RENT CONTROL AND URBAN STRUCTURE: A NOTE

By

William G. Moss

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Department of Economics
University of California
Davis, California

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Postwar work on rent control has concentrated on the distribution of the costs and benefits of this policy across individuals by income, its effects on the supply of new housing, the maintenance of existing housing, and its effects on residential mobility.[1] Two aspects of rent control have not been discussed. One is its effects on the structure of urban areas as this is represented by the area covered by urban development and the variation of population density by location. The second, a corollary to the first, is the spacial impact of rent control on housing markets when there exists jurisdictional fragmentation, and rent control is pursued by one or a few jurisdictions. These latter two issues are particularly important because there seems to be increasing interest in rent control and increasing concern about peripheral growth of urban areas, a phenomenon commonly called urban sprawl.

The purpose of this note is to demonstrate the impact of rent control on the area of urban development, density gradients, and housing price gradients. It is shown that rent control increases the peripheral growth of urban areas and may conflict with the commonly stated distributional goals because of jurisdictional fragmentation.

Assume that the population, N, of consumers is homogeneous with respect to preferences and income. All consumers work at the center of the urban area. But the residential location closest to work is at a distance s_o which is exogenously given. Consumer preferences are represented by the utility function

$$u = z^{\alpha} h^{\beta}, \quad \alpha + \beta = 1, \quad 0 < \alpha, \beta < 1$$

where z is a numeraire commodity and h is housing. Consumers have income y, face a schedule of housing prices as they are related to location p(s), and pay transportation costs between work and residence of $t \cdot s$, where t is the cost of transportation per unit distance and s is the distance from residence to work. Consumers seek to maximize utility subject to the budget constraint

$$y - t \cdot s - z - p(s)\, h \geq 0.$$

The resulting demand functions for a given location s are

$$z = \alpha(y-ts) \qquad (1)$$

$$h = \frac{\beta(y-ts)}{p(s)} . \qquad (2)$$

The level of utility can be represented by the indirect utility function

$$v = \frac{\alpha^{\alpha}\beta^{\beta}(y-ts)}{[p(s)]^{\beta}} . \qquad (3)$$

Since consumers are identical, equilibrium requires that each experiences the same level of utility. Let the periphery of urban development be located at a distance $\bar{s}$ from the center, where $\bar{s}$ is endogenously determined. Then each consumer realizes a level of utility

$$\bar{v} = \frac{\alpha^{\alpha}\beta^{\beta}(y-t\bar{s})}{[p(\bar{s})]^{\beta}} . \qquad (4)$$

Therefore from (3) and (4)

$$p(s) = p(\bar{s}) \left(\frac{y-ts}{y-t\bar{s}}\right)^{1/\beta}, \quad s_o \leq s \leq \bar{s} \qquad (5)$$

Assume that the housing industry is competitive with identical producers. The production function for housing is

$$H = L^{\gamma}X^{\theta}, \; \gamma + \theta = 1, \quad 0 < \gamma, \quad \theta < 1.$$

The price of X, w, is given and is independent of location, and the price of land (L) varies with location and is represented by the schedule r(s). Therefore the long-run cost function for housing is

$$C = H \cdot \left(\frac{r(s)}{\gamma}\right)^{\gamma} \left(\frac{w}{\theta}\right)^{\theta}.$$

In long-run equilibrium

$$p(s) = \left(\frac{r(s)}{\gamma}\right)^{\gamma}\left(\frac{w}{\theta}\right)^{\theta}. \tag{6}$$

Assume that the price of land in agricultural use is exogenously given at r_A. Therefore

$$p(\bar{s}) = \left(\frac{r_A}{\gamma}\right)^{\gamma}\left(\frac{w}{\theta}\right)^{\theta}. \tag{7}$$

Substituting (7) into (5), the equilibrium price schedule for housing is

$$p(s) = \left(\frac{r_A}{\gamma}\right)^{\gamma}\left(\frac{w}{\theta}\right)^{\theta}\left(\frac{y-ts}{y-t\bar{s}}\right)^{1/\beta}. \tag{8}$$

Population density at location s is

$$n(s) = \frac{H(s)}{L(s)}\;\frac{1}{h(s)} = \frac{mr_A(y-ts)^{m-1}}{(y-t\bar{s})^{m}}\;,\; m = \left(\frac{1}{\beta\gamma}\right) \tag{9}$$

To determine $\bar{s}$ assume that the urban area is on a featureless plane with developable land occupying a pie-shaped region of ϕ radians. Then the population at a distance s from the center is $n(s)\phi s\, ds$. $\bar{s}$ is determined by

$$N = \int_{s_o}^{\bar{s}} n(s)\cdot\phi s\; ds.$$

Substituting from (9) and integrating by parts,

$$N = \frac{r_A\phi}{t^2(m+1)}\left[\left(\frac{y-ts_o}{y-t\bar{s}}\right)^{m}(y+ts_o m) - (y+t\bar{s}m)\right]. \tag{10}$$

It is difficult to solve this analytically. However totally differentiating and allowing only $\bar{s}$ to vary,

$$dN = \frac{r_A\phi m}{t(m+1)(y-t\bar{s})}\left[\left(\frac{y-ts_o}{y-t\bar{s}}\right)^{m}(y+ts_o m) - (y-t\bar{s})\right]d\bar{s}\;.$$

Since $N > 0$, (10) implies

$$\left(\frac{y-ts_o}{y-t\bar{s}}\right)^m (y+ts_o m) > (y+t\bar{s}m) > (y-t\bar{s}).$$

Therefore $\frac{\partial \bar{s}}{\partial N} > 0.$ [2]

Assume that the population is initially N_1 and the periphery of urban development is $\bar{s}_1$. Then population grows to $N_2 > N_1$, and urban development extends to $\bar{s}_2 > \bar{s}_1$. From (8) and (9) it is evident that housing prices and density rise at all locations as a result of population growth.

To analyze the impact of rent control assume that housing prices are frozen at their level when population is N_1 at all locations s such that $s_b \leqq s \leqq s_c$, where $s_o \leqq s_b < s_c \leqq \bar{s}_1$. When population grows to N_2, the population residing in the rent controlled jurisdiction remains constant because housing prices, housing consumption, and therefore population densities do not change. Housing prices and population densities are obtained by evaluation (8) and (9) at $\bar{s} = \bar{s}_1$. [3] Therefore all of the population increase must reside in the uncontrolled areas including newly developed areas at the periphery. The result is that with rent control urban development now extends to $\bar{s}_c$ where $\bar{s}_c > \bar{s}_2 > \bar{s}_1$.[4]

In the uncontrolled areas equations (8) and (9) still apply with $\bar{s} = \bar{s}_c > \bar{s}_2$. Therefore with rent control housing costs and population densities are greater in the uncontrolled areas and less in the controlled area than they would be otherwise. Also peripheral growth of urban development is greater as a result of rent control. These conclusions are illustrated in figure 1.[5]

We have used a very simple model to illustrate our points. But the conclusions still follow in more complicated ones. For example, if we assume that the population is heterogeneous with respect to preferences and income, our conclusions still hold. In such a model poorer individuals tend to live at central locations while richer ones live more peripherally.[6] If a jurisdiction other than the central city imposes rent control, low income individuals in the central city suffer a welfare loss due to higher housing costs. This would also be the case if rent control is imposed in the central city while a significant poor population resides elsewhere.[7] Our results with respect to densities and peripheral growth also hold.

Rent control is usually motivated by concerns about income distribution. We have shown that with jurisdictional fragmentation the distributional objectives of rent control and the policy itself may be in conflict. We have also shown that the objectives of rent control conflict with the concerns of some people about the degree of peripheral growth of urban areas. This is ironic because often the same people propose rent control who are concerned about urban sprawl, especially people in liberal college communities.

Footnotes

* This note was stimulated by comments by Abba Lerner concerning proposals for rent control in Berkeley, California when the author was a teaching assistant for Professor Lerner in 1968. Helpful comments were also received from Eric Gustafson, Steven Sheffrin, and Linda Shaffer. Any shortcomings are the responsibility of the author.

1. See Olsen [1972] and the references cited there.

2. If we totally differentiate (10), allowing s_o and $\bar{s}$ to vary and hold population constant (dN=0), it can be shown that $\frac{\partial \bar{s}}{\partial s_o} > 0$.

3. This is a simplification. When rent controlled units are rationed, the equilibrium bundle of controlled housing and other commodities may not be that which would be consumed if individuals could freely adjust their housing consumption at the lower, controlled prices. See Olsen [1972].

4. Let N_c be the population of the rent controlled area. Then evaluate $N - N_c = \int_{s_o}^{s_b} n(s)\phi s \, ds + \int_{s_c}^{\bar{s}} n(s)\phi s \, ds$ and totally differentiate allowing only N and $\bar{s}$ to vary. Then it can be shown that $\frac{\partial \bar{s}}{\partial N}$ is greater in this case than in that in which there is no rent control.

5. Freezing rents at a point in time is a fairly realistic representation of rent control. In contrast, assume that rent control takes the form of a maximum constant price over the controlled area. Then land value is constant, but population density is lower at locations closer to the center of the urban area. This occurs because disposable income after transportation costs is higher since transportation costs are lower. Therefore, housing consumption per person is higher and density lower at more central locations in the controlled area. The other qualitative results of the model are unchanged.

6. This is a standard result. See Alonso [1964], Kain [1962], and Muth [1969].

7. This conclusion follows primarily from the existence of a controlled and an uncontrolled housing market.

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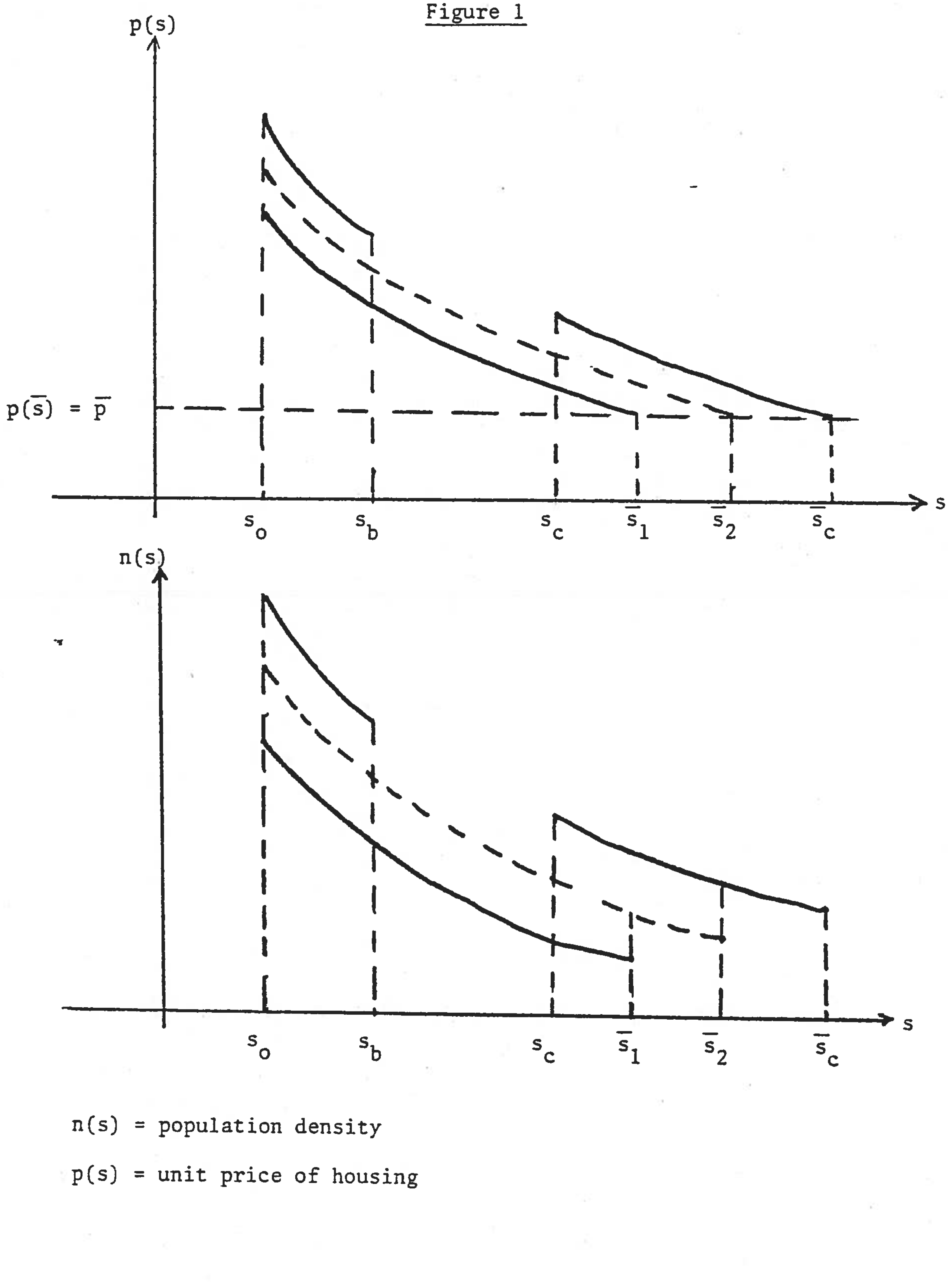
Figure 1



n(s) = population density

p(s) = unit price of housing