On the Estimation of Determinants of Housing Quality: The Case of Ghana

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Abstract: This paper examines a welfare issue of growing importance in many least developed countries, that of determinants of housing quality and uses the case of Ghana to add to the body of empirical knowledge. The paper presents estimates of the determinants of housing quality in Ghana using the Core Welfare Instrument. The empirical analysis based on the Logistic and Ordinary Least Square regressions revealed that tenure, age, income, gender, marital and employment status are significant determinants of housing quality in Ghana. Supply side policy initiatives such as tax credits for developers of new housing and home improvement could help increase quality affordable housing in Ghana particularly in the urban areas.

Introduction

Deteriorating physical characteristics and limited access to social services characterize much of the housing stock in Ghana (Twum-Baah, Kumekpor and de Graft-Johnson, 1995). These characteristics may be accentuated in rural areas. *Compound housing* dominates the housing types (about 72% in 1991/92 – Ghana Statistical Service, 1995), followed by huts, single family and multi-family (flats/apartments) housing. The traditional compound house consists of a large rectangular structure, generally 7 or more rooms ranging around three sides of a courtyard. Most huts are found in the rural areas, while flats and other housing types are common in urban areas. Most Ghanaian live in houses with walls made of wood, mud brick or cement, while the typical roofing material is sheet iron or mud.

Asiama (1990) suggested that, in Ghana, two people per room indicates crowding, and overcrowding occurs when there are 2.5 or more people per room. This research indicates that roughly 44.5% of all households live in overcrowded housing in Ghana, a situation that has

serious implications for health and urban planning in the short and the long run. Thus, current housing conditions in Ghana are far from ideal.

In response to these perceived inadequacies in housing, policies and programs of various governments since independence have often been implemented on an *ad-hoc* basis, lacking sound empirical analysis. This research is a first step attempt to help improve our knowledge of the housing situation in Ghana and suggest policies that may aid in improving the housing stock.

A Constructed Housing Quality Index for Ghana

Physical housing characteristics (Arimah, 1992, 1996; Daniere, 1994; Kutty, 1996), standardized using the UN approach recommended by Arias & DeVos (1996), were supplemented by additional data available from the CWIQ survey to include access to quality of life amenities, such as schools, health centers, and public transportation. The CWIQ survey comprised a nationally representative sample of 14,514 Ghanaian households – 9,162 rural and 5,352 urban. All 10 administrative regions of Ghana were sampled. Designed to collect the minimum amount of information needed to identify and classify households into their respective poverty quintiles and to provide basic welfare monitoring information, CWIQ modules identify robust consumption correlates to census and sample information previously obtained which can be used to construct a weighted index of poverty predictors (World Bank, 1997).

Since housing quality is a composite good, comprising many product characteristics, a set of 13 items was evaluated for scaling into a housing quality index for the Ghanaian case. The proposed index combined scores for materials of the outer walls, materials of the roof, type of cooking fuel, type of lighting fuel, type of water service, type of sewage service, tenure, and distances to nearest drinking water, food market, public transportation, primary school, secondary school, and health clinic/hospital. The full scoring for each variable, with the exception of the distance variables discussed below, is shown in Table 1. The summation of scale values into a housing quality index will be similarly ordinal in implications, not a metric of implicit value.

Wall and roofing materials were assigned values according to their durability, based on the number of response choices in the CWIQ survey. These scale values are strictly ordinal and do not, therefore, imply any particular implicit value. The main source of drinking water was based on hygienic conditions of the water source, water from an indoor tap being considered safer than water from rivers, lakes or ponds, for example. Table 1 lists the ordinal score associated with each source and also displays rural/urban differences. Very few rural households in Ghana have flush toilets, with about an equal proportion having latrine sewage systems (52%) and no systems (47%). Nearly 78% of urban households used electricity for lighting and 22% kerosene, while the majority of rural households use kerosene or paraffin (83%) for lighting, followed by electricity (16%). Some 90% of rural households use firewood for cooking, the rest using other sources, mainly charcoal.

Owner-occupied housing ranges from nearly 51% in the rural areas to less than 20% in urban areas, while over 40% of the households in Ghana pay no rent. Owned dwellings in the rural areas (and many in the urban areas) are owner-built units of mud, mud-brick, or other local materials, obscuring the relationship to housing quality generally expected in Western surveys. In contrast, rental units and "no-rent" units are comprised largely of multi-family apartments or compound housing, built by the state or private-state project collaboration. A binary variable grouped these categories, and their implicit reflection of the perception of general quality of dwellings, by tenure group: owner-occupied = 1, non-owner occupied = 0.

Location (Linneman, 1981), or access to Central Business Districts (Palmquist, 1984) and basic lifestyle amenities such as pure water (Daniere, 1994), is important for housing characteristics studies. Daniere found that squatters in third world countries value closeness to pure water sources and are willing to pay a premium for such access. The average distance from a Ghanaian housing unit to the nearest food market or to public transportation is 35 minutes, 44 minutes to the nearest health or medical clinic, and 50 minutes to the nearest secondary school. Distances to important amenities are much greater, on average, in the rural areas than in urban areas. It takes rural households about 40 minutes to get to the nearest food market, 25 minutes to

their main source of water and 43 minutes to the nearest public transportation, 51 minutes to the nearest clinic and 60 minutes or more to the nearest secondary school. Indicators for distance to facilities were measured in minutes and entered as categorical variables, with nearness scoring higher than longer distances. Thus, a score of 7 was assigned to distances less than or equal to 10 minutes, 6 to distances 10 minutes to 20 minutes away, and down to a score of 1 for distances of 70 minutes or greater.

The next step was to determine if those items can be combined to form a single latent factor called "housing quality". Cronbach's alpha was used to assess the internal consistency reliability of the index (Table 2) on the basis that "...if the items of a scale have a strong relationship to their latent variable, they will have a strong relationship to each other" (Arias & DeVos, 1996, p.65). Low inter-item correlation for four items of the original index (i.e., type of roofing material, type of sewage system, tenure, and distance to nearest primary school) led to a re-specification of the index into a nine-item scale. Results of the second specification exhibited an overall Cronbach's alpha of 0.80, as well as being more parsimonious (i.e., less data is required and it is internally more consistent, Table 2). To further evaluate the index in assessing a single construct of housing quality, principal-components factor analysis was performed on both the original 13-item index and the re-specified nine-item index (also Table 2). The nine-item index was relatively unidimensional, as judged by the higher factor loadings on the first factor and the proportion of total variance explained by the first factor.

The distribution of the constructed housing index – regionally and between rural and urban settings – demonstrated a disproportionate share of deficient housing stock located in the rural, northern part of Ghana (i.e., Upper East, Upper West and the Northern regions). Much of the variation across the regions of Ghana may be attributable to characteristics associated with largely rural housing compared to urban. Some of the variation may be due to tolerances of climatic differences among the regions, such as rainfall or its absence. Compared with a national mean HQI of 34.83 (s.d. = 9.68), the mean score in the rural areas of Ghana is 30.33 (s.d. = 8.15), while that in the areas defined as urban is 42.56 (s.d. = 6.79). How much of this is due to

physical structure and amenities, and how much is attributable to the greater distances to quality-of-life amenities in the rural areas than in urban areas?

A cursory examination of the data (Table 1) would, on average, add one point each to urban scores for such physical factors as wall materials, cooking and lighting fuel, and as many as three or four points for main source of drinking water, relative to rural scores. Thus, not only the greater distances to such important amenities as markets, health, and schools differentiate rural from urban housing quality, but also physical differences are quite notable. Of immediate import to housing quality is the source and distance to the main water source, whether rural or urban. Acceptable water is a key household quality variable for many functions, not the least of which is sanitation. In the following sections, two key indicators of housing quality in Ghana are compared: the constructed housing quality index and an overcrowding indicator.

Factors Affecting the Index of Housing Quality in Ghana

The constructed housing quality index (HQI) was found to be normally distributed, and the relationship to posited socioeconomic and demographic variables was estimated by ordinary least squares. The explanatory value ($R^2 = 0.53$) was quite reasonable for the sample. Only two of the 12 independent variables were not significant at the 0.05 level – household size and employment status of the household head (full-time), but even the estimated parameters for these variables both exhibited the expected signs and appeared to be important household correlates of housing quality in Ghana. Rural/urban location differences in housing quality were significant and substantially shifted the housing quality scale, urban households averaging HQI scores 9.14 points higher than those in rural areas (Table 3).

Employment of household heads in agriculture/forestry/fishing significantly and negatively shifted the HQI score 3.5 points lower compared to those household heads employed in the formal sector. Similarly, household heads employed in the private informal sector (including street and market vendors and artisans) experienced HQI scores marginally lower than those employed in the formal sector. Tenure was significantly related to housing quality, but the relationship is not typical of other countries, even for sub-Saharan Africa. Households living in

owned homes exhibited HQI scores 2.35 points lower, on average, than households not living in owned homes. Although this result differs from housing quality studies in other developing countries, it is consistent with the Ghanaian housing situation (Ghana Statistical Service, 1995) and may be partially attributed to the fact that senior level government employees and private sector employees in higher income groups live in rented housing provided by the government or private sector employers.

Households headed by females exhibit HQI scores 2.3 points higher than their male counterparts, supporting the findings in Ghana by Tipple (1994). Marital status was significant and negative, married households shifting HQI scores slightly lower (0.82 points) than unmarried households, consistent with the results of Memken and Canabal (1994). Income quintile was significantly and positively associated with level of housing quality. Educational attainment impacted HQI significantly but minimally – for each additional year of education, the HQI score increased by 0.059 points. Households headed by older people also tended to have higher scores than those headed by younger people.

Standardized estimates for all households in Ghana indicated a strong location (rural/urban) effect. A Chow test determined the need for separate rural and urban models (Maddala, 1989). Splitting the sample into two segments by location and eliminating the location shift variable from the specification led to a substantial drop in the R^2 in each sub-model (Table 3), but the F-values were significant at 0.001. Income quintile remained significant, as did the occupation status of the household head, sex, and tenure. Ownership in the rural areas of Ghana still correlated with lower housing quality, compared with renting or other type of occupancy. Age of the household head significantly and positively affected the HQI score. The income quintile appeared to be the most important indicator of housing quality in urban areas, followed by agriculture/forestry/fishing sector employment of the head (even in the urban areas), tenure, and marital status. The direction of the effects were consistent with those obtained for the national model (e.g., negative signs for tenure, marital status). For urban households, female household heads have HQI scores 0.68 units higher than their male counterparts. Conversely,

homeowners and married household heads tended to have lower HQI scores than renters or single household heads, *ceteris paribus*.

Factors Affecting Overcrowding Measure of Housing Quality

The second stage in the empirical analysis was to use overcrowding as a housing quality measure to compare with the approach of the constructed HQI. The overcrowding indicator (OI) was computed by dividing the household size by the number of rooms in the dwelling. Unlike the physical quality measure discussed in the HQI analysis, the crowding measure examines housing quality from the perspective of household needs in relation to the space available in the dwelling. Although reliance on a crowding measure for evaluating housing conditions has decreased over the years due to improved housing conditions in advanced countries, its application to research on housing conditions in developing countries is still salient.

Testing the frequency distribution of the crowding variable indicated a non-normal distribution. Using more than two persons per room as an indicator of crowded housing recommended by Asiama (1990), the crowding variable was re-coded as a binary dependent variable (i.e., overcrowded = 1 and not overcrowded = 0). Logistic regression analysis was used to assess the relationship between crowding and socioeconomic and demographic variables elicited in the CWIQ survey. The observed R^2_L of 0.10 indicates a 10% improvement in predictive efficacy of the hypothesized model over the null model (Table 4). Tenure, gender, location, marital status of household head, full-time employment, income quintile, age, and educational level were significantly related to the log odds of households living in overcrowded housing at the level 0.05 or better. Work in the agriculture/fishing/forestry sector and private informal sector work were the only variables not significant at commonly accepted levels.

Households in urban areas are more likely to experience overcrowded housing situations than their rural counterparts. The odds of living in a crowded housing condition are 4.57 times higher for married couples than for household heads not married, while the odds of being in crowded housing are 1.32 times greater for female-headed households than for male-headed households. However, households who are one quintile higher in the income distribution have

odds of living in an overcrowded household 0.71 times that of households in the next lower income quintile. The odds of living in crowded housing are 1.4 times higher for people working full-time than for those working part-time or unemployed. Similarly, the odds of living in crowded housing are 1.03 times greater for every additional year of schooling.

Rural Crowding

Logistic analysis results of the rural households are also presented in Table 4. The relative strength of the effects of the independent variables on the odds of experiencing overcrowding was high for marital status, income quintile, educational level and tenure. Tenure, age, and income quintile were significant and negative influences on overcrowding, while educational level, gender, marital status and full-employment exhibited significant and positive signs. Household heads from the private informal and agriculture/forestry/fishing sectors again did not demonstrate crowding responses significantly different from those in the formal sector.

The odds of living in overcrowded housing were reduced by 0.721 for each higher income quintile. Female-headed households and married family households were more likely to experience overcrowded housing situations than are male-headed households in the rural areas. The odds of owners living in overcrowded housing in the rural parts of Ghana are 0.60 that of renters or people living rent-free, while the odds are increased by 1.03 for every additional year of formal education.

Urban Crowding

Marital status, income quintile and tenure exhibited strong relationships with overcrowding, while variables with weaker effects on the odds of being in overcrowded housing included full-time employment, gender, and agriculture sector employment. Tenure, agriculture/ forestry/fishing sector employment, and income quintile have negative effects on overcrowding, while age, gender, marital status and full-time employment status have a positive effect on the odds of being in overcrowded housing. The odds of being in overcrowded housing were 6.07 greater for married couples than for single or other types of households. Households which are

one quintile higher in the income distribution have lower odds of living in an overcrowded housing (0.68 times that of households in the next lower income quintile).

Policy Implications and Recommendations

Tipple (1994) pointed out that the Global Strategy for Shelter urges governments to increase the existing housing stock by between two to three million dwellings a year in the sub-Saharan Africa region by all means possible over the next two to three decades. Overcrowded housing conditions in the past have led to outbreaks of epidemics in the urban areas of Ghana. Before independence, government-housing policies were geared toward the reduction of overcrowded housing conditions by building prefab housing and flats for government workers. While recent government efforts have been aimed towards the provision of an enabling environment to increase the supply of quality housing via private sector initiatives, results of this research suggest that housing quality in Ghana still needs significant improvement.

Income, location, marital status and tenure appear to be the principal determinants as to which households occupy physically deficient and overcrowded housing in Ghana. The strongest effect is income. These results show that the problem with housing quality in Ghana is not inherent only in the unavailability of facilities or structure inadequacies, but, more importantly, in the simple fact that households occupying these structures are poor. Applying supply side measures such as tax credits for developers to help create more jobs in the housing sector and to increase the earning potential of households (particularly for homeowners and married household heads) to afford decent living dwellings may prove most fruitful.

On the micro level, local traditional banks and rural savings and loans should reach out to the middle class households who often have savings in real assets, such as land and uncompleted dwellings. Lack of confidence in the traditional financial sector has compelled some households to conserve their savings in the form of real assets. This situation has led to the expansion of uncompleted housing in the urban areas of Ghana. On average, it takes the owner of an uncompleted unit of housing about 6 to 10 years to finish the unit. Funds tied to this form of investment could have been saved in the traditional banks to generate interest, with the proceeds

used to create a mortgage pool for low-to-middle-income homeowners. On the other hand, individuals with stable, high-paying jobs should be encouraged to use their own funds to construct their dwellings.

Other measures that could facilitate the improvement of housing in Ghana include careful planning, implementation and control of supply-side measures. For example, most building materials are imported from other countries in Europe, Asia, and South Africa. Capital incentives could be channeled to industries specializing in production of local building materials. Local production of building materials can lower the cost of raw materials, while jobs created in the building industries could increase income levels of households employed in this sector to enable them to afford quality dwellings.

The government might also consider creating a unit within the Ministry of Works and Housing to solicit funds from donor agencies such as the European Union and DANIDA in support of the creation of local Non-Governmental Organizations (NGOs) specialized in housing (e.g., Habitat for Humanity). These local NGOs can create savings and loans schemes in the rural areas, use proceeds from savings of local farmers, and obtain grants from donor agencies to help rural dwellers in the form of loans to improve the quality of their housing. Community leaders and Chiefs should be encouraged to inform local NGOs of their current needs, such as outdoor tap water and toilet facilities. Special loans could also be made available to community leaders and Chiefs for the development of community facilities (e.g., water, treatment and delivery sewers). Current joint efforts of the Ghanaian government and the European Union creating micro industries in the rural areas to minimize migration to urban areas must be intensify.

Summary

Despite a history of economists' attempts to measure housing quality in the United States going back to at least 1937, there is still disagreement as to what constitutes housing quality. Perhaps equally important, very few housing quality studies have been undertaken in developing countries to understand living conditions and inform policy decisions. This research has

attempted to improve our understanding of the living conditions in sub-Saharan Africa, specifically Ghana, by examining the interrelationships of indicators of housing quality with selected socioeconomic and demographic characteristics. As a result, newly constructed housing quality measure was applied to assess the quality of Ghanaian housing stock from data gathered using the standardized Core Welfare Indicators Questionnaire (World Bank).

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Table 1. Housing Quality Indicator Variables, Ghana, 1997.

Definition/Category	Score	Frequency of Category (%)		
		Total	Urban	Rural
Wall material Cardboard	1	0.0	0.1	--
Iron sheet	2	0.3	0.7	0.1
Wood/mud brick	3	58.2	27.5	76.1
Stone/brick/cement	4	41.4	71.6	23.8
Roofing material Thatch	1	15.9	2.2	69.8
Sheet iron or mud	2	69.8	69.7	24.0
Asbestos or wood	3	12.0	23.3	5.3
Tile or cement	4	2.3	4.8	0.9
Cooking fuel Crop residue/sawdust	1	0.1	0.1	0.1
Firewood	2	66.0	25.0	90.0
Charcoal	3	28.5	62.0	8.9
Kerosene/oil	4	1.2	2.8	0.3
Gas	5	3.6	9.0	0.5
Electricity	6	0.4	0.9	0.1
Lighting fuel Candles	1	0.1	0.2	0.1
Kerosene/paraffin	2	60.8	22.0	83.4
Gas	3	0.1	0.2	0.1
Electricity	4	38.4	77.5	15.5
Main source of drinking water Vendor, truck	1	3.6	6.6	1.8
River, lake, pond	2	25.0	4.5	37.0
Unprotected well	3	7.3	3.9	9.3
Protected well	4	6.9	6.0	7.3
Bore hole	5	19.5	4.1	28.6
Public outdoor tap	6	21.5	37.4	12.2
Pipe into dwelling	7	15.4	37.2	2.6
Sewage system No system	1	48.5	51.5	46.9
Latrine	2	44.6	31.6	52.0
Flush toilet	3	6.9	16.9	1.1
Tenure Own dwelling	1	39.1	19.6	50.5
Does not own/pay rent	0	19.9	37.1	9.8
Use dwelling/no rent	0	41.0	43.3	39.7

Table 2. Cronbach's Alpha for 9-item Housing Quality Scales.

	9-item index			
Indicator	**Average inter-item correlation**	**Alpha**	**Factor 1**	**Factor 2**
Distance to nearest public transportation	0.649	0.767	0.730	0.341
Distance to nearest hospital	0.623	0.770	0.718	0.291
Distance to secondary school	0.603	0.773	0.709	0.156
Type of lighting fuel	0.575	0.789	0.736	0.336
Type of cooking fuel	0.533	0.797	0.690	0.431
Distance to nearest market	0.527	0.787	0.591	0.604
Type of materials of walls	0.503	0.804	0.654	0.335
Main water source	0.496	0.789	0.647	0.276
Distance to nearest water source	0.400	0.800	0.484	0.036
Distance to nearest primary school	—	—	–	--
Tenure	—	—	–	--
Type of sewage system	—	—	--	--
Type of roofing material	—	—	–	--
Cronbach alpha		0.80		
Eigen value			4.00	1.08
% total variance explained			44.50	12.00

Table 3. Factors influencing housing quality index (HQI).

Variable	National		Rural		Urban	
	Parameter Estimate	Standard Error	Parameter Estimate	Standard Error	Parameter Estimate	Standard Error
Income quintile	1.785***	0.051	1.695***	0.065	1.953***	0.079
Agriculture/ forestry/fishing	-3.583***	0.160	-3.651***	0.209	-3.490***	0.249
Informal sector	-0.387**	0.193	0.121	0.306	-0.526**	0.231
Full-time employment	-0.448	0.281	-0.082	0.363	-0.899**	0.427
Age	0.060***	0.004	0.068***	0.006	0.039***	0.007
Education	0.059***	0.009	0.077***	0.013	0.031**	0.012
Sex of head (1=female)	2.395***	0.151	3.425***	0.202	0.685***	0.216
Marital status (1=married)	-0.829***	0.151	*0.400**	0.199	-1.466***	0.221
Tenure (1=own)	-2.354***	0.145	-2.397***	0.175	-1.990***	0.263
Household size	0.032	0.027	0.060	0.035	0.007	0.044
Number of rooms	-0.200***	0.044	-0.246***	0.053	-0.062	0.081
Location (1=urban)	9.139***	0.149	—	—	—	—
N	12,651		8,287		4,364	
R^2	0.528		0.250		0.280	
F-value	1182.5***		245.8***		152.6***	
Intercept			24.675		37.358	

Indicates significant at 0.05, * 0.01 or better

Table 4. Log odds of living in a crowded housing condition in Ghana.

Variable	National		Rural		Urban	
	Parameter Estimate	Odds Ratio	Parameter Estimate	Odds Ratio	Parameter Estimate	Odds Ratio
Income quintile	-0.338*** (425.887)	0.713	-0.327*** (274.003)	0.721	-0.375*** (155.188)	0.687
Agriculture/ forestry/fishing	-0.010 (0.039)	0.990	0.104 (2.668)	1.110	-0.275*** (8.709)	0.759
Informal sector	-0.099 (2.627)	0.906	-0.097 (1.137)	0.907	-0.110 (1.624)	0.896
Full-time employment	0.363*** (15.103)	1.438	0.299*** (6.928)	1.349	0.512** (9.350)	1.670
Age	-0.006*** (17.642)	0.994	-0.014*** (59.167)	0.987	0.011*** (17.626)	1.011
Education	0.024*** (66.597)	1.025	0.035*** (83.727)	1.036	0.009 (3.728)	1.009
Sex of head (1=female)	0.277*** (31.181	1.320	0.286*** (20.865)	1.331	0.294** (12.314)	1.342
Marital status (1=married)	1.520*** (988.716)	4.573	1.358*** (509.251)	3.890	1.804*** (474.249)	6.078
Tenure (1=own)	-0.586*** (171.561)	0.557	-0.505*** (96.736)	0.603	-0.725*** (60.860)	0.484
Location (1=urban)	-0.149** (9.772)	0.861	—	—	—	---
N	12,667		8,303		4,365	
R^2	0.10		0.08		0.12	
Model chi-square	1619.56***		1004.73***		741.52***	
Log likelihood ratio	15898.34		10465.41		5304.68	

Indicates significant at 0.05, * 0.0 or better
Note: numbers in parentheses are Wald chi-square