

V. CONCLUSIONS AND POLICY IMPLICATIONS

Major results that follow from the analysis are:

- Length of stay is the single most important variable affecting housing improvement and consolidation.

- Owners make substantially more improvements in their homes.

- Education and type of job of the head are important determinants of the consolidation process.

- Investment surpluses go toward improving homes.

- In spite of a financial constraint faced households manage to substantially improve their homes for which they rely more on their own resources or receive help from friends and relatives.

The above results have some direct policy implications and provide guidelines to policy makers.

Since personal savings and personal loans from friends and relatives are an important source of financing housing improvements and consolidation, therefore, projects which are undertaken should mobilize these funds. Small loans spread over a number of years at low interest rates and for specific house improvements could be administered. Similarly guidelines as to the frequency and amounts of these loans should be related to period of residence in a particular house.

TABLE 6

Determinants of Home Improvement of Recent Arrivals to
Katchi Abadis in Karachi Stepwise Regression Coefficients
(t statistics in parenthesis)

Variables	(1)	(2)	(3)	(4)
OWNRNT	6.23 (12.25)***	5.64 (10.57)***	4.97 (8.59)***	3.76 (5.17)***
LPERRES		1.04 (4.30)***	1.04 (4.30)***	1.02 (4.28)***
LOANPER			1.69 (2.83)***	1.73 (2.91)***
SAVING				1.73 (2.73)***
LMTTINC				0.01 (0.17)
LHHSIZE				0.02 (0.56)
LAGE				0.05 (1.33)
LEDUC				−0.04 (−0.95)
TYPJOB				0.03 (0.08)
CONSTANT	−8.22 (−19.51)	−8.76 (−20.22)	−8.76 (−20.34)	−8.75 (−20.45)
R^2	0.22	0.24	0.26	0.27
$\bar{R}^2$	0.22	0.24	0.25	0.26
# CASES	539	539	539	539
FSTAT	150.08	86.70	61.24	48.35

  * Significant at the 90% level.
 ** Significant at the 95% level.
*** Significant at the 99% level.

The results of the analysis also confirm that improvement and consolidation are a gradual process therefore concentration should be on incremental development in sites and services and other projects undertaken by the government to make them affordable.

The result that owners make substantial more improvements in their homes suggest that security also leads to consolidation as suggested by other studies on developing country cities.

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APPENDIX A

Sampling Methodology and Descriptive Statistics of Data

A survey of 6275 households was conducted by the Applied Economics Research Centre, University of Karachi in 1987-88. The sample for the survey was spatially distributed throughout the city of Karachi. It was allocated to the different areas (planning zones) of the city on the basis of their population. Sample within the zones was allocated to different types of houses on the basis of net residential area under each type of use. Sixty-five percent of the sample was allocated to the Planned Areas and thirty-five percent to the *Katchi Abadis* (unplanned and illegal settlements).

In the Planned Areas, zones were divided into clusters on the basis of plotsizes and the sample was distributed in proportion to the number of plots by size. This was done separately for each type of housing category within the zone. In case of flat sites one household on each floor was selected from each block in a housing complex.

Since no information on number of plots is available the sample in *Katchi Abadis* was spatially distributed between clusters of predominant housing types. within each cluster starting points for selection of households were determined randomly. A Monte Carlo experiment indicated that movement in all directions from the starting points was the best strategy. Whether to turn left or right at every intersection was decided by the toss of a coin. Then every fifth house was chosen for interview. With houses on both sides of the street toss of a coin again decided whether to select the house on the right or on the left.

In case of subdivision of plots or different households living on separate floors all households living in the selected structure were interviewed.

Summary statistics of the key variables are given in Table A-1 below:

TABLE A-1

	Mean	*Standard Deviation*
OVRPDIS	0.27	0.97
UNDPDIS	0.19	0.28
AGE (Years)	43.61	13.42

UNDAGE1	0.064	0.19
UNDAGE2	0.081	0.20
HHSIZE (Numbers)	7.12	3.32
ADJRENT	−90.81	267.88
WORKLOC	0.14	0.35
MIG	0.58-01	0.23
MLOCY (Rs.)	443.78	944.17
MYLIN (Rs.)	2177.50	976.33
TMYLIN (Rs.)	−26.15	1475.96
DUMMY 0.58	0.36	
EDUC (Years)	6.62	13.00
PLOTSZE (sq. yds.)	117.99	131.87
ROOM (Numbers)	2.52	1.37
BATH (Numbers)	1.12	0.48
WALL	0.75	0.44
ROOF	0.59	0.49
WTR	0.69	0.46
ELECTR 0.90	0.30	
PARK	0.28	0.45
GARBCL 0.56	0.49	
PERRES (Years)	8.72	10.74

APPENDIX B

Computation of the Consolidation Index

Weight

Type of Improvement Assigned*

1. WALL

   Katcha to Pucca (Plastered) 1.00

   Katcha to Stone/Unplastered 0.20

2. ROOF

   Iron Beams/Asbestos to Reinforced Concrete Ceiling 3.5

   Mud/Katcha to Reinforced Concrete Ceiling 5.0

   Mud/Katcha to Iron Beams/Asbestos 1.5

3. FLOOR

   Katcha to Pucca 1.0

4. AVAILABILITY OF WATER

   Not Connected to Connected 3.0

5. AVAILABILITY OF ELECTRICITY

   Not Connected to Connected 1.5

6. ROOMS

   Addition of a Room 10.0

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*Weights are assigned on the basis of costs of construction.