The Economics and Law of Rent Control

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Abstract

We consider a rent control regime where rent increases on, and eviction of, a sitting tenant are not allowed. However when an apartment becomes vacant the landlord is free to negotiate a new rent. We argue that this stylized system is a good (though polar) approximation for many rent control regimes existent today in several U.S. cities and the world over. Under such a regime, if inflation exists, landlords prefer to rent to short-staying tenants. Tenants are of different types, where type refers to the amount of time they stay in an apartment, and landlords are unable to determine types before they rent to tenants. Since departure date contingent contracts are forbidden, an adverse selection problem arises. In this case, short-stayers are harmed by rent control while long-stayers benefit and landlord's profits remain the same, and, in addition, the equilibrium is Pareto inefficient. We show that when tenant types are determined endogenously, then in the presence of rent control there may be multiple equilibria where one equilibrium is Pareto dominated by another equilibrium. The abolition of the rent control regime, can not only shift the equilibrium out of this inferior outcome, but can also result in an across-the-board lowering of rents.

(**JEL classification numbers:** D40, K10, L51, R31)

Acknowledgments: The authors have benefited from a presentation of this paper at the Applied Microeconomics Workshop at Cornell University. For comments and discussion, we would like to thank Pinaki Bose, Robert Masson and Ted O'Donoghue.

THE ECONOMICS AND LAW OF RENT CONTROL

I. Introduction

In early 1996, when New York City's rent control law came up for evaluation and possible modification, the public debate spilled over beyond New York to national newspapers and the international media. The questions that arose in this debate have arisen in the past in discussions concerning rent control in other parts of the United States, Sweden, Germany, France and India. These debates reveal, more than anything else, how widely the central issues of rent control are misunderstood.

Two examples of this misunderstanding are as follows. First, a standard feature of the debate concerning rent control is that the battle lines are typically drawn between landlords and tenants, with the popular argument claiming that rent controls work to the advantage of tenants and to the detriment of landlords. In reality, the conflict of interest occurs between tenants of different kinds, for instance between sitting tenants and new tenants or between tenants who have transferable jobs and those with jobs that allow them to settle down in one place. The precise manner in which this happens is explained by the models developed in this paper.

Second, what stirs most people against existing rent control laws in the US and elsewhere (to the extent that they do stir them) are stories of people who have held apartments for many years and now pay "absurdly" low rents. Thus to John Tierney, writing in the New York Times Magazine (Tierney, 1997), it is shocking that " ... Alistair Cooke still has his eight-room $2,078-a-month apartment on Fifth Avenue with a park view ... ." Similar accounts have been heard from around the

world. The old widow who lives in a large apartment in Delhi and pays a rent of 100 rupees (approximately $3) per month is the kind of familiar story which gives rise to indignation and shock. However, we feel that the reason for indignation in such cases is a misunderstanding of the economics of rent control. Suppose Mr. Cooke or the old lady had bought the apartment many years ago (for a price which today would appear absurdly small). This is equivalent to a rental agreement which involves a lump sum initial payment and then a very small monthly payment, in this case, zero. Should this be reason for shock and indignation? Should this be the basis of saying that the old lady should return the apartment to the original owner or at least start paying a higher monthly rent? Clearly not. She bought the place and that is the end of the matter. But now, if a monthly rent of zero is no reason for indignation, why should a monthly rent of Rs. 100 be treated differently? If the old lady pays a rent of Rs. 100 because that the agreement (or generally accepted presumption) was that that is what she would do forever, then we could, effectively, think of her as having *bought* the place under the agreement to pay in monthly installments of Rs 100. Of course Rs. 100 looks very small today; but zero looks even smaller and that is what a person who bought the apartment she lives in pays. In this paper we will argue that there are important reasons for removing rent control, but the shock value of a low rent is not one of them.

A part of the blame for the popular misunderstanding of the effects of rent control lies with the economists. Despite quite a substantial literature on the subject, some of the key analytical questions remain unanswered. The absence of a unifying theoretical model has also meant that the empirical work has often suffered by virtue of not being anchored to an analytical model.

The aim of the present paper is to construct a general model which captures the main stylized features of rent control around the world. One of the most popular forms of rent control, called “rent

stabilization" or "second-generation rent control"[1] allows landlords to freely choose a nominal rent when taking on a new tenant (the tenant is of course free to reject the offer), but places restriction on raising rents on a sitting tenant, thereby causing an erosion in the real value of rent if a tenant stays on for too long, whenever there is positive inflation in the economy, which for most economies is true most of the time. This means that landlords will prefer short-staying tenants to long-staying tenants. Since this information, concerning "tenant-types," will be better known to the potential tenant than the landlord, the tenancy market will be characterized by asymmetric information. Our basic model describes the tenancy market as a model of asymmetric information in which the tenant's types (whether they are long-stayers or short-stayers) are exogenously given. It is shown that the presence of second-generation rent control can lock the market outcome in a Pareto sub-optimal equilibrium, whereas a system of free contract can be Pareto optimal. Of course, this does not mean that moving from one system to another would result in everybody being better off. However, the model does illustrate how the real conflict of interest is not between landlords and tenants, as portrayed in most popular debates on rent control, but between tenants of different kinds.

We then move on to endogenize the tenant types. That is we allow for the fact that the outcome in the rental market may affect the tenant's life-style, for instance, discouraging him from shifting too many times or encouraging him to move whenever he gets a better job offer. Once the tenant's "type" is modeled as an endogenous variable we get the surprising result that rent control may give rise to multiple equilibria. This is a very natural result which requires very little by way of assumptions, but seems to have gone unnoticed in the literature. In case the economy gets locked in the "bad equilibrium," among the many possible equilibria, the removal of rent control can not only bring about an efficient outcome

[1] These are discussed at length in the next section.

but cause an across the board lowering of house rentals, thereby leaving all tenants better off. This is the central result of this paper and it is established in section IV. The remainder of the paper explores generalizations and discusses policy matters. The real world of course is never as tidy as our models; and so, it is argued in the last section, the actual formulation of rental policy will require a combination of insights gained from our model and commonsense.

We should clarify that all our comparisons of different rent-control regimes take the form of comparative statics. We do not consider switch-overs from one regime to another. Hence all of the policy prescriptions that flow out of this exercise concern new tenants and new contracts. We do not comment on how or for that matter whether, there should be any changes of law applicable to currently sitting tenants.

The next section is about the institution of rent control. It discusses different kinds of rent control, some stylized facts, and the real-world context of our theoretical constructions.

II. The Institution of Rent Control

In the United States and Europe the numerous governmental controls in the rental housing market which are generally described as "rent control" arose during World War II in response to the mass disruptions caused by the war. After the war, New York City and many European jurisdictions retained versions of these out of fear that the return of troops would cause demand shocks and send rents skyward. In other parts of the United States the social upheaval and high inflation of the 1970's was a driving force behind the re-implementation of rent controls. California, Connecticut, Massachusetts, New Jersey and New York are all states where jurisdictions implemented rent control

policies during this period. While a number of jurisdictions have since abandoned or relaxed rent control laws, they are still commonly found in the U.S. and all over the world.[2]

Before we proceed to discuss rent control, it is worthwhile clarifying what it means for a housing market to have no rent control. There really are two kinds of "no rent control:" (A) the kind with no government intervention in the market and (B) the kind where the government provides the foundation for contracting between agents and enforces the contracts by committing to take punitive action against those who renege on their contracts.[3] While (A) describes the case where there is no government involvement in the rental market, (B) requires active involvement of the government. In this paper when we consider a regime with no rent control, we shall be concerned with (B), which will at times be referred to as a "free contract regime." By the converse of the above definition, we shall say that the housing market is "rent controlled" if government fixes the rent or sets limits on rent increases or disallows the eviction of tenants, irrespective of what contract the tenant and the landlord may have signed. Essentially rent control is a generic term to describe rental laws which severely limit the contracts that landlords and tenants are allowed to sign. For example, a landlord and a tenant may agree in principal to a contract where the tenant stays for exactly two years and pays 10% more in rent each year, but there can be a rent control law that considers this an invalid contract because it disallows contracts that specify a move-out date, or which set rent increases too high.

While many different forms of rent control exist in the world, we will focus on a stylized version which is widely used throughout the world. We will focus on a rent control regime which does not allow the eviction of a sitting tenant and which limits the amount a landlord may increase the rent on a sitting

[2] Arnott (1995) discusses the history of rent control in the U.S. and Europe and provides a useful bibliography.
[3] There will, of course, always be some restrictions on the range of allowable contracts. For instance, you are not allowed to stipulate in a contract that the landlord gets to kill the tenant if the tenant failed to pay the rent on time.

tenant (enough so that rents do not, typically, keep up with inflation).[4] Upon vacancy, however, the landlord is free to negotiate a new rent with a new tenant. This is precisely the regime that exists in quite a few U.S. communities including Los Angeles, Berkeley, Santa Monica and Palm Springs and similar to the system in Washington, D.C.[5] This is also a good estimation of rent control laws in other communities in the U.S. and elsewhere in the world including virtually all major cities in India. In New York City properties under 'rent stabilization' are closest to the rent control law just described. In New York City there have been two major rent control regimes, 'Rent Control' and 'Rent Stabilization.' Rent Control was a strict regime started in 1947 that assigned rents for individual properties and allowed only minor increases. This policy currently covers slightly more than 100,000 units in New York City and is declining with vacancy decontrol. Much more common are properties under Rent Stabilization. This system was implemented much later, in 1969, and was a less stringent form of rent regulation where periodic rent increases are allowed.

While neither of these schemes were of the precise type studied in this paper, the Rent Stabilization policy was similar. In this policy, there was, however, no provision for the resetting of rents to market levels upon vacancy, but there were ways for landlords to raise the controlled rent over and above the small increases allowed by the regulatory board. One way was through pass-through costs. This allowed landlords who spent money on improvements to a rent stabilized apartment to raise the rent by appealing to the board. Another way was by pleading hardship or increased operating costs. Anecdotal evidence suggests that landlords raise rents through these channels often, even if the amount

[4] Section 6 of the Delhi Rent Control Act, 1958, allowed a maximum of a 10% rent hike every three years, no matter what the inflation. In India the average inflation every three years has exceeded 20%. The Act also made it virtually impossible to evict a tenant. The 1958 Act has subsequently been superseded by the Delhi Rent Act, 1995, which is only slightly more flexible. As far as inflation adjustment goes, it allows a rent increase of 75% of the annual inflation rate based on the wholesale price index.

of money spent on improvements is small. As both of these tactics are sure to meet opposition from a sitting tenant, the common practice is for the landlord to appeal for these increases upon vacancy.[6] New York City's rent control laws also provided non-rent protection for tenants. In particular, the Rent Stabilization Code stipulated that landlords must offer tenants a renewal lease (at the stabilized rent) before the expiration of the current lease. It also limited the set of circumstances in which the landlord could evict a sitting tenant (non-payment of rent, for example).[7] These provisions are essentially the non-eviction of a sitting tenant clause that we stipulate for the stylized rent control law studied in this paper.

Our stylized model of rent control also resembles the rent control laws of both Germany and France. Franz Hubert, in describing German rent control laws, states that they provide protection against eviction and, "while the initial rent of a new lease is freely negotiable, later rent reviews are tied to the rent level of the recent lettings of comparable dwellings." He also states that in France a similar law exists (Hubert, 1995). Clearly if it is necessary to limit further rent increases, the landlord is seeing some erosion of the sitting tenants rent with respect to the market. Indeed, Axel Börsch-Supan (1986) states about the West German rent control laws, "...in a good approximation, the rent level for sitting tenants can be described as lagged average rents of comparable units." We feel, therefore, that our stylized version of rent control is indeed quite fitting for many parts of the world and subsequently that the results of our model, and the implications therein, are far reaching.

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[5] Dreier (1997) and Olsen (1990) describe rent control history and programs for many of the U.S. communities that implemented them. In Los Angeles annual rental increases for sitting tenants are limited to 7%, but once vacated a new rent can be set without any limits.

[6] See Jarett and McKee (1997) for anecdotal evidence of the rent increasing tactics of NYC landlords as well as a brief history of rent control in New York City.

[7] Cinque (1997) discusses the non-rent protections afforded tenants by New York City's various rent control laws.

What is especially surprising about the poor quality of the popular rent control debate is the fact that rent control is a well-studied subject in economics. Yet examples of incomprehension abound in the popular press. The most common example is where the rent control debate is posed as a battle between tenants and landlords. For example, Billy Easton, executive director of the New York State Tenants and Neighbors Coalition, is quoted in the New York Times as saying about this belief that rents would increase dramatically if rent control were abolished in New York City: "Why would landlords be fighting [a continuation of rent controls] so hard unless they stood to make a huge profit?"[8] This is a clear illustration of the mentality of those debating this issue. It may be true that tenants and landlords are battling over rent control, but this is not a direct effect of the economics of the problem. In fact, much of landlord's resistance is to the bureaucracy of the system. In an editorial, the editors of the New York Times write: "[rent control] ... is a bureaucratic nightmare for small landlords ..."[9] We also believe that at times lobbies fight for causes which are against their own interests, because of their failure to understand the ultimate consequences of different kinds of government action or legislation. Indeed if this were not so, the *raison d'être* of economists would be questionable.

What is perhaps more interesting is how often a symptom of rent control gets mentioned, but rarely as a consequence of the economics of rent control, just as a side-effect. This is the tension between long staying tenants and short-staying tenants. For instance in the same editorial, the New York Times states, "... the leases of the very-long term tenants, ... tend to be the cheapest in the rent-regulated system ..."[10] Louis Winnick, Vice Chairman of the Institute of Public Administration, states about the financial struggles of co-ops in New York which have long-term tenants in their buildings:

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[8] "New York Senate Leader Vows to End Rent Control" by Richard Perez-Pena, **The New York Times**, December 6, 1996.
[9] "A Generational Rent Gap" Opinion, **The New York Times**, June 13, 1997.
[10] Ibid.

"Today's co-op owners have learned something about the economics of housing: That rent regulations start battles not only between landlords and tenants, but also between neighbors in the same building."[11] Economists also misconstrue the economics of rent control. Take, for example, economist Frank Branconi, executive director of the Citizens Housing and Planning Council of New York, who, "... advocates for a modified system in which an apartment rises to the market price whenever it is vacated, and then the new rent is regulated again for the next tenant."[12] This is exactly the stylized system that we study. We show in our model, that this system of rent control lead not just to Pareto sub-optimal outcomes, but possibly to higher rents across the board.

There have been many empirical studies of rent control which are nicely summarized by Olsen (1990), but the combined results, as one economist describes them, have been "... disappointingly uninformative."[13] A few areas of general consensus have emerged however. Rent control has led to tenure discounts or lower real rents for long-term tenants (Börsch-Supan, 1986), and some evidence exists that turnover and therefore mobility is lowered in areas with rent control (Olsen, 1990). Little convincing evidence exists to support the notion that rent control hampers construction and maintenance. Various studies of the Los Angeles rent control regime, Olsen (1990) reports, "... find very small transfers in aggregate from landlords to tenants." He states, "the major transfers are from tenants who move frequently to those who seldom move."[14] Overall the empirical evidence suggests that the effects of rent control laws are higher rents for new and short-term tenants, smaller increases for sitting tenants leading to lower rents for long-stayers, and little effect on revenue for landlords (Olsen, 1990).

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[11] "Neighbor vs. Neighbor," **The New York Times**, April 16, 1997.
[12] Tierney, **New York Times Magazine**.
[13] Arnott (1995), p. 111.
[14] Olsen (1990), p. 19.

There has also been a considerable amount of theoretical work done on rent control. The common textbook version of rent control is a simple price ceiling model of supply and demand that relates most closely to what Arnott (1995) describes as 'first generation' rent controls. These are akin to the 'rent control' regime which New York City implemented in 1947, in which rents were fixed at a level and rarely allowed to rise. In this version, demand exceeds supply, and the 'winners' in the market are those tenants lucky enough to find housing. For the landlords, rent control limits the amount of money they can charge for their properties, and they see the market value of their property fall and therefore neglect maintenance and upkeep. In addition, new housing is not constructed as the expected return on such an investment is limited. Secondary effects include mismatches of tenants to properties, with tenants holding on to large apartments long after their need for the extra space has gone, reduced labor mobility, and increase in discrimination and the rise of non-rent payments from tenants to landlords.

Advances on the textbook model have added variable quality of apartments to show that a ceiling on rent may lead landlords to cut back on the quality component of the property, or maintenance, which leads to a fall in renter's welfare and, under certain conditions, a rise in landlord's welfare (Frankena, 1975; Raymon, 1983). Arnott (1995) states that studies of what he calls 'second generation' rent control laws, i.e. those similar to 'rent stabilization' in New York City and our stylized rent control system, characterized by more lenient rent increase policies, are not fully articulated, that only partial models exist. Perfectly competitive models, such as Sweeney (1974), look at both the dynamics of the housing market and quality differentiation. Typically the landlord knows the rent function (which includes quality) and sets maintenance expenditures (which impact quality) to the present value of net revenue.

Some models of imperfect competition view the market as monopolistically competitive (Igarashi and Arnott, 1994) and are similar to the search models of Diamond (1984) and Pissarides (1990) where potential tenants with idiosyncratic tastes look for housing in a differentiated market. Differentiated products allow landlords to price above marginal costs, however free entry drives profits to zero with the result being vacant excess capacity. Other models, more closely related to our own, exploit the asymmetric information extant in the rental housing market (Börsch-Supan 1986; Hubert, 1995; Hubert, 1996). In Hubert (1995) tenants can be more or less costly to service but landlords do not see the cost until a tenant has occupied a property. Bad tenants are forced out by large rent increases and are passed to other landlords creating an externality problem which rent control could potentially avoid. Arnott (1995) argues that these studies suggest that there is scope for beneficial 'second generation' rent control.

There has also been some work done on the political economy of rent control, where both landlords and tenants are considered political actors and can influence policy. Fallis (1988) notes that there are many more tenants than landlords and asks the question why is rent control not more widespread. Epple (1994) models the rental housing market by considering two types of tenants, permanent and temporary. Permanent residents stay in a community so their numbers are fixed while temporary tenants are transitory and their numbers vary. Only permanent residents vote on rent control policies and rent control in this case applied only to permanent residences and is a price ceiling. This ceiling determines supply of housing. When voting a permanent resident does not know if he will be displaced from his permanent dwelling and also does not know the number of temporary residents in the community. The permanent resident therefore weighs the benefit of lower rent if he maintains his permanent dwelling and the cost of potentially finding a new dwelling in a market with excess demand.

While the political aspects of rent control are important, we treat rent control policies in the current paper as a *fait accompli* and do not discuss the political process that engendered them.

What we aim to do in this paper is to fill the void in the rent control literature and present a unified model of 'second generation' rent control, and show that Pareto sub-optimal equilibrium as well as multiple equilibrium can arise. [15]

III. The Basic Model

Let us assume that there are n types of potential tenants in an economy. If N is the set of types, then $N = \{1, \cdots, n\}$. Suppose a fraction p_i of all tenants are of type i. Thus $p_1 + \cdots + p_n = 1$. All agents in this paper are infinitely-lived.

A tenant's type basically refers to how long a tenant stays in the same apartment before moving to a new one. Let t_i be the number of months a tenant of type i stays in the same apartment. Without loss of generality we assume that,

$$t_1 < t_2 < \cdots < t_n.$$

In other words, type 1 tenants are the restless souls. Either they have a preference for quick change or have transferable jobs. Type n tenants are the types who gather moss. Others are somewhere in between those extremes. Of course, in reality, depending on the rent-control regime that prevails in an economy, a person may decide to quit a transferable job and take up a stable job or vice-versa. But we will, for now, assume that the tenant types are given. This assumption is relaxed in the next section.

[15] See Arnott (1995) for a description and review of past theoretical work. See also Smith, Rosen and Fallis (1988).

This is a model with asymmetric information. Each tenant knows his type but a landlord cannot tell the tenant's type by looking at him. In addition, let us suppose that there is a rent-control law that does not allow quit-contingent contracts or rent escalation clauses for long-stayers. The monthly rent has to be fixed at the time of taking on a new tenant.

Note that even though a tenant's type is unknown to the landlord at the time the tenant moves in, the tenant's type gets revealed at the time the tenant moves out. Hence, by charging a lump-sum amount at the time of a tenant's moving out, a landlord can overcome the problem of asymmetric information. A rent-control law typically prevents such complicated contracts and thus causes the asymmetric information problem to persist (Basu, 1989). Key money (or what in India is called *pugree*) with agreement to return a part of it depending on when the tenant leaves may thus be viewed as the market's way to get around rent-control. In our model we assume that key money *with contingent return* is not allowed by the law. In other words we are about to analyse the case of 'second generation rent control,' as described in section II.

We will also assume that there is inflation in this economy which erodes the value of money each month by $1-\beta$, which is greater than zero. That is, we are assuming that there is some inflation in the economy. This is empirically very well-founded. Among the 113 countries for which the World Bank in its *World Development Report 1997* gives the average inflation during 1985-95, 111 countries reported positive inflation.

Let the discount factor for all individuals be $\delta \in (0,1)$, for each month.

If a landlord charges a rent of 1 dollar per month in real terms from a new tenant and somehow gets only tenants of type i, then the stream of income earned by the landlord, in real terms, is given by

$$1 \quad \beta \quad \beta^2 \qquad \cdots \qquad \beta^{t-1} \quad 1 \quad \beta \quad \beta^2 \qquad \cdots \qquad \beta^{t-1} \quad 1 \qquad \cdots$$

Given the presence of rent control, this stream of income is easy to understand. Since the market rent for a *new* tenant is 1, the landlord earns 1 in period 1. Since the rent control law does not allow the nominal rent to be changed, and the inflation rate is $1-\beta$, in the second period (third period) the 1 dollar is equal to β dollars (β^2 dollars) in real terms. This explains the second and third terms in the stream shown above. After t periods the tenant quits. The new tenant pays a rent of 1 dollar in real terms (or β^{-t} dollars in nominal terms). This explains why the tth term is 1. And so on. The present value of the above stream using the discount factor of δ is denoted by v_i and this is given by:

$$v_i = 1 + \beta\delta + (\beta\delta)^2 + \quad \cdots \quad + (\beta\delta)^{t_i - 1} + \delta^{t_i} v_i \tag{1}$$

or,

$$v_i = \frac{1 - (\beta\delta)^{t_i}}{(1-\beta\delta)(1-\delta^{t_i})} \tag{2}$$

<u>Lemma 1</u> If $i < j$, then $v_i > v_j$.

<u>Proof</u> We shall, without loss of generality, assume that $t_j = t_{i+1}$. Let v_j^k be the present value of rents earned by a landlord whose first k tenants are of type i and all others of type j. (Hence, $v_j^0 = v_j$)

We first show that $v_j^1 > v_j$. Clearly,

$$v_j^1 = 1 + \beta\delta + (\beta\delta)^2 + \quad \cdots \quad + (\beta\delta)^{t_i - 1} + \delta^{t_i} v_j \tag{3}$$

Since $t_j = t_{i+1}$, and given (4) and (1), we have

$$\begin{aligned} v_j^1 - v_j &= \delta^{t_i} v_j - (\beta\delta)^{t_i} - \delta^{t_i+1} v_j \\ &= \delta^{t_i}\left[(1-\delta)v_j - \beta^{t_i}\right] \end{aligned}$$

$$= (1-\delta)\delta^{t_i}\left[v_j - \frac{\beta^{t_i}}{1-\delta}\right]$$

It is easy to see $v_j > \frac{\beta^{t_i}}{1-\delta}$. (4)

The right-hand term is the present value of the stream $\left[\beta^{t_i}, \beta^{t_i}, \quad \cdots \quad\right]$, while v_j is the present value of the sequence $\left[1, \beta, \beta^2, \quad \cdots \quad, \beta^{t_i}, 1, \beta, \beta^2, \quad \cdots \quad, \beta^{t_i}, 1, \quad \cdots \quad\right]$ The latter sequence dominates the former, term by term. Hence, (4) is true, and, therefore, $v_j^1 > v_j$.

It is easy to check, $v_j^k > v_j^{k-1}$, $\forall k$, and that $\lim_{k\to\infty} v_j^k = v_i$. It follows that $v_i > v_j$.

[Q. E. D.]

Continuing with the case in which rent is \$1 per month, let us denote $v_{(i)}$ as the expected present value of returns to the landlord when all tenants of type i or above make themselves available to the landlord as potential tenant from whom the landlord randomly selects one. Then, clearly $v_{(n)} = v_n$. And, more generally,

$$v_{(i)} = \sum_{k=i}^{n}\left(\frac{p_k}{\sum_{j=i}^{n} p_j}\right)\left[1 + \beta\delta + (\beta\delta)^2 + \quad \cdots \quad + (\beta\delta)^{t_{k-1}} + \delta^{t_k} v_{(i)}\right] \qquad (5)$$

or

$$v_{(i)} = \frac{\sum_{k=i}^{n}\left(\frac{p_k}{\sum_{j=i}^{n} p_j}\right)\left[1 + \beta\delta + (\beta\delta)^2 + \quad \cdots \quad + (\beta\delta)^{t_k - 1}\right]}{1 - \sum_{k=i}^{n}\left(\frac{p_k}{\sum_{j=i}^{n} p_j}\right)\delta^{t_k}}$$

(6)

Since the above expressions are worked out assuming that the rent is one dollar (in real terms for a new tenant), it is now easy to work out the expressions for the case when the rent is R dollars. If the landlord gets only tenants of type i, we denote the present value of her rental income as $v_i(R)$ and clearly

$$v_i(R) = Rv_i \tag{7}$$

where v_i is given by (2).

If the rent is R and only tenants of type i and higher seek tenancy, we denote the landlord's present value of income form leasing out one apartment by $v_{(i)}(R)$. Clearly,

$$v_{(i)}(R) = Rv_{(i)} \tag{8}$$

where $v_{(i)}$ is given by (6).

<u>Lemma 2</u> If $i < j$, then $v_{(i)} > v_{(j)}$.

<u>Proof</u> Note that, for all k,

$$v_k = 1 + \beta\delta + (\beta\delta)^2 + \quad \cdots \quad + (\beta\delta)^{t_k - 1} + \delta^{t_k} v_k$$

or

$$1 + \beta\delta + (\beta\delta)^2 + \quad \cdots \quad + (\beta\delta)^{t_k - 1} = (1 - \delta^{t_k}) v_k$$

Substituting this in (6), we get

$$v_{(i)} = \frac{\sum_{k=i}^{n} \left(\frac{p_k}{\sum_{j=i}^{n} p_j} \right) (1 - \delta^{t_k}) v_k}{1 - \sum_{k=i}^{n} \left(\frac{p_k}{\sum_{j=i}^{n} p_j} \right) \delta^{t_k}}$$

or

$$v_{(i)} = \frac{\sum_{k=i}^{n} p_k (1 - \delta^{t_k}) v_k}{\sum_{j=i}^{n} p_j - \sum_{k=i}^{n} p_k \delta^{t_k}} \tag{9}$$

It is worth noting that if the term v_k was not there on the right-hand side of (9) then the right-hand side would be equal to 1. Hence, $v_{(i)}$ is clearly a weighted average of v_i, v_{i+1}, ..., and v_n. It is also evident that if $j > i$, $v_{(i)}$ is gotten from $v_{(j)}$ by redistributing some of the weights away from v_j, ... , v_n to v_i, ... , v_{j-1}. Since, for all $k < j$, $v_k > v_j$ (by Lemma 1), it follows that $v_{(i)} > v_{(j)}$.

[Q. E. D.]

As we discussed in the introduction, one of the most popular variants of rent control takes the form of disallowing landlords from raising rents adequately or evicting tenants, even by contractual

agreement, this is commonly known as "rent-stabilization," or, in Arnott's (1995) terminology, "second-generation rent control." For ease of analysis let us consider the polar case of this by assuming that the rent-stabilization law takes the form of allowing landlords to choose a rent, R, at the time of taking on a new tenant (who of course has the freedom to turn down the offer); but then the rent remains (nominally) the same as long as the tenant stays on.

Let us now model the tenant's decision-problem under this rent control regime. Let us assume that all tenants have the same option (irrespective of their types) if they reject leasing an apartment. This could consist of buying a property and settling down or living with a friend (we are aware that 'friend' may be the wrong word if this arrangement persists for long). This option gives a person a life-time utility of B. We assume that all tenants receive the same life-time benefit from renting an apartment, A, and must, of course pay rent R, which, in present values terms is Rv_i for a type i tenant. We assume that A>B, and define the difference, A-B, as D. Therefore a tenant will lease an apartment if and only if, $A - Rv_i \geq B$ or $Rv_i \leq A - B \equiv D$. What we mean by this, in operational terms, is this: Irrespective of a tenant's type (which is here exogenously given), if a tenant finds that the present value of rentals exceed, D, the tenant will opt out of tenancy.

If a tenant is of type i, and the rent is R, the present value of rentals paid by the tenant is clearly Rv_i, as in (7), with v_i is defined by (1) or (2). Hence, a type i tenant will opt for tenancy as long as $Rv_i \leq D$. By Lemma 1 we know that as R increases, the shortest-staying tenants (i.e. of type 1) will be the first ones to opt out of tenancy, followed by types 2, 3 and so on with the last to opt out being the longest stayers (type n). Since the short stayers are the more attractive tenants from the landlord's point of view, this is what drives the adverse-selection process in this model.

Now consider a landlord who has one property to lease out. Let E(R) be the landlord's expected present value of rental when the per-period rent is R. Following the argument in the above paragraph, we can now compute what E(R) will be like as R varies. An important and interesting implication of this is the following.

<u>Lemma 3</u> E(R) reaches its maximum when $R = D/v_n$.

Note that D/v_n is the critical rent above which the longest-staying tenants opt out of tenancy. The proof of Lemma 3 is obvious with the use of a somewhat unusual diagrammatic technique that we develop below. Let us first explain how E(R) can be represented diagrammatically. Consider a case where n = 3. In Figure 1, the horizontal axis represents, R. In this figure draw the lines Rv_1, Rv_2 and Rv_3. By Lemma 1, Rv_1 is the steepest followed by Rv_2 and then Rv_n or (what is the same here) Rv_3. Draw a horizontal line at height D from the origin and mark off the critical rents, namely, D/v_1, D/v_2 and D/v_3 where each type drops out of the rental market. All this is shown in Figure 1.

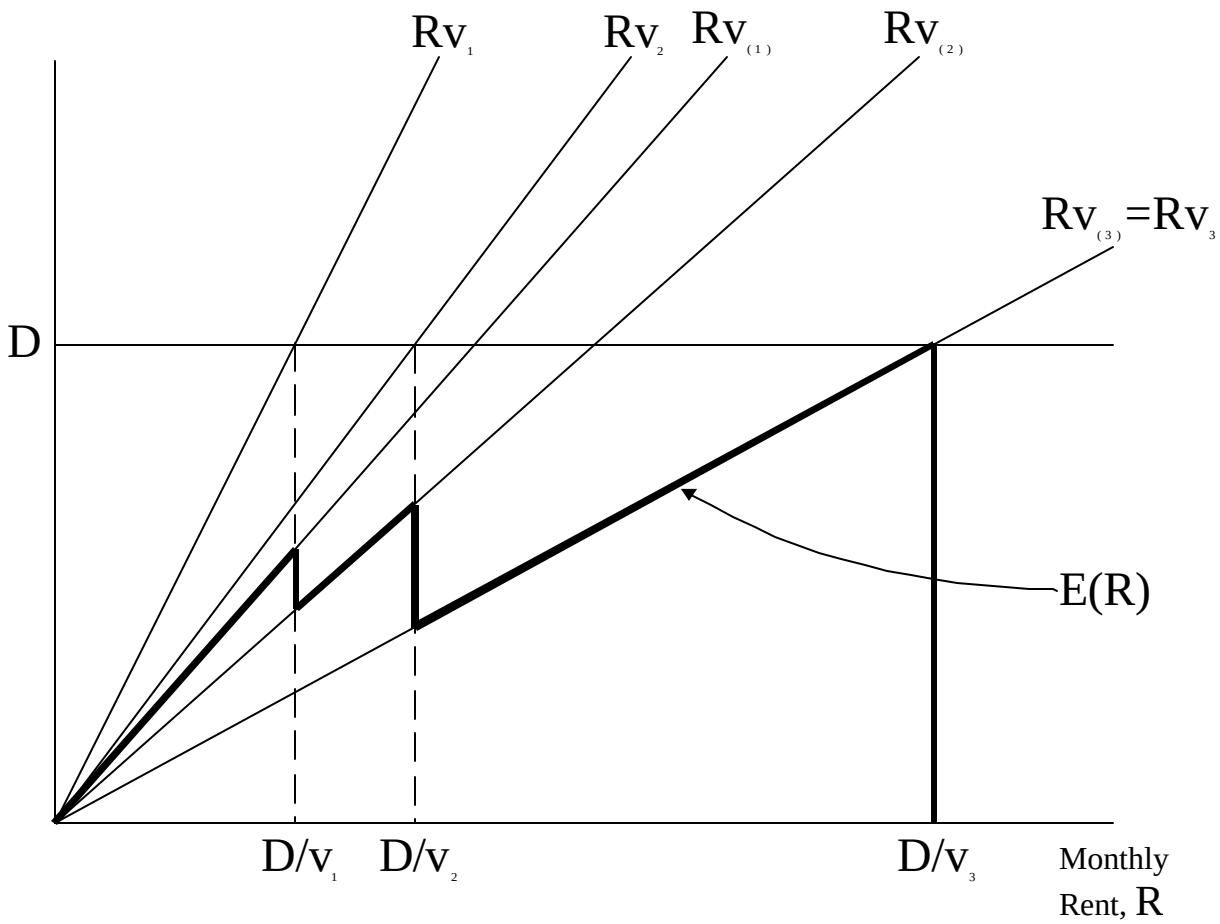

Figure 1

In the same figure draw $Rv_{(1)}$, $Rv_{(2)}$ and $Rv_{(3)}$. Recall that $Rv_{(i)}$ is a weighted average of Rv_i, Rv_{i+1}, … and, Rv_n. It follows that $Rv_{(3)}$ coincides with Rv_3.

Now suppose the monthly rent is below D/v_1. Then all three types of tenants seek tenancy. Hence the landlord's expected present value of rentals earned (i.e. E(R)) is given by $Rv_{(1)}$. Once R exceeds D/v_1, type 1 ceases to lease in property. As long as $R \leq D / v_2$, E(R) is equal to $Rv_{(2)}$. Beyond D/v_2, E(R) equals $Rv_{(3)}$. Hence the landlord's expected present value of rentals, E(R), must satisfy the following:

$$E(R) = \begin{cases} Rv_{(1)}, & \text{if} \quad R \le D / v_1 \\ Rv_{(2)}, & \text{if} \quad D / v_1 < R \le D / v_2 \\ Rv_{(3)}, & \text{if} \quad D / v_2 < R \le D / v_3 \\ 0, & \text{if} \quad D / v_3 < R \end{cases}$$

The E(R) function is illustrated by the thickened line in Figure 1.

One easy implication of the definitions is that $Rv_{(i)} < Rv_i$ for all $i < n$. It immediately follows that all the peaks of E(R) excepting the one at rental, D/v_n, will be dominated by the peak at D/v_n (as shown in Figure 1). This completes the proof of Lemma 3.

Note that if the opportunity cost of leasing property differed for each type, that is, the opportunity cost to type i was D_i instead of D, Figure 1 would have to be adjusted by drawing in D_1, D_2, and D_3 and locating the critical rentals D_1/v_1, D_2/v_2, and D_3/v_3. Lemma 3 would not then be necessarily valid. However, the inefficiency results that we prove do not hinge critically on the assumption of "equal opportunity cost." And so, in view of its simplifying nature, this is an assumption that we continue to use.

It is now easy to see the that if the rental market was monopolistic (in the sense of there being one landlord with 1 property to lease out) then she would set the rent at D/v_n. All but the longest-stayers would be driven out of the market in equilibrium. Consider the extreme case where $t_n = \infty$. In this case rental is equivalent to sale by installment payment, where the installment payments go on forever.

Let us now proceed to analyze what happens if there are many landlords competing with one another as would be the case in any large city. Let us assume that the cost to a landlord of leasing out an apartment (in present-value terms) is C. In order to consider the interesting case suppose $C < D$. It follows therefore that it is Pareto efficient to let all tenants have a rented property each. But let us see

what the outcome will be under perfect competition. By perfect competition we mean here that (a) all agents are price-takers (which implies, in particular, that if the market rent is R, a landlord expects to get no tenant if she unilaterally raises the rent to R') and (b) there are enough (potential) landlords to drive profit down to zero.

The perfectly competitive outcome is easy to illustrate using the diagrammatic technique developed above. In Figure 2 we reproduce the E(R) curve. Let us suppose that C is as shown, and R^* be such that $E(R^*)=C$.

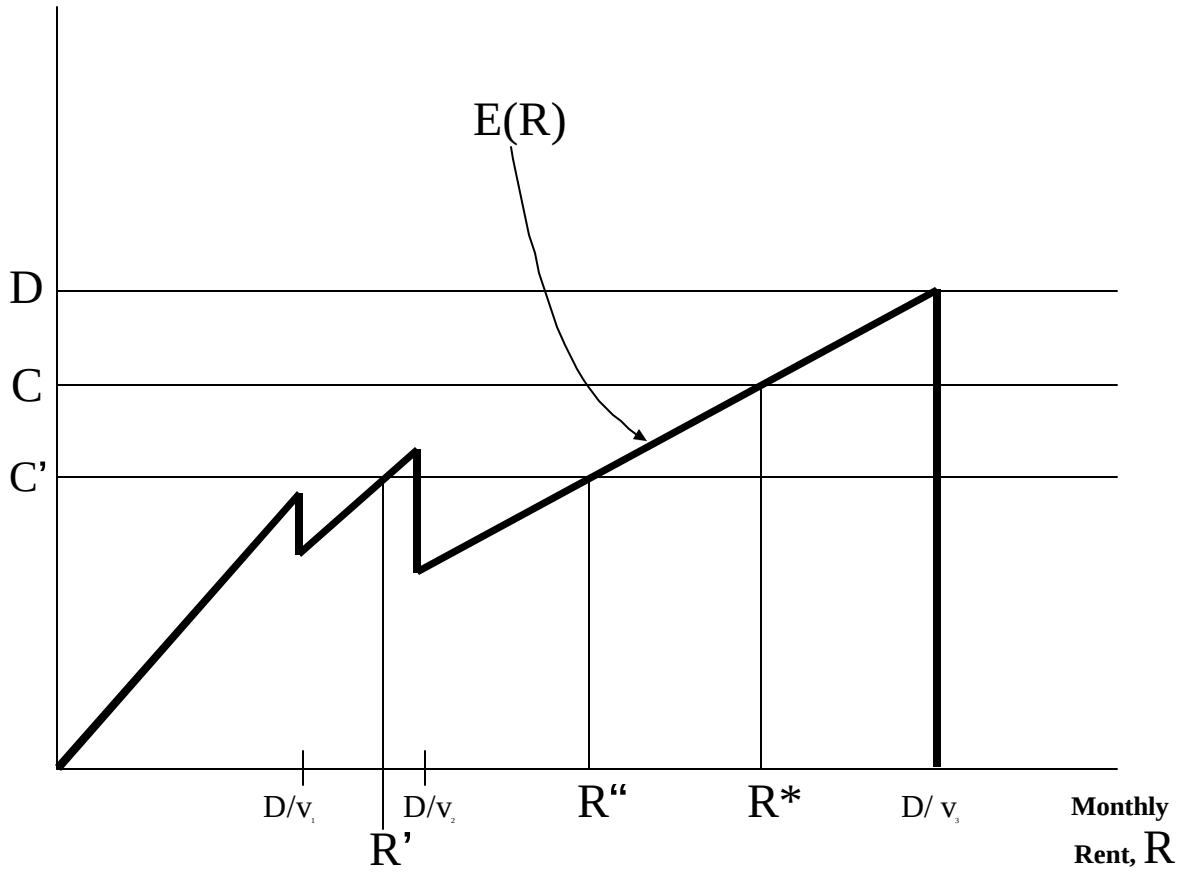

Figure 2

If the market rent, R, exceeds R^*, the landlords will be making supernormal profits. So there will be more entry of landlords and R cannot be an equilibrium. If R is below R^*, C > E(R) and

landlords will exit the rental market. Hence R^* (in Figure 2) is the equilibrium rent under perfect competition when landlords cost of leasing out property is given by C.

Let us now consider the case where the landlord's cost, instead of being C, is C'. Then there are two rental rates, R' and R'' at which $C' = E(R') = E(R'')$. Are both of these equilibria? It depends on how exactly we interpret a "competitive market." If by that we mean that landlords cannot change rents in either direction (as in Mas-Colell, Whinston and Green, 1995, Chapter 13) then both R' and R'' constitute equilibria. However, it seems reasonable to argue that while landlords cannot unilaterally deviate from the market rent in an upward direction, they can unilaterally deviate in a downward direction (without losing all tenants). Then R'' ceases to be an equilibrium. First, we explain this intuitively; and then (at the end of this section) we give it a formal game-theoretic interpretation.

The intuitive reason is simple. Suppose all landlords are charging R''. Then if one landlord cut her rent to $\hat{R} \in (R', D/v_2)$, all tenants would try to lease from this landlord and she would make a positive profit, since (as is clear from Figure 2) $E(\hat{R}) > C'$. Hence, R' is the only competitive equilibrium in this case.

Let us see how different people are affected in equilibrium. By comparing Figures 1 and 2 it is clear that the cost of rental to types 1, 2 and 3 are $R'v_1$, $R'v_2$ and $R'v_3$. By marking the R' point of Figure 2 in Figure 1 it is clear that $R'v_1 > R'v_2 > R'v_3$ and $R'v_2 > C' > R'v_3$. Hence the short stayers pay rents that are too high (above the cost to the landlords) and long stayers pay rents that are too low (type 1's do not rent at all in this market as $R'v_1 > D$). This is the real dividing line in the rent control debate.

Most of the popular divisions arise between landlords and tenants. If the law is going to be changed on sitting tenants, indeed there would be conflicts of interest between landlords and tenants. But if the law is going to be changed for all future tenancy contracts (as it should be) then the conflict of interest is between tenants of one type and another. But these are such diffuse categories that popular attention has mistakenly been directed at the more visible line between landlords and tenants.

Return to the case illustrated in Figure 2 where the landlord's cost is C. In equilibrium everybody excepting the type-n tenants are driven off the market. Yet for each tenant-type, i, there exists a rental such that both landlord and tenant would benefit. This implies that under rent control the competitive equilibrium can be Pareto inefficient.

It the rent control law is revoked and replaced by a system in which a tenant and a landlord can sign on any rental and eviction contract, it is easy to see that Pareto efficiency is attained. This is because the asymmetric information problem is not insurmountable here. Though for a new-tenant his type is not transparent to the landlord, at his time of departure his type gets revealed. So by writing a departure-date contingent contract (or by putting in a rent-escalation clause) landlords can get around the asymmetric information problem. The problem with most rent-control regulations is that they tend to disallow (or render illegal) clauses in rental contracts which allow landlords to overcome the asymmetric information problem.

Let us, for completeness, consider the case where a landlord and a tenant can agree to any contract and the state legal machinery ensures that the contract is adhered to. Under such a legal regime, one kind of contract that would achieve optimality is a fully-inflation indexed rental contract. Suppose a landlord writes a contract where the *real* rental is R each month. In other words, the nominal rent is raised each month sufficiently to correct for the amount of inflation. Under such a rental

contract, the tenant type is unimportant to the landlord because no matter who the tenant is, if the real monthly rental is R, the landlord's present value of earnings is $R/(1-\delta)$. If the cost of leasing out is C, the competitive *real* rental rate is R^* where

$$\frac{R^*}{1-\delta} = C$$

In other words, in a competitive equilibrium the nominal rent in period 1 is $(1-\delta)C = R^*$. In the next month it will be $(1-\delta)C/\beta$. The following month $(1-\delta)C/\beta^2$ and so on. As long as $C \leq D$, all tenants will be leasing in apartments and the outcome is Pareto optimal.

If we have a rent-control law which does not allow rent-escalation clauses (at all or adequately) but does allow departure-date contingent rentals, we once again get optimality. We could then think of the landlord offering contracts like $\tilde{R}(1)$, $\tilde{R}(2)$, ... , which says that you need make no monthly payment (it is easy to generalize and allow for *some* nominally-fixed monthly payment) but if you leave the apartment after t months you make a lump-sum payment of $\tilde{R}(t)$. In that case, it is easy to see that the competitive outcome is Pareto optimal.

In reality landlords do often mimic this system. They take initial deposits from tenants and promise to return part of the money if the tenant leaves early. The returns are however never quite so finely-tuned as in the above paragraph, for fear of falling foul of rent-control laws.

What was described above as a competitive equilibrium may also be characterized as a Nash equilibrium of a game, as done by Mas-Colell, Whinston and Green (1995, pp. 443-50) in the context of Akerlof's (1970) model of adverse selection. The characterization we prefer to use is different from that of Mas-Colell *et al*. They essentially construct a model of Bertrand competition between two landlords (the assumption of "two" is without loss of generality in their model) *each of whom can*

supply an unlimited number of apartments at a cost of C each. The italicized part of the above sentence is clearly an unrealistic assumption. It is technically necessary because the existence of capacity constraints can give rise to well-known existence problems.

We get around this problem with a different description of the game. While avoiding the above assumption is the strength of our formulation, the disadvantage is that the behavior of the tenants is not fully explained in our model. Instead it is specified simply by appealing to intuition. *Given such behavior*, the landlords play a formal game, and we isolate a refinement of the Nash equilibria which mimics competitive equilibrium.

In our model there are m (potential) landlords where m exceeds the total number of tenants, t. Each landlord can offer at most one apartment for lease. If she does so, then she incurs a one time cost of C. Each landlord's strategy set, S, is equal to $\{N\} \cup [0, \infty)$. If landlord i chooses N, it means she does not enter the rental market or, equivalently, does not offer an apartment for lease. In that case she does not incur C and her profit is zero. If she chooses a strategy $R_i \in [0, \infty)$ it means she offers an apartment for lease. Her profit then depends on R_i and other landlords' choice of strategies. The nature of the payoff function is explained later.

We are essentially looking for a strategy m-tuple $(s_1, \ldots, s_m) \equiv s$ which is a Nash equilibrium. We are however not interested in looking at *any* Nash equilibrium - but a certain refinement of it, which we shall call a "single-peaked Nash equilibrium." A rental value of R is a **single-peaked Nash equilibrium** if m-t landlords choose strategy N and all the other t landlords choose the same rent $R \in [0, \infty)$ and these strategies constitute a Nash equilibrium.

In order to locate the single-peaked Nash equilibria we need to specify the nature of the payoff functions.

The payoff functions of the landlords are assumed to have the following properties: (a) If among all the landlords who chose to enter, i selects the smallest rent R_i, then landlord i expects a payoff of $E(R_i) - C$. (b) If t landlords enter and all but one of them charge the same rent R and the deviant charges $R' > R$, then the deviants' expected profit is -C.

(a) is a very natural assumption. The person charging the lowest rent has the pick of the entire set of tenants who are willing to lease in and she chooses 1 at random. (b) is a stronger assumption but it mimics the idea the idea of competition. It says that if every landlord charges the same rent R, then if one landlord tries to raise the rent, no tenant will come to her. This is a standard assumption in competitive models though we know that strictly speaking this is valid only if there is a continuum of agents.

Given these assumptions, the single-peaked Nash equilibria of this m-person game coincides exactly with the competitive equilibria described above. In Figure 2 if the cost is C, the only single-peaked Nash equilibrium is R^* and if the cost is C' the only single-peaked Nash equilibrium is R'.

The only case where we can get multiple equilibria is the non-generic special case where the cost, C, is such that the horizontal line just touches a peak. That is, there exists $i < n$ such that $E(D/v_i) = C$. Barring this special case, a rental, $\tilde{R}$, is a competitive equilibrium or a single-peaked Nash equilibrium if

$$\tilde{R} = \min \left\{ R \middle| E(R) = C \right\}.$$

IV. Endogenous Quit Decisions

There are several directions in which one can modify and extend the above model. We will in this section consider one involving the endogenization of the tenant's type. It is true that some people are inherently prone to moving and some have transferable jobs. But no matter what the inherent penchants, people do modify their behavior depending on the conditions in the rental market. If inflation is very high and a rent-control order holds the nominal rent constant for sitting tenants, inherently peripatetic individuals may try to change their ways and stay put in one place, and some people with transferable jobs may quit such jobs. In this section we shall try to show that the endogenization of tenant types can generate some very interesting results, including the generic possibility of multiple equilibria. Moreover, the removal of rent control can result in a uniform lowering of rents.

Let us consider the case where all tenants are innately identical but they can *choose* to be one of two types: 1 and 2. The assumption of *ex ante* identity is inessential and is made for ease of explanation. Type i changes his apartment every t_i months where $t_1 < t_2$. In other words, a tenant *chooses* to be a short-stayer or a long-stayer. Again, for reasons of simplicity, let us assume $t_2 = \infty$. In other words a potential tenant has to decide whether to be a short-stayer or settle down permanently in a rented apartment. Let us see what happens if we have the kind of second-generation rent control discussed in the previous section. In other words, every time a landlord gets a new tenant she can fix the nominal rent, R, which then remains unchanged as long as the tenant stays.

To motivate the tenant's decision problem, let us consider alternative life strategies for the tenant. If a tenant decides on a career path in which he moves to take up a better job, wherever such opportunities arise, he will be a short stayer and his expected life-time wage-income is W_1. If alternatively he chooses a life where he stays in one place and takes up whatever job he gets in the

vicinity, he is a long stayer and his expected life-time wage-income is W_2. We assume, what seems reasonable enough, that $W_1 > W_2$.

Suppose the market rent is R. A person who decides to be a tenant will choose to be a short stayer if and only if

$$W_1 - Rv_1 \geq W_2 - Rv_2$$

or

$$\left[W_1 - W_2\right] \geq \left[v_1 - v_2\right]R .$$

By Lemma 1, we know that the right-hand term is positive. Hence, there exists a critical rent size, $\overline{R}$, such that if $R \leq \overline{R}$, tenants prefer being of type 1 and if $R > \overline{R}$, tenants prefer to be of type 2. Clearly,

$$\overline{R} \equiv \frac{W_1 - W_2}{v_1 - v_2} \tag{10}$$

Let us, as in the end of section III, describe the outcome of the rental market by thinking of this as a game among the m landlords. As before m > t, where t is the number of potential tenants. For simplicity assume D is very high; so the potential tenants always choose to be tenants. A tenant's crucial decision now pertains to what type he will be. If all landlords charge the same rent, R, each tenant's choice has already been described. If $R \leq \overline{R}$, each tenant chooses to be of type 1. Otherwise he is of type 2.

Let us denote this decision by the function $T:[0,\infty) \rightarrow \{1,2\}$. T(R)=1 if and only if $R \leq \overline{R}$. Thus T(R) tells us what type the tenants will be, if there is only one rent prevailing in the market, that is, R. Now, consider the case where, with all the landlords charging R, one landlord deviates to R'. What can the deviant landlord expect? As in section III, we assume that if $R' > R$, she expects to find no tenants. If $R' < R$, tenants will of course come to her, but the question is what life-style will the tenant choose: short-staying or long-staying? It seems to us, and this is what we will assume, that all

tenants will be of type T(R) - even the tenant who rents at rate R' from the deviant landlord. More formally, in the language of games used at the end of section III, we assume the following: (c) If t landlords enter the rental market and all but one of them charges a rent of R and one landlord charges a rent $R'<R$, then the tenants attracted by the deviant landlord will be of type T(R).

This assumption seems to be intuitively very reasonable. Suppose you live in a city with a second-generation rent control law in which every landlord, except one, charges a very high rent. The one exception is your landlord who charges a low rent of R'. Suppose if *every* landlord charged R' you would have adopted the short-staying life style (involving moving every time you got a better job). What will you do when only your landlord charges R'? There seems little rational motivation for you to adopt the short-staying life-style. In fact, when you see the harsh rental market condition all over the city, you will have an extra reason to stay put where you are.

Figure 3 considers the case in which all landlords charge the same rent R and the thick line shows each landlord's expected life-time rental income, E(R). Note that if

$R \leq \overline{R} \equiv (W_1 - W_2)/(v_1 - v_2)$, all tenants are of type 1 and if $R > \overline{R}$, all tenants are of type 2.

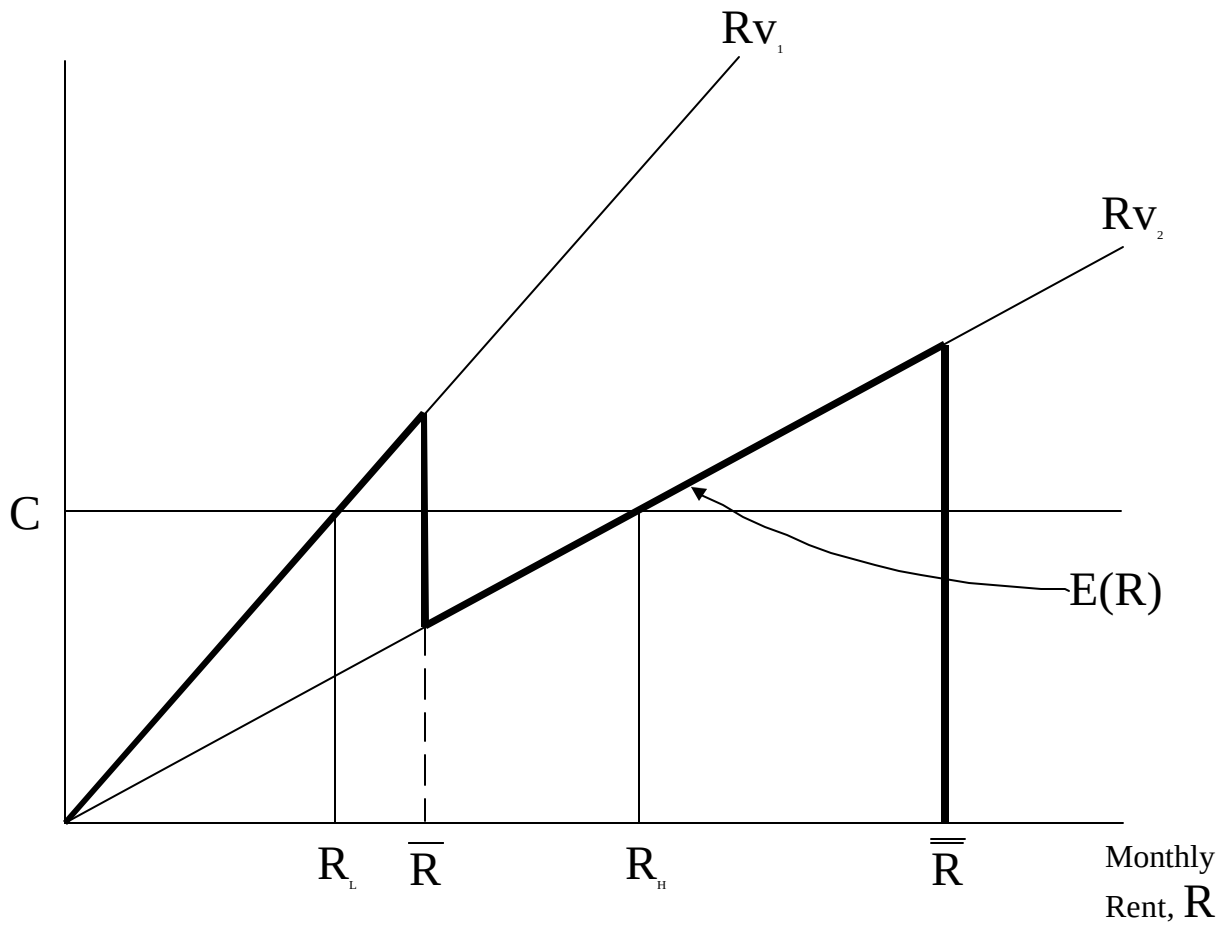

Figure 3

Now suppose (as in section III) a landlord's cost of leasing out an apartment is C (as shown in the figure). To fix our attention on the interesting case we consider one where the horizontal line at C intersects E(R) more than once (at rents R_L and R_H). Unlike in section 3, here both R_L and R_H constitute competitive equilibria or, equivalently, single-peaked Nash equilibria. To see this, first take the easy case where rent is R_L. Since $R_L v_1 = C$, landlords earn a zero profit. Since, for all $R < R_L$, $Rv_1 < C$, no landlord can do better by under-cutting the market rent. Neither can a landlord do better by raising the rent unilaterally since no tenant will come to her (see assumption (b) in section III).

Next consider the case where the market rent is R_H. Landlords' profits are zero, but it seems, at first sight, that an individual landlord can do better by charging a lower rent--anything between R_L and $\overline{R}$. Suppose one landlord does undercut the market rent and charges $R \in (R_L, \overline{R}]$. She will have no problem getting a tenant of course. However the tenant who moves in will not behave like a type 1 tenant, because if he gives up this tenancy there is no reason for him to expect that he will again find an apartment for R. Remember that all but one landlord is charging a rent of R_H. Hence, through a unilateral rental under-cutting one cannot hope to change the tenant's behavior from type 2 to type 1. Hence, the deviating landlord's expected profit will be Rv_2-C. This is non-positive for $R \in (R_L, \overline{R}]$. So no one benefits from deviating from R_H, which is a competitive equilibrium. For a formal game-theoretic argument we have to merely cite assumption (c) above to explain why it does not pay to undercut the rent R_H.

The argument that explains the possibility of multiple equilibria given second-generation rent control is based on the assumption that there are limits to the number of apartments a single landlord can offer (for simplicity assumed to be one in this paper). If a landlord could under cut R_H by offering $R' \in \left(R_L, \overline{R}\right]$ and supply a large number of apartments at that rent, she may be able to cause tenants to alter their life's strategy from being long-stayers to short-stayers. In other words (c) would then no longer hold, and so R_H would cease to be a single-peaked Nash equilibrium. But in any metropolitan city it does seem reasonable to assume that no single landlord can cause such a large infusion of apartments as to induce tenants to alter their life strategy.

Finally, let us see what happens when there is no rent control, that is, we have a contractual system. Clearly then R_H will cease to be an equilibrium, because landlords can write type-contingent

contracts, So a landlord can deviate to a rent such as $\overline{R}$ and make it contractual on the tenant quitting after t_1 periods. It is easy to see that the only equilibrium is at R_L in Figure 3.

In a contractual system, this same contract can be written in many different ways. One is to set rent at R_L per month with the understanding that the tenant quits after t_1 periods (or, equivalently, adjust the real rent up to R_L after every t_1 periods). Another equivalent contract is to set the first month's rent at R_L and then have an inflation clause, such that the kth month's nominal rent is R_L/β^{k-1}.

The essential upshot is that under second-generation rent control, both R_H and R_L can be equilibria. Whereas under the contractual system only R_L is. Suppose the second-generation rent control is in effect and it is the bad equilibrium, i.e. R_H, that somehow comes into being. In comparison to this a system of no-rent-control (and instead free contract) is not only Pareto efficient but it is Pareto dominant. The removal of rent control will result in all rents going down. All tenants are better off. They can choose the preferred life-style with a greater life-time income of W_1. This also hints at an important link, which may be worth exploring in the future, between rent-control regimes and the labor market. As the above analysis suggests, certain kinds of rent-control regimes can make the labor market more inflexible, with workers not responding to wage differentials because they do not wish to give up the advantages of being a sitting tenant. It is likely that India's labor market has been affected adversely by the urban rent control laws; this is clearly a matter deserving independent inquiry.

V. Extension: Turnover Costs

In this section we explore an extension to our model in which the landlord incurs turnover costs. Turnover costs are common in the rental housing market and typically consist of cleaning, repainting and renewing worn out appliances (and furniture if apartment includes furniture) upon vacancy.

Let us consider the case where there exists a fixed turnover cost which the landlord has to pay each time a tenant vacates an apartment. In this case, every time a tenant leaves, the landlord has to incur a transaction cost of ϕ (for cleaning, re-painting, and so on). Then in (1) we need to add the term $-\delta^{t_i}\phi$ to the right-hand side and that will mean (2) would be:

$$\hat{v}_i = \frac{1-(\beta\delta)^{t_i}}{(1-\delta^{t_i})(1-\beta\delta)} - \frac{\delta^{t_i}\phi}{1-\delta^{t_i}} \tag{11}$$

The hat on the v_i is to mark out this general case. In other words, $\hat{v}_i$ is the present value of income earned by a landlord if she charges a nominal monthly rent of $1 in real terms for every new tenant, gets only tenants of type i and incurs a cost of ϕ every time a tenant quits. We define the cost term of equation 11 as:

$$\Phi_i \equiv \frac{\delta^{t_i}\phi}{1-\delta^{t_i}} \tag{12}$$

It is easy to see that $\Phi_i < \Phi_j$, for all i > j. Therefore there is now a tension between the benefits to the landlord from a short-stayer, that rents are not eroded as much as with a long-stayer, and the costs, that turnover costs are incurred more frequently. This can lead to even more types of tenants being kept out of the market. Define $\Phi_{(i)}$ as expected present turnover costs to the landlord when all tenants of type i or above make themselves available to the landlord as tenants. We can then write $\hat{v}_{(i)}$ as $v_{(i)}$ - $\Phi_{(i)}$, or:

$$\hat{v}_{(i)} = v_{(i)} - \frac{\phi\left(\dfrac{\sum_{j=i}^{n} p_j \delta^{t_j}}{\sum_{j=i}^{n} p_j}\right)}{\left(1 - \dfrac{\sum_{j=i}^{n} p_j \delta^{t_j}}{\sum_{j=i}^{n} p_j}\right)} \tag{13}$$

If the rent is R and only tenants of type i and higher seek tenancy, we now denote the landlords present value of income from leasing out one apartment by $\hat{v}_{(i)}(R)$. From equations (8), (9) and (12) it is clear that,

$$\hat{v}_{(i)}(R) = Rv_{(i)} - \Phi_{(i)} \tag{14}$$

It is now easy to see that with this specification it is no longer generally true that if $i < j$, $\hat{v}_{(i)} > \hat{v}_{(j)}$, and so from the landlord's point of view the shortest stayers are no longer necessarily the ideal tenants.

The tension between the desirability of oft-reset rents and undesirability of frequent turnover costs can potentially alter the equilibrium from section III. Shorter stayers are likely excluded from the rental market by landlords who want to avoid frequent turnover costs. They accomplish this by setting rents high enough so that short-staying tenants exit the market. Therefore turnover costs can lead to the exclusion of tenant types that would not have been excluded in the absence of these costs. This leads to a market outcome that is worse, in the Pareto sense, than the outcome without turnover costs.

VI. Conclusion

Rent control laws have been enacted in many municipalities in many countries around the world, making them one of the most popular public policy prescriptions among metropolitan governments. Unfortunately, knowledge of the effects of rent control is inadequate for such a widespread phenomena, especially knowledge of second-generation rent control. This paper has constructed a general model of second-generation rent control. We began by describing a stylized rent control system that captures the essential elements of most second-generation rent control systems: Restrictions on rent escalation and the eviction of sitting tenants and curbs on the use of departure date contingent contracts. These restrictions give rise to an asymmetric information problem where landlords prefer to rent to tenants who stay in an apartment for only a short time, but they are unable to tell tenant types at the time of rental.

We proceed to show that this kind of rent control system, with asymmetric information and exogenously given tenant types (the 'type' of a tenant being identified in terms of how long a tenant expects to stay in the same apartment), can lead to outcomes that are Pareto sub-optimal. Free contracting, however, allows the agents in this model to overcome the asymmetric information problem. We then study the case of endogenously determined tenant types, that is, a model in which how long a tenant stays in one place is decided by the tenant on the basis of market signals. This captures the fact that many agents make lifestyle choices depending on the conditions of the rental housing market and may choose to remain in a city where he or she occupies a rent controlled apartment even though a higher paying job is available in another city. Endogenizing the tenant's type give rise to the possibility of multiple equilibria in our model. Removal of rent control laws can not only increase efficiency in the rental market, but can also lead to a general lowering of rents, making all tenants better off. Finally, turnover costs are added to the model which creates a tension between the desirability of short staying

tenants, as they allow rents to be reset to market values often, and the undesirability of short stayers, because frequent vacation of apartments increases the incidence of turnover costs for the landlord.

A number of empirical implications arise form our model. Since landlords cannot write departure date contingent contracts or have a rent escalation clause included in the contract, the landlord must set initial rents higher to compensate for the erosion of real rents suffered during occupancy. This should lead to across the board higher rents in rent controlled apartments that are being offered on the market (vacant apartments) than comparable offerings in non rent controlled cities. One would also expect to find evidence of a tenure discount in rent controlled cities (as does Börsch-Supan, 1986), where tenants who have rented the same apartment for many years pay considerably less in rent than do tenants who have only just recently taken possession of an apartment. The construction of new housing should not necessarily be any less frequent in a rent controlled city, because, as in our perfect competition model, we show that landlords do no worse under rent control than they would have without it (as in Olsen, 1990). An important implication of the model is that rent control might decrease the mobility of the labor force. As sitting tenants are reluctant to move from a rent controlled apartment, they are less likely to accept a higher paying job in another city. Therefore, empirically, we would expect to find that the average tenure of renters is much higher in rent controlled cities than in non rent controlled cities (some evidence of this is found in Olsen, 1990). The received empirical evidence generally supports these hypotheses, drawing a picture remarkably similar to the one that is implied by our model, but the scarcity of detailed empirical evidence suggests that there is still work to be done in this area.

From the above set of results, it is easy to get the idea that the optimal policy solution is to free the rental housing market of all government restrictions. We caution the reader from extending this logic

too far, however. As we discuss earlier in the paper, free contracting in the rental housing market, in the sense that we use it, really implies a considerable role for governments. The government provides the framework in which contracts are enforced, and though in our model the absence of rent control was associated with a system of free contract, there will in reality be three important kinds of limits on the range of contracts allowed. First, since every society considers certain kinds of activities illegal, a contract that specifies the use of some illegal activity would naturally not be recognized even if both parties voluntarily agree to it. A contract which entails the landlord killing a tenant who fails to pay the rent would belong to this category. Secondly, a contract which adversely affects an uninvolved 'third party' (that is, someone who is not a signatory to the contract) would be considered illegal. Finally, what one has to keep in mind is that, in this age of lawyers, contracts can soon become so complicated that it becomes virtually impossible for the signatories to fully understand what exactly they are agreeing to. In such a scenario, the more savvy can 'trap' the others into transactions that they would not have got into *if* they understood the full ramifications of the contract. To prevent this from happening, a practical response is to set some broad limits to the range of permitted contracts. To the extent that rent controls are themselves partly the consequence of a well-meaning attempt to restrict the range of contracts, one has to exercise caution and commonsense when limiting the terrain of possible contracts. What our model suggests is that the class of possible contracts should include rent escalation clauses, tenancy termination clauses and in general, contracts involving terms which are departure date contingent. This freedom of choice allows tenants and landlords to overcome the asymmetric information problem and reaches not only Pareto efficiency but may result in across-the-board lower housing rentals than what occurs in the presence of rent control.

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