Working Paper 85-5

THE EFFECT OF SECOND GENERATION RENT CONTROLS ON THE QUALITY OF RENTAL HOUSING

by

David L. Mengle*

Federal Reserve Bank of Richmond

November 1985

Drafted: June 1984

*Werner Z. Hirsch and F. Ward McCarthy, Jr., provided helpful comments and suggestions. The views expressed in this paper are solely those of the author and do not necessarily reflect the views of the Federal Reserve Bank of Richmond or the Federal Reserve System.

ABSTRACT

Microeconomic theory predicts that rent controls will lead to greater housing quality deterioration than would have been the case in an uncontrolled market. However, empirical analyses of rent control have concentrated on income distribution effects. This study tests the hypothesis of quality deterioration using a two period linked sample of dwelling units drawn from eight Standard Metropolitan Statistical Areas, half of which have rent control laws. The results indicate that quality was 7.1% lower in controlled markets in 1974, and 13.5% lower in 1977. Slow, cumulative effects of deferred maintenance may be responsible for the more pronounced 1977 results.

I. Introduction

During the 1970's, rent control became the subject of a heated debate in the United States. Major battlegrounds included Boston and New Jersey in the early part of the decade, followed by Washington, D.C. By 1979, about a third of all Californians lived under rent controls, including the residents of Los Angeles and San Francisco.

Throughout the debate, New York City's experience was held up as evidence that rent control would inevitably lead to housing shortages, quality deterioration, and accelerated abandonment.[1] Advocates responded that these ill effects could be avoided by means of "moderate" or "second generation" rent controls. These new controls differ from wartime and New York City versions in that they are not rent freezes *per se*, but generally contain mechanisms for restricted rent increases. In addition, "pass-through" mechanisms for certain categories of costs are often included. Finally, some laws generally seek to assure housing quality by penalizing landlords who allow quality of controlled units to deteriorate below some minimum level.[2]

Economists are generally hostile to rent control,[3] and analyses showing how such laws lead to housing shortages are staples of microeconomics and urban economics textbooks. However, it is surprising to note the lack of empirical attention this subject has received from economists in comparison with other policy issues. So far, the most significant empirical studies of the effects of rent controls are those of Ira S. Lowry *et al*. (1971), Edgar O. Olsen (1972), Daniel Peña and Javier Ruiz-Castillo (1984), and Peter Linneman (1984), all of which concentrate on distributional issues.

---

[1] See, for example, Frank S. Kristof (1981).

[2] Monica R. Lett (1976) presents a more detailed analysis of these laws. Also, see Richard E. Blumberg *et al*. (1974).

[3] J. R. Kearl *et al*. (1979).

With regard to the effect of rent controls on housing maintenance and quality, the major studies have emphasized theoretical issues,[4] and little empirical evidence has been amassed to support or refute the contention that housing deterioration is accelerated by rent control. Finally, C. Peter Rydell *et al.* (1981) attempt to consider both distributional and quality issues together. Although this study is primarily a simulation rather than an empirical analysis, the authors do predict that gains from lower rents will, over time, be gnawed away by slow but steadily increasing deterioration.

The purpose of this study is to empirically test the proposition that rent control leads to lower housing quality than would have been the case in the absence of controls and, further, that this effect increases over time. In order to conduct such a test, a theoretical housing market framework will be set up in the next section, followed by the empirical model and results. In the final section, a summary and comment on policy implications of the findings will be presented.

II. A Theory of Housing Markets

Sherwin Rosen's (1974) exposition of the hedonic pricing methodology will form the theoretical framework for the empirical analysis to follow.[5] Generally, hedonic pricing assumes that price, h(z), is a function (not necessarily linear) of a vector of characteristics, $z = (z_1, z_2, \ldots z_m)$. In other words, each good is a bundle of attributes and the contents of this package determines price. This is considered an especially fruitful approach to the analysis of housing markets due to the fact that the goods traded differ in so many dimensions, yet are exchanged as indivisible bundles.

---

[4] Jerome Rothenberg (1974) analyzes rent control within a general model of the housing market. See also John C. Moorhouse (1972).

[5] For further, more rigorous development of the hedonic theory, see Bryan Ellickson (1983).

So far, most empirical applications of this method have either sought to construct supply and demand functions from observed hedonic price data,[6] or have concentrated on the consumer side of the model.[7] In contrast, this study is interested in the reactions of landlords to the imposition of rent controls, and thus will stress the production aspect of the Rosen model.

Rosen assumes that producers maximize profits

$$\pi = Mh(z) - C(M,z) \tag{1}$$

where M is quantity of dwelling units (z bundles), h(z) is the hedonic price function, and C is a cost function showing the minimum cost of producing a given quantity of a given configuration. The first order condition with respect to z_i is that marginal price equal marginal cost per unit:

$$\partial h(z)/\partial z_i = M^{-1}\partial C(M,z)/\partial z_i. \tag{2}$$

Next, assume there exists an offer price ϕ, which is the price a firm will accept for various quantities of z if profit is to be held constant. Substituting ϕ into the profit function, and holding π constant at π_0, the offer function is

$$\phi = \frac{\pi_0}{M} + \frac{C(M,z)}{M} \tag{3}$$

and the slope of this function with respect to z_i is

$$\partial\phi/\partial z_i = M^{-1}\partial C(M,z)/\partial z_i. \tag{4}$$

Equilibrium obtains when offer prices equal market prices so that tangency

---

[6] See, for example, Ann D. Witte, Howard Sumka, and Homer Erekson (1979).

[7] Ellickson (1981) and John M. Quigley (1983).

occurs between the offer price function and hedonic price function, that is,

$$\partial\phi(z,\pi_0)/\partial z_i = \partial h(z)/\partial z_i. \tag{5}$$

This condition is shown in Figure 1.[8]

It is important at this point to determine the reaction of a profit maximizing landlord to binding controls on the price he is authorized to charge for his dwelling. Assume his local government imposes rent controls so that the rent charged on a particular dwelling unit is equal to ϕ_c. The short run profit function is then

$$\pi_s = M_0\phi_c - C(M_0,z_0,z_a) \tag{6}$$

where zero subscripts describe those variables the landlord cannot affect at low cost, that is, that are fixed in the short run, and the "a" subscript refers to elements of z the landlord can alter, so that $z_a = f(\phi_c)$. Assuming that profits are maximized with respect to the controlled price, the following first order condition obtains in the short run:

$$\partial\pi_s/\partial\phi_c = M_0 - (\partial C/\partial z_a)(\partial z_a/\partial\phi_c) = 0. \tag{7}$$

Therefore, assuming costs are increasing in elements of z,

$$\partial z_a/\partial\phi_c = M_0/(\partial C/\partial z_a) > 0. \tag{8}$$

In words, alterable attributes will change in the same direction as does controlled price. This in turn leads to the refutable hypothesis that, if rents are reduced in real terms (which is likely if controls are imposed

---

[8] Utility maximizing consumers, at the same time, attempt to locate on the lowest bid price function possible. Interaction of consumers and producers, then, fixes the hedonic price function as an envelope of bid and offer price curves.

during periods of inflation), those aspects of the quality vector over which the landlord has control in the short run will generally be observed to be cut back.

However, one of the alleged advantages of second generation controls is that they are designed to minimize quality deterioration. At the same time, maintenance levels are costly for tenants and local officials to police, and cutbacks are typically slow to show their effects. For example, tenants may be unaware that landlords under controls may now repair leaking roofs rather than replace them, or that formerly annual services may now be performed every two years. Thus, the first hypothesis to be tested is that rent controls will be associated with lower quality, even in the presence of maintenance floors. Alternatively stated, incentives for landlords to cut back maintenance will be strong enough for them to seek out ways to evade provisions of second generation controls included to maintain quality.[9]

In attempting to test such a hypothesis, problems arise because M is suppressed in Figure 1. Thus, although hedonic price functions can be estimated, they are not, by themselves, helpful in looking at changes in quality.

An operational link between hedonic price functions and quality can be forged by constructing the marginal distribution of z_a with respect to households. For any value of z_a, measured along the horizontal axis, the proportion of dwellings in the market possessing that quantity of z_i may be considered to be the joint probability that any household will select that value of z. Repeating this over all values of z_a yields a distribution of z_a values in the market, more precisely, the marginal distribution of z_a with respect to households.

---

[9]Even if rent control laws were silent on quality, landlords would not cut maintenance out entirely. Specifically, landlords would generally have incentives to allow quality to decline to the minimum levels tenants would accept at controlled rents. See Rothenberg (1974), pp. 22-4.

The result is a new diagram to supplement that of Rosen, as shown in Figure 2. The top diagram is the hedonic price function, and the bottom diagram describes the distribution of z_a values chosen across the market. Thus, the gap in Rosen's exposition has been filled, because the M value that was suppressed is now available as a proportion. Further, although z_a in this case has only one dimension for simplicity, this can be generalized to any m-dimensional z vector. Finally, it is now possible to easily illustrate comparative statics within the hedonic framework, because one can now observe changes in distributions of z_a as exogenous changes are introduced into the market.

In order to apply this methodology to the present research effort, recall that Equation (8) implied the refutable hypothesis that, in the presence of rent controls that reduce rents in real terms, landlords are expected to supply fewer of those elements (z_a) of quality which can be cut back at relatively low cost. In the present context, one would observe a lower distribution of z_a conditional on the existence of controls. In practice, it can be asserted that there exists some relationship between z_a and other elements of z, for example, age of building. For any age, there is a mean value of z_a conditional on that value of age. The locus of conditional means of z_a is, of course, the regression line of z_a on age. In attempting to determine the effect of rent control, therefore, it is necessary to find out whether or not the height of the regression line differs between controlled and noncontrolled markets. In other words, given similar dwelling characteristics, is the distribution of z_a lower in rent controlled markets? Of course, in actual practice one would consider distributions conditional on other variables beside legal environment and age, as well as whether or not the slope of the regression line is affected by controls.

The final linkage of z_a to the hedonic model may be found in the offer function (Equation (3)) in which offer price (ϕ) is a function of, among other variables, elements of the z vector. Assuming that ϕ varies strictly monotonically with z_a, this function may be inverted so that alterable quality is a function of price and other conditioning variables. Assuming further that rent controls are effective in lowering rents in real terms, legal environment will be asserted to play the same explanatory role as rents. Thus, the model to be presented here will test the hypothesis that the conditional distributions of alterable housing quality (z_a) have lower means in rent controlled markets. The conditioning variables, in addition to legal environment, are those that may be plausibly asserted to affect a landlord's profit function.

A subsidiary hypothesis to be explored is that quality deterioration, if observed, will tend to increase over time because disinvestment through depreciation only manifests itself slowly. In other words, if conditional distributions of quality are indeed lower in rent-controlled markets, this bias may be expected to grow larger as controls are in effect longer. This is consistent with Rydell _et al_.'s (1981) prediction that quality effects will be more pronounced over time.

A final hypothesis to be tested is that effects of rent control on quality will be the same in lower income households as in the market as a whole. The results here would be of interest in connection with other studies mentioned above that have explored the income distributional effects of controls. In other words, given that rent controls have been found to generally favor lower income individuals by keeping rents lower, are these benefits offset by lower quality?

III. Empirical Model and Results

The following model will be estimated for both 1974 and 1977:

$$q_{it} = \alpha + \beta z_{it} + \gamma x_{it} + \tau w_{it} \qquad (9)$$

where q_{it} is a measure of alterable quality of dwelling i, t is 1974 or 1977, z_{it} is a vector of dwelling characteristics, x_{it} is a vector of market characteristics, and w_{it} is a vector of interaction terms. The data set is described in the Appendix, and the variables comprising the z, x, and w vectors are defined in Table A1.

The most important variable for the purposes of this analysis is the rent control dummy (RC), which is contained in the x vector. The tests of the hypotheses described above will hinge on the sign and significance of the coefficient of this variable, along with the change in magnitude of the coefficient from 1974 to 1977. Because presence of a rent control law means a higher value of RC, the hypothesis that rent control is associated with lower alterable quality implies a negative coefficient. Further, the hypothesis that the effects of controls increase over time implies that the magnitude of the RC coefficient will be significantly larger in 1977 than in 1974.

Two considerations should be borne in mind regarding expectations about RC. First, during the period covered by this study, rent control laws had only been on the books since 1973. Effects of deferred maintenance do not always show up immediately, but it is difficult to predict how much of a lag will occur before quality is visibly affected. Thus although the above hypothesis implies a negative coefficient in both 1974 and 1977, one would be more likely to find significant effects in 1977 than in 1974.

The second consideration is that laws are not uniform across the cities covered by this study. For example, Newark, New Jersey, allowed 5% across-the-board rent increases each year, while Clifton, New Jersey, allowed annual increases equal to half the annual percentage increase of the Consumer Price Index. However, it is difficult to say a priori which type of law will incur more costs for landlords. During periods of high inflation (e.g., 1974), the percentage of CPI approach would be less costly, while, once inflation abates (as in 1976), the constant annual percentage may be preferred by landlords. In addition, other provisions of the laws, such as capital improvement pass-through and attempts to maintain quality levels, are similar across cities. Thus, it will be assumed here that laws in the six controlled cities covered by this analysis create similar incentives.

Other variables in the city characteristics vector include vacancy rate (VAC) and per capita income (YPC). VAC attempts to account for differences in housing demand conditions between cities.[10] Most likely, vacancy rates, since they vary inversely with intensity of demand, may be indicators to landlords of whether to invest or disinvest in the rental housing market. Thus, one would expect a negative sign. Finally, YPC is included to pick up unique characteristics of cities and, more importantly, price and cost differences.

The dwelling characteristics vector includes four variables, age of building in which a dwelling unit is located (BUILT), presence of owner in building (OWNHERE), neighborhood quality (DUMP), and neighborhood racial composition (RACE). One would a priori expect the coefficient of BUILT to have a negative sign, since it seems reasonable that older buildings should have more wear and tear and, therefore, more problems than a relatively new structure. Second, having the owner in a dwelling should tend to favor a higher level of maintenance in a building. Thus, if OWNHERE takes a unit

---

[10] Recently, some analysts have emphasized the importance of declining rental housing demand in explaining disinvestment in rental housing. See, for example, John C. Weicher et al. (1981).

value if the owner lives in the building, one would expect a positive coefficient.

DUMP is included to take account of the external effects of the general level of upkeep of a dwelling's surroundings. As Otto A. Davis and Andrew Whinston (1966) have pointed out, a landlord's maintenance decision may be strongly influenced by the decisions of the neighborhood's other landlords. Since a higher value of this variable denotes a favorable rating, one would expect a positive coefficient. Finally, RACE is included because, given the existence of residential segregation, there is a high probability that the race of the head of household is the predominant race in that household's neighborhood. Thus, this variable should pick up neighborhood characteristics not included in DUMP. If one asserts that landlords may discriminate against nonwhites or that nonwhite neighborhoods are generally of lower quality than white neighborhoods, RACE should have a negative coefficient.

It is plausible that rent control laws not only affect quality by themselves, but also influence the effect of other conditioning variables on quality. In other words, rent control may affect the slopes of the other variables as well as the height of the intercept. Thus, interaction terms will be included for rent control with age (RBUILT), with presence of owner (ROWNH), and with neighborhood (RDUMP and RRACE). Although it is difficult to predict the signs of the coefficients of these terms, one may expect rent controls to exacerbate negative effects and reduce positive effects of the other conditioning variables. Thus, the interactions should all carry negative coefficients. In order to test the contribution the interaction terms make to the estimation, the appropriate F tests will be carried out.

The results for the full sample of 8,281 dwelling units are shown for both 1974 and 1977 for both linear and semilog forms in Table 1. The results are generally consistent between 1974 and 1977, and most coefficients have signs in accord with expectations. More important, the law variable (RC) is negative and significant in both 1974 and 1977. Further, the magnitude of the coefficient for 1977 is approximately twice that of the coefficient for 1974 in both forms. Both of these are consistent with theoretical predictions, and results of further tests of statistical significance will be presented below.

Interpretation of the coefficients of the rent control variable is most straightforward using the semilogarithmic functional form because dummy variable coefficients may be transformed in order to yield an interpretation in percentage terms.[11] The result is that in 1974 the presence of rent control is associated with a 7.1% decrease in the value of the quality variable, while in 1977 it is associated with a 13.5% decrease.

A particularly striking finding here is the magnitude of the 1974 RC coefficient. As stated above, the laws were relatively new at the time, and quality effects are typically slow to manifest themselves. A possible explanation is that expectations of rent control on the part of landlords may have induced maintenance cutbacks even before the laws were on the books.

Other conditioning variables also perform as expected. BUILT and RACE have negative signs, while DUMP and OWNHERE are positive. The sign and magnitude of DUMP is particularly interesting because it supports the contention that externalities are important in determining housing quality. This is in contrast to the lackluster performance of neighborhood variables in some hedonic regressions.[12] Finally, vacancy rate has the expected negative sign in both years.

---

[11] If m is the relative (percentage) effect of the presence of rent control on quality, and d is the coefficient of the rent control dummy in the semilogarithmic functional form, then $m=\exp(d)-1$. See Robert Halvorsen and Raymond Palmquist (1980).

[12] See, for example, Werner Z. Hirsch (1981).

The interaction terms did not all yield the expected results. Specifically, interactions of rent control with age, presence of owner, and neighborhood quality yield positive coefficients, although they are not all statistically significant. The most likely explanation that suggests itself is that the presence of controls, inducing general cutbacks in upkeep, detracts from the importance of the other factors in determining quality. In other words, quality deterioration not only increases but is also more evenly spread across a market if rent control is in effect. However, one interaction variable that does perform as expected, and that yields a ready economic interpretation, is that between rent control and race. RRACE has a significantly negative coefficient in both 1974 and 1977, and may be interpreted as signifying that rent controls are associated with intensified discriminatory behavior against nonwhites.[13] This may take the form of cutting back maintenance expenditures relatively more in nonwhite than in white neighborhoods after controls are enacted.

F tests are conducted of the joint insignificance of the interaction terms and of the joint insignificance of the rent control law and the interaction terms. The results are shown in Table 2, and certainly support the importance of rent control and its interactions with the other variables. Finally, the insignificance of the difference between the rent control coefficients is tested by running the two years' equations as a system in which the coefficients are restricted to be equal and then running them without restrictions. Applying an F test described by Franklin M. Fisher (1970) to the restricted and unrestricted sums of squared residuals, the hypothesis that the difference between the coefficients is not significant is rejected at the 1% level. In other words, the effect of rent control laws on quality did increase from 1974 to 1977.

---

[13] Linneman (1984) finds racially neutral income distribution effects in New York City. The findings here suggest that quality deterioration may lead to negative net effects on nonwhites.

The results of the estimated model using the lower income subsample are shown in Table 3. Although the results are generally consistent with those of the full sample, there are some significant differences. Similarities include, first, that signs of coefficients are the same as for the full sample and, second, quality is computed in the semilogarithmic form to be 7.2% lower in the presence of rent control and 13.9% lower if controls are in effect in 1977. The most important difference from the full sample estimate is the drop in significance for the law variable in 1974. Although this may be expected because the laws had not been in effect for very long, this does not explain the difference between the results for full and low income samples. A possible explanation is that controls were not initially effective in lower income neighborhoods, that is, they did not hold rents significantly below what they would have been in an uncontrolled market. At the same time, controls may have been very effective in more affluent neighborhoods as soon as they were enacted. In addition, because demand was relatively low in poorer neighborhoods, maintenance was likely to already be at a low level.[14] Thus, little difference would be observed initially between poor areas in controlled and noncontrolled markets. However, as controls remain in effect longer, it is likely that excess demand created by below-market rents will spill over from affluent to lower income neighborhoods, thus exerting upward pressure on rents in the poorer areas. However, controls prevent landlords from profiting from this gain by raising rents, so their least costly alternative is reducing maintenance expenditures. Thus, by 1977 alterable quality is observed to be significantly lower in controlled markets in both the low income and full samples.

---

[14] For anecdotal evidence, see U.S. Congress, Senate (1976), p. 14.

The other major difference between the results for the two samples is that the interaction terms (other than RRACE), as shown in Table 2, are not individually or jointly significant in 1974, although rent control and its interaction terms with the other variables are jointly significant. However, their signs are consistent with those for the full sample. By 1977, RDUMP and ROWNH become statistically significant, as do the interaction terms taken jointly. Finally, although the magnitude of the rent control coefficient is higher in 1977 than in 1974, the difference is not statistically significant. Again, the reason behind these seeming anomalies may be that the effects of rent control are slower to manifest themselves in poorer neighborhoods because the effectiveness of controls is longer in coming about.

IV. Concluding Comments

To summarize briefly, rent controls were associated with a 7.1% decrease in quality during 1974, and with a 13.5% decrease in 1977. The results are similar if the analysis is restricted to a low income subsample, indicating that favorable distributional effects may be partially offset by quality deterioration. In addition, the magnitude of the law coefficient increased over time. Other variables, such as neighborhood quality and age, race, and income of head of household, performed as expected. The results also suggest that quality effects are not racially neutral. The upshot of the findings is that sanctions against landlords who cut back maintenance expenditures have not realized their intended results.

On first blush, one may infer that these findings show that penalties must be made more severe in order to constitute a higher expected cost to landlords who allow their properties to deteriorate. Viewed in isolation, such a policy could be successful and, in the very short run, the probability of observing an unsatisfactory dwelling could be made uniform across legal environments.

However, such a policy may well turn out to be counterproductive over a longer term. The reason is that, having closed off the main means of defending cash flows, profit maximizing landlords will look to other alternatives. The most likely result, given that returns to rental housing in controlled markets will decline relative to other investments, would be either sale at depressed prices or abandonment. In the former case, new buyers would build expectations of controlled revenues into the prices they paid, and may be expected to earn a normal return if their expectations turn out to be correct. The main result, then, would be a major transfer of wealth to tenants from those who were landlords when controls were imposed. In the latter case, however, it is difficult to see how anyone could benefit unless one's hidden agenda is to remove rental housing from the private sector.

DATA APPENDIX

Most of the data used in this study are from the Annual Housing Survey (AHS) conducted by the United States Bureau of the Census in cooperation with the Department of Housing and Urban Development. The AHS has been conducted since 1973, although usable data for time series actually begin in 1974. Over a three-year period, sixty Standard Metropolitan Statistical Areas (SMSA) are sampled, with the same one-third being visited every three years. Further, the same households are visited in each "wave," thereby giving a longitudinal character to the survey.

The AHS contains detailed information on the characteristics of dwellings, and is therefore well suited to the hedonic pricing method. The categories of data available in this survey pertain to neighborhood quality, housing quality, structure, costs, geography, previous residence, and characteristics of the occupants. The AHS, unfortunately, contains no data on landlord maintenance expenditures. This shortcoming can be circumvented by focusing on indications of reduced maintenance and isolating those variables which depend on the landlord's actions. These may include water breakdowns, toilet breakdowns, holes in floors, cracks in the walls and ceiling, rats and mice, and others. In addition, data are available on the number and duration of some of these faults in a building. The variables used in this study are shown in Table A1.

In order to provide a scalar measure of alterable quality, an unweighted summation of dummy variables

$$q_i = \sum_j q_{ij} \tag{10}$$

is used, where q_{ij} is a dummy variable for attribute j of dwelling unit i, equal to zero if a deficiency is observed and one otherwise. The attributes that comprise the measure are leaky roof, open cracks or holes in walls or ceiling, holes in floor, peeling paint over one square foot, broken plaster over one square foot, public light fixtures burnt out, stair railings missing or not firmly attached, hazardous steps on common stairways, and evidence of rats or mice in last 90 days. The fewer deficiencies observed, the higher the value of q_i.

This study uses a combined data set of 8,281 dwellings from eight SMSAs, of which four are controlled and four are not. Size and control status are summarized in Table A2. This set of 8,281 dwelling units is selected according to several criteria. All dwellings are located in the rent controlled city portions of their SMSAs. All rental units that were added to or withdrawn from the market during the period of observation are excluded from the sample. All dwelling units selected must be private, unsubsidized rental units. In addition, single family dwellings along with two family detached units are excluded since they would be exempt from controls in most of the cities in the sample. The lower income subsample of 2,786 dwellings is selected from the full sample by excluding all units except those whose occupants' incomes are below the full sample median in both 1974 and 1977.

Note that pooling dwellings from different cities involves the assumption of the existence of a national housing market. For evidence favoring such an assumption, see Linneman (1980).

REFERENCES

Blumberg, Richard E.; Robbins, Brian Quinn; and Baar, Kenneth K. "The Emergence of Second Generation Rent Controls." Clearinghouse Review (August 1974):240-9.

Davis, Otto A., and Whinston, Andrew. "The Economics of Urban Renewal." In Urban Renewal: The Record and the Controversy, pp. 50-67. Edited by John Q. Wilson. Cambridge, Massachusetts: MIT Press, 1966.

Ellickson, Bryan. "An Alternative Test of the Hedonic Theory of Housing Markets." Journal of Urban Economics 9 (January 1981):56-79.

________. "Indivisibility, Housing Markets, and Public Goods." In Research in Urban Economics, pp. 91-160. Edited by J. Vernon Henderson. Vol. 3. Greenwich, Connecticut: JAI Press, 1983.

Fisher, Franklin M. "Tests of Equality between Sets of Coefficients in Two Linear Regressions: An Expository Note." Econometrica 38 (March 1970):361-6.

Halvorsen, Robert, and Palmquist, Raymond. "The Interpretation of Dummy Variables in Semilogarithmic Equations." American Economic Review 70 (June 1980):474-5.

Hirsch, Werner Z. "Habitability Laws and the Welfare of Indigent Tenants." Review of Economics and Statistics 63 (May 1981):263-74.

Kearl, J. R.; Pope, Clayne L.; Whiting, Gordon C.; and Wimmer, Larry T. "A Confusion of Economists?" American Economic Review 69 (May 1979): 28-37.

Kristof, Frank. "The Effects of Rent Control and Rent Stabilization in New York City." In Rent Control: Myths and Realities, pp. 125-47. Edited by Walter Block and Edgar O. Olsen. Vancouver, B.C.: Fraser Institute, 1981.

Lett, Monica R. Rent Control: Concepts, Realities, and Mechanisms. New Brunswick, New Jersey: Center for Urban Policy Research, Rutgers University, 1976.

Linneman, Peter. "Some Empirical Results on the Nature of the Hedonic Price Function for the Urban Housing Market." Journal of Urban Economics 8 (July 1980):47-68.

________. "Income Distribution Effects on Renters of Rent Controls: The Case of New York City." Mimeo, The Wharton School, University of Pennsylvania, January, 1984.

Lowry, Ira S.; DeSalvo, Joseph S.; and Woodfill, Barbara M. Rental Housing in New York City. II: The Demand for Shelter. New York: The New York City-Rand Institute, June 1971.

Moorhouse, John C. "Optimal Housing Maintenance Under Rent Control." Southern Economic Journal 39 (July 1972):93-106.

Olsen, Edgar O. "An Econometric Analysis of Rent Control." Journal of Political Economy 80 (November 1972):1081-1100.

Peña, Daniel, and Ruiz-Castillo, Javier. "Distributional Aspects of Public Rental Housing and Rent Control Policies in Spain." Journal of Urban Economics 15 (May 1984):350-370.

Quigley, John M. "Nonlinear Budget Constraints and Consumer Demand: An Application to Public Programs for Residential Housing." Journal of Urban Economics 12 (September 1982):177-201.

Rosen, Sherwin. "Hedonic Prices and Implicit Markets." Journal of Political Economy 82 (January 1974):34-55.

Rothenberg, Jerome. "Urban Housing Markets: An Analytical Model and its Applications to the Impact of Rent Control." In Urban and Social Economics in Market and Planned Economies, pp. 3-30. Edited by Alan A. Brown, Joseph A. Licari, and Egon Neuberger. Vol. 2. New York: Praeger Publishers, 1974.

Rydell, C. Peter; Barnett, C. Lance; Hillestad, Carol E.; Murray, Michael P.; Neels, Kevin; and Sims, Robert H. The Impact of Rent Control on the Los Angeles Housing Market. N-1747-LA. Santa Monica, California: The Rand Corporation, August, 1981.

U.S. Congress. Senate. Committee on the District of Columbia. Fiscal Pressures on the District of Columbia. Hearing before the Committee on the District of Columbia, United States Senate, 94th Cong., 2d sess., 1976.

Weicher, John C.; Villani, Kevin E.; and Roistacher, Elizabeth A., ed. Rental Housing: Is There a Crisis? Washington, D.C.: Urban Institute Press, 1981.

Witte, Ann D.; Sumka, Howard J.; and Erekson, Homer. "An Estimate of a Structural Hedonic Price Model of the Housing Market: An Application of Rosen's Theory of Implicit Markets." Econometrica 47 (September 1979):1151-73.

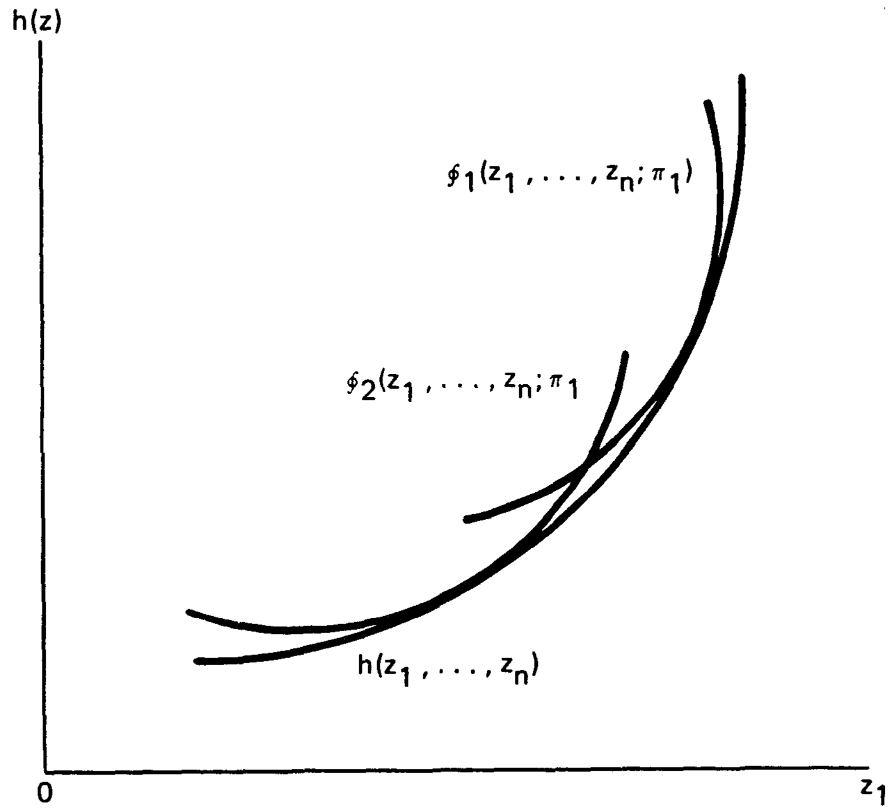

Figure 1: Equilibrium of Producers under Hedonic Pricing

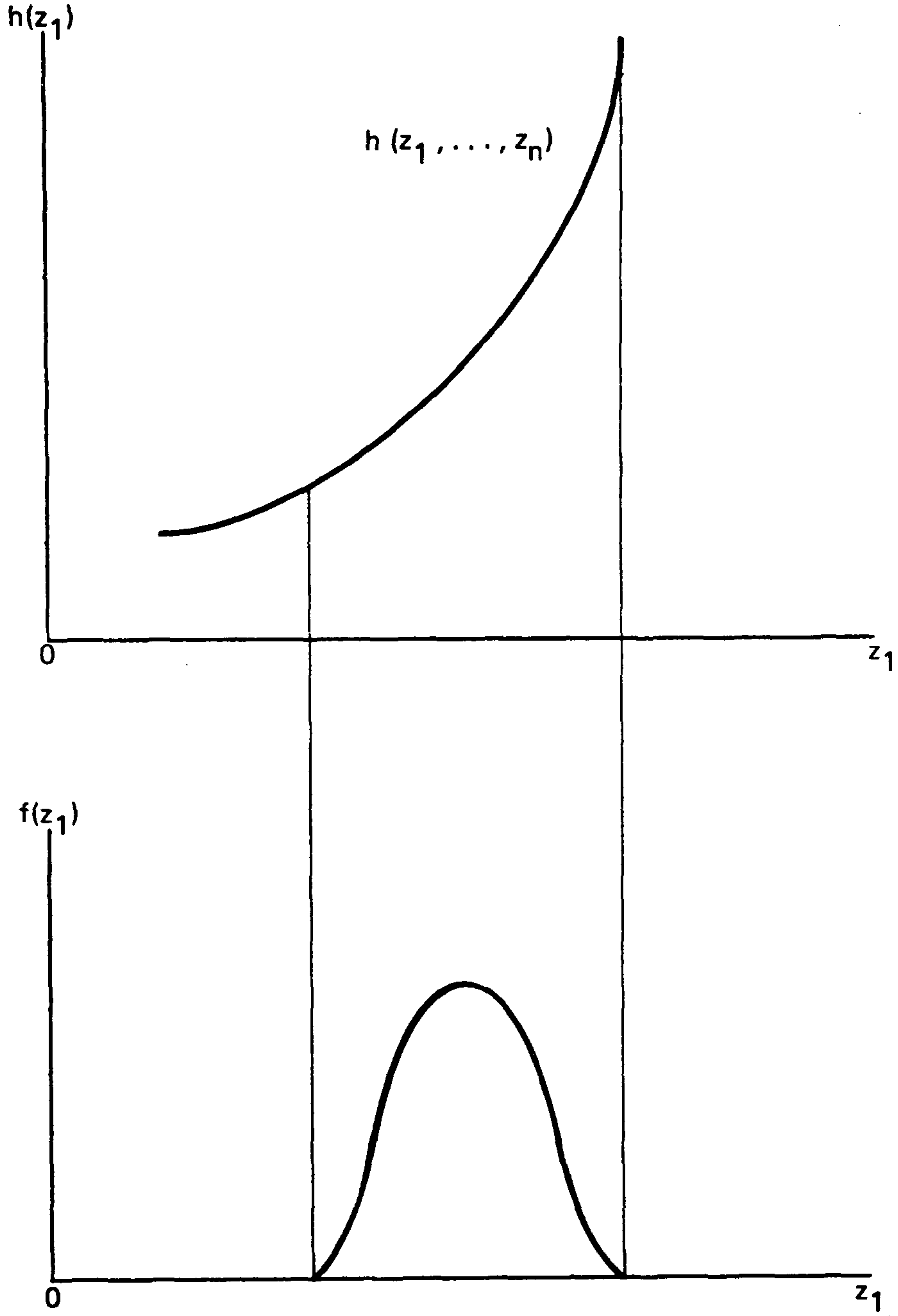

Figure 2: Distribution of Quality in Rosen's Model

TABLE 1

REGRESSION RESULTS: CONTINUOUS QUALITY VARIABLE MODEL
(FULL SAMPLE, N=8,281)

	1974		1977	
	Linear	Semilog	Linear	Semilog
INTERCEPT	12.912849	2.533827	17.358431	2.841616
	(54.2666)	(117.8766)	(63.0157)	(121.7586)
BUILT	-0.096994	-0.00813229	-0.146685	-0.010990
	(7.8147)	(7.2531)	(9.0608)	(8.0124)
OWNHERE	0.217881	0.018132	0.255163	0.018945
	(3.8466)	(3.5435)	(3.4925)	(3.0605)
DUMP	0.678319	0.058408	0.723995	0.058162
	(9.2802)	(8.8457)	(10.7634)	(10.2059)
RACE	-0.326887	-0.028733	-0.183974	-0.015980
	(7.2364)	(7.0413)	(3.1395)	(3.2186)
RC	-0.797841	-0.073528	-1.778886	-0.145179
	(3.9836)	(4.0640)	(8.0282)	(7.7334)
VAC	-0.042734	-0.00287296	-0.184269	-0.012991
	(7.2693)	(5.4100)	(21.2577)	(17.6885)
YPC	-0.00005142†	-0.0000017147*	-0.000385478	-0.0000234543
	(2.2382)	(0.8262)	(12.4794)	(8.9622)
RBUILT	0.078047	0.006550409	0.111025	0.008781883
	(4.7474)	(4.4107)	(5.2071)	(4.8614)
ROWNH	0.135598*	0.012551†	0.267513	0.024501
	(1.9237)	(1.9711)	(2.9549)	(3.1943)
RDUMP	0.187332†	0.020466	0.324394	0.032630
	(2.1619)	(2.6146)	(3.8561)	(4.5781)
RRACE	-0.239147	-0.021862	-0.390788	-0.033450
	(4.1394)	(4.1889)	(5.2819)	(5.3363)
R^2	.1430	.1346	.2213	.1963
F	125.41	116.89	213.67	183.57

(Absolute values of t-statistics in parentheses.)
All coefficients significant at 1% level unless noted as follows:
†Significant at 5% level. *Not significant at 5% level.

TABLE 2

CONTINUOUS QUALITY VARIABLE, LINEAR MODEL: TESTS OF SIGNIFICANCE

VARIABLES	F STATISTICS Full Sample 1974	1977	Low Income Sample 1974	1977
RBUILT, ROWNH, RDUMP, RRACE	12.1761	20.7452	2.4001†	10.0714
RC, RBUILT ROWNH, RDUMP, RRACE	45.6270	204.0695	21.7428	81.0939
Shift: RC(1977 - 1974)	9.3058		3.0352*	

All statistics are significant at 1% level unless noted as follows:
†Significant at 5% level. *Not significant at 5% level.

TABLE 3

REGRESSION RESULTS: CONTINUOUS QUALITY VARIABLE
(LOW INCOME SAMPLE, N=2,786)

	1974		1977	
	Linear	Semilog	Linear	Semilog
INTERCEPT	13.290596 (28.7178)	2.563070 (60.5626)	17.728113 (32.6469)	2.863094 (60.6283)
BUILT	-0.138513 (5.2693)	-0.011571 (4.8138)	-0.135231 (3.8909)	-0.010157 (3.3603)
OWNHERE	0.322856 (3.2242)	0.026777 (2.9242)	0.367278 (2.7948)	0.027128† (2.3737)
DUMP	0.732148 (6.0437)	0.063287 (5.7129)	0.679743 (6.2528)	0.053929 (5.7045)
RACE	-0.328413 (4.3539)	-0.028324 (4.1062)	-0.239559† (2.3742)	-0.018907† (2.1547)
RC	-0.819637† (2.2485)	-0.074481† (2.2344)	-1.755560 (4.2128)	-0.149222 (4.1176)
VAC	-0.027412† (2.5493)	-0.00148546* (1.5107)	-0.192111 (12.5211)	-0.014091 (10.5605)
YPC	-0.00012774 (2.5766)	-0.000008106* (1.7880)	-0.000445717 (6.6896)	-0.0000261272 (4.5092)
RBUILT	0.044326* (1.2524)	0.003368231* (1.0407)	0.023562* (0.5052)	0.002408833* (0.5939)
ROWNH	0.056699* (0.4321)	0.006406339* (0.5339)	0.354142† (2.0719)	0.034276† (2.3059)
RDUMP	0.219911* (1.4862)	0.023439* (1.7322)	0.545717 (3.7663)	0.053725 (4.2637)
RRACE	-0.238109† (2.2386)	-0.022289† (2.2916)	-0.515598 (3.7180)	-0.047804 (3.9639)
R^2	.1465	.1364	.2293	.2061
F	43.27	39.85	75.03	65.47

(Absolute values of t-statistics in parentheses.)
All coefficients significant at 1% level unless noted as follows:
†Significant at 5% level. *Not significant at 5% level.

TABLE A1

VARIABLE DESCRIPTIONS

Dwelling Characteristics (z)

BUILT	Age of building
OWNHERE	Owner dummy = 1 if owner lives in building
DUMP	Neighborhood quality variable = 1 if there are no rundown houses or buildings in neighborhood
RACE	Neighborhood race variable = 1 if head of household is nonwhite

Market Characteristics (x)

RC	Law variable = 1 if city had a rent control law during 1974-77 period. Source: Lett (1976), pp. 72-6.
VAC	City vacancy rate. Source: U.S. Bureau of Census, *Annual Housing Survey: Housing Characteristics for Selected Metropolitan Areas*. Various issues, 1977, 1978.
YPC	Per capita income. Source: International City Management Association, *Municipal Year Book: 1981*.

Interaction Terms (w)

RBUILT	(RC) x (BUILT)
ROWNH	(RC) x (OWNHERE)
RDUMP	(RC) x (DUMP)
RRACE	(RC) x (RACE)

Unless otherwise noted, variables are from Annual Housing Survey tapes, 1974-7 and 1975-8 linked samples.

TABLE A2

CITIES IN POOLED DATA SET

City	N	Rent Control Law?
Boston	2,086	Yes
Detroit	844	No
Minneapolis-St. Paul	484	No
Newark	291	Yes
Paterson-Clifton-Passaic	377	Yes
Philadelphia	1,375	No
Pittsburgh	185	No
Washington	2,639	Yes
Total	8,281	

Observations for Paterson-Clifton-Passaic and Philadelphia were made during 1975 and 1978; all others are from 1974 and 1977.