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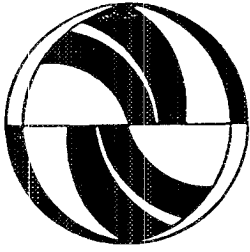https://escholarship.org/uc/item/83j5h9d3

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Publication Date
1994-11-01

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Working Paper
UCTC No. 240

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The Influence of Expected Suburbanization on Urban Form and the Journey to Work

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Working Paper
November 1994

Abstract

Standard urban models assume residents never think about their next job. More likely, the individual value of a given home and the choice of commute length are based not only on the current job site, but also on the expectation of where future jobs will be and the likelihood of both job separations and residential moves. The first factor lessens the value of access to the present job, while the second determines the opportunity cost of moving. Both sets of factors lead to flatter rent gradients and more sprawl than predicted by standard theories. The analysis further suggests that relatively stable jobs are likely associated with relatively shorter commutes. Past studies of the regional balance of jobs and housing, of 'wasteful' commuting, of differences in the length of commute by gender, and of spatial tests for discrimination in housing and local labor markets have neglected these considerations, and may yield biased results as a consequence.

1. Introduction

The conventional theory of urban structure is known to be limited in many respects, as any theory must be. Of course some elements of the real world are more pivotal than others, depending on the problem at hand. Their absence from a model may have direct bearing on the usefulness of theoretical results as well as the validity of subsequent empirical strategies. This paper argues that such may be the case with past studies of the journey to work, and by extension the structure of urban areas. By neglecting the influence of potential future job locations and life-cycle factors on current housing decisions, these studies inadequately explain both overall commuting behavior and differences in commuting patterns among various population groups.

The standard approach is to argue that each household will trade off the value of access to their current job against the cost of housing when choosing where to live. In an area with a single site for most employment, this story generates declining equilibrium rents and densities with the length of the commute. To account for labor markets with multiple major employment locations, most analysts have simply generalized the static model to allow for many such rent and density nodes -- i.e., suburbanization of employment and the population. (Examples include White [35], Wieland [37] and Yinger [38].)

This paper also considers a setting of multiple employment centers, but allows for a fuller explanation of the resulting residential location pattern. We consider an environment where job location may change and where it is costly to move. Moreover, the cost of a move is permitted to depend on the characteristics of the individual and the job and home sites. The ultimate choice of a place to live is therefore based not only on the current job, but also on the expectation of (1) where the next job will be, and (2) how often the household will choose to move for other reasons. The first factor lessens the value of access to the current job location, while the second determines the opportunity cost of moving.

Extending the usual framework in this simple but important manner sheds light

on questions raised by recent empirical work regarding a number of transportation policy issues, including evidence on the regional balance of jobs and housing, 'wasteful commuting', the gender gap in commute lengths, and the spatial mismatch hypothesis. In general, the connection between current job and housing locations is weakened by the considerations introduced here, particularly among the segments of the working population who either expect to soon move into a larger home or who expect job locations to change. (The jobs/housing balance question is discussed in Cervero [3], Giuliano [9] and Gordon, et al. [12,15].) Evidence from Los Angeles that the average commute is pretty much the same throughout the area supports the notion that people are keeping their future options open, rather than focusing exclusively on minimizing the current commute length (Giuliano and Small [10,11]; Gordon, Kumar and Richardson [15]).

The wasteful commuting hypothesis, introduced by Hamilton [16], is that aggregate commuting far exceeds the amount necessary to minimize the equilibrium work-home trip. Other papers have extended the analysis to account for the role of local amenities and multiple employment centers, all of which assume that households do not plan ahead for possible job changes. (These include Giuliano and Small [11], Small and Song [31], and White [36].) It is also clear that studies looking at differences in the commuting behavior of men and women have not effectively controlled for the life-cycle and career-cycle characteristics potentially influential in both job and residence location choice. (See, for example, Gordon, et al. [13], Madden and Lic [23] and Madden and White [24].) The model presented in this paper suggests we would predict a shorter commute for persons with relatively small job change costs, relatively high home move costs, higher commuting costs per mile, and less job turnover. Compared with men as a group, we would expect women workers to have all these characteristics except possibly the latter. However, the importance of these dimensions of gender differences have yet to be measured.

Finally, one view of the 'spatial mismatch' hypothesis is that racial minorities face more discrimination in housing markets than in labor markets, such

that they are spatially constrained when competing for jobs. Evidence of longer

commutes for blacks has been used as evidence of housing market discrimination, and

the lack of evidence of longer commutes has in turn been used as evidence of a lack

of housing discrimination in those markets.[1] The approach to understanding commute

length outlined in this paper calls into question the second set of results more

than it does the first. Short commutes may at least in part be explained by

relatively stable job location, high moving costs, and high commute costs. This is

consistent with a housing market that constrains the choices of minorities yet

provides centralized employment sources or access to social services. The

contribution of housing discrimination to longer commutes is diminished, however, if

there is reason to believe that the observed individuals have either relatively

little faith that the distant job site is secure or the expectation that future jobs

will be nearer the current home location.

The main idea is demonstrated in a basic urban model. We show that if the

location of future employment sites within the local labor market are unknown with

certainty, a worker will consider commute costs over their entire time horizon when

evaluating alternative places to live. Rather than think only about where they live

and work now, they also think about where they might work later. Moreover, they may

well account for how often they plan to move for other reasons. Any one household's

current location is thus as tied to the probability of working somewhere else

locally as it is to the present job location, and as such is explained by all the

things the literature has used to explain location plus three additional factors:

The expected distribution of future employment locations, the expected costs of

changing home sites, and the expected number of both job and residence changes.

By extending a standard urban model in straightforward fashion, this paper

demonstrates the potential importance of these factors for a variety of topical

empirical research questions. The paper begins by specifying a model of urban

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[1]See Ellwood [6], Gabriel and Rosenthal [8], Gordon, et al., [14], Hughes and Madden [17],
Ihlanfeldt and Sjoquist [18,19,20], Ihlanfeldt and Young [21], Kain [22], Price and Mills [28],
Taylor and Ong [32], Zax [39,40], and Zax and Kain [41].

structure. It then presents a two center, two period example with uncertain future employment location. The market rent gradient is compared with the conventional approach to valuing employment access, suggesting the tendency for these factors to lead to cities which are more decentralized that usually assumed. Section 4 extends the discussion to include the individual choice of the journey to work, arguing that moving costs vary according to life cycle circumstances. Suggestions for empirical implementation are offered in the concluding section.

2. Uncertain Job Location, Urban Form, and the Journey to Work

The formal analysis starts with the familiar benchmark of the residential pattern associated with a standard urban model of a single employment site 'Downtown'.[2] The model assumes that each household inelastically supplies a unit of labor supply to their employment site, at a commuting cost of $T(z)$, where z is the one-way commute length in miles. Each household also consumes housing h, and a numeraire composite good x. On the supply side, housing is produced by competitive firms from land and capital according to the concave constant-returns-to-scale production function $h = f(L,K)$, where L is land and K is capital.[3]

Household behavior, and thus the willingness of to pay for housing at each location, may be summarized by the bid rent function

$$r(z,U) = max_{h,x} \ \{[y - x - T(z)]/h: \ U(h,x) \geq U^o\} \tag{1}$$

This represents the maximum price the household can pay per unit of housing and maintain utility level U. Differentiating (1) with respect to distance, and applying the envelope theorem, gives:

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[2]This paper does not explain job location, i.e., labor demand and the suburbanization of employment. It is entirely concerned with the suburbanization of labor given the suburbanization of employment. For related approaches with somewhat different purposes, see Simpson [30] and Nijkamp, van Wissen and Rima [27].

[3]This is the so-called Mills-Muth model of urban residential location; see Mills [25] and Muth [26] for foundations, and Brueckner [2] and Fujita [7] for recent discussions and extensions. Note that while the story below extends the basic model to include some dynamic elements, we maintain the classic assumption that capital is perfectly malleable, distinguishing this approach from the dynamic urban models of Brueckner [1] and von Rabenau [33], among others

$$\frac{dr(z,U^{\circ})}{dz} = \frac{\partial r(.)}{dz} = -\frac{\tau'(z)}{h(.)} \qquad (2)$$

This is the standard result: Spatial variation in the price of housing reflects the value of access to the only location everyone in the city has inelastic demand for, the central employment site.

Two increasingly common features of metropolitan areas that question this result are multiple employment centers, and the mobility of residents, workers and their jobs. As shown by several analysts, the equilibrium rent gradient will be somewhat different than (2) if there is more than one employment center (e.g., White [35], Wieland [37] and Yinger [38]). In that instance, equilibrium rents will tend to reflect the value of access to the *nearest* employment site. Thus, the monocentric pattern is repeated around each employment site, though on a smaller scale. The metropolitan area as a whole will be more decentralized, by construction. As a fundamentally static story, however, this approach fails to capture the effects of either mobility or change, per se.

This paper extends the multicentric story to consider how bids are affected if an individual's job site is uncertain when the place of residence is chosen. Roughly speaking, we show that equilibrium rents will then tend to reflect the *discounted* value of access to the most *likely* employment site. There are two consequences of this perspective which are important. First, we expect that to the extent these factors are important, metropolitan areas will tend to be more decentralized that conventional urban theory would suggest. In particular, rent and density gradients will be everywhere flatter than typically predicted by multicentric models. Second, the individual journey to work will be longer than most models suggest, where the length of each commute depends critically on the occupational and life-cycle characteristics of the commuter.

These results reflect a choice process where residence bids for any site reflect expectations regarding future suburbanization of employment, and the spatial

variation in moving and commute costs over the time horizon. In the model described below, each household considers where they might work later and how often they plan to move. If home location is a nonstochastic choice variable, then the initial and subsequent bids will simply involve a comparison of the present value of future commuting costs to every expected job location, weighted by the probability of having a job at that location. That is, the calculation of the value of access at each feasible location at any point in time involves minimizing both the expected stream of commuting costs associated with each location and with total moving costs.

Before introducing a bid-rent scheme conceptualizing these elements, note that such factors are generally observable. Aside from individual idiosyncrasies, they largely depend on occupation, age and family status. On the one hand, a university professor may have only one feasible employment site within the area, while a construction worker may not work at the same site more than a few months at a time. A young couple planning a family may be expecting to move-up into a larger house within the next few years, while a family with children may be planning to stay in their current house for another twenty years. The motivation for this analysis is that these observable differences can affect the aggregate distribution of the population in a metropolitan area in a manner largely unexamined in the literature.

It is simplest to decompose this process into two parts: site valuation, and moving decisions. The latter are introduced in the next section. Consider a linear city with (potential) employment locations at 2 sites: Downtown (D) and the Suburbs (z_s). Expectations span two time periods, today and tomorrow. Today everyone is working, but they expect to lose that job tomorrow. Though they expect to be employed in the next period, they are unsure where that job will be. They form expectations based on the proportion of their employment base expected to be located at each site. That is, the likelihood of being employed downtown in the next period is subjectively calculated as the share of employment in that occupation expected to be found there.

Everyone in the city forms rational expectations in this regard, based perhaps

on the published reports of the local university's forecasting model. The share of the city's employment in a particular occupation that is expected to be located in the suburbs tomorrow is denoted by β, with the share left downtown then $1 - \beta$.[4] Our story begins by assuming all residents share the same β, though this will be relaxed later. Expected commuting costs over the two periods are current costs plus the present value of expected second period costs. Current commuting costs are either $\tau_D(z)$ or $\tau_s(z)$, depending on whether the worker now works downtown or in the suburbs.

The location of the suburban employment center is at distance z_s from downtown. As one considers residential locations further from downtown, i.e., as z increases, note that commuting costs for suburban workers can either rise or fall depending on the location. Thus $\tau_s'(z) < 0$ for $z < z_s$, and $\tau_s'(z) > 0$ for $z > z_s$, while $\tau_D'(z) > 0$ everywhere. Furthermore, the relevant measure of commuting costs, and hence the value of access to employment, is in part forward looking. Today's costs are either $\tau_D(z)$ or $\tau_s(z)$, as mentioned. Expected commuting costs in the next period are $\left(1 - \beta\right)\tau_D(z) + \beta\tau_s(z)$. The present value of all expected commuting expenses is therefore either

$$E_D[\tau] = \tau_D(z) + \delta\left[\left(1 - \beta\right)\tau_D(z) + \beta\tau_s(z)\right]$$

or

$$E_s[\tau] = \tau_s(z) + \delta\left[\left(1 - \beta\right)\tau_D(z) + \beta\tau_s(z)\right]$$

for current downtown workers and current suburban workers, respectively, where $\delta \equiv 1 / (1 + i)$ and i is the interest rate.

If we focus the analysis by requiring that x, h and r be constant over the two

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[4]This model is described in terms of a single-worker household, but the general approach can incorporate multiple worker households as well by expanding the interpretation of β to capture other elements of the importance of each job site. For example, if α_j measured the stability of the job of worker j and γ_j captured other aspects of the importance of worker j's job to the household, then we would define the household $\beta = \sum_{j} \left(\alpha_j + \gamma_j\right)$, summing over all household workers.

periods, the present value bid rent function may be written as,[5]

$$(1 + \delta) r(z, U, \beta, i) = \max_{h,x} \left\{ \frac{(1 + \delta)(y - x) - E[\tau]}{h} : \quad s.t. \quad U(h, x) \geq U^\circ \right\} \quad (3)$$

The rent gradient for a *downtown* worker is then

$$(1 + \delta) \frac{\partial r_D}{\partial z} = - \frac{[1 + \delta(1 - \beta)] \tau_D'(z) + \delta \beta \tau_S'(z)}{h} \quad (4)$$

The gradient has the same sign as $-[(1 + \delta) \tau_D' + \delta\beta (\tau_S' - \tau_D')]$. The first term $(1 + \delta) \tau_D'$ is the change in the present value of commuting costs with distance in a two period world with fixed job locations; it is the analog to the standard model commute cost gradient. The second term $\delta\beta (\tau_S' - \tau_D')$ is the effect of job location uncertainty, and is negative for $z < z_S$ and of indeterminate sign for $z > z_S$. Compared to a two period model with stable jobs, bid rents will thus decline less rapidly from downtown for current downtown workers at least up to z_s whenever $\beta \neq 0$. Depending on what happens in equilibrium, there is also the suggestion that those workers will be more decentralized than in standard models.

The comparable rent gradient for a worker currently employed in the suburbs is

$$(1 + \delta) \frac{\partial r_S}{\partial z} = - \frac{\delta(1 - \beta) \tau_D'(z) + (1 + \delta\beta) \tau_S'(z)}{h} \quad (5)$$

This also *increases* less rapidly with distance for $z < z_S$ if $\beta < 1$; i.e., if the suburban job location is not secure. The effect beyond the suburban center depends on how τ_D' compares with τ_S', though both are positive there.

To get at that question and explore these expressions further, it is convenient to assume commute costs are a constant $$t per unit distance, such that $\tau_D(z) = tz$ and $\tau_D' = t$. Commute costs for current suburban workers are then $\tau_s(z) = t(z_s - z)$ and

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[5] A more general treatment would extend the time horizon and allow for more than two possible job sites. For an infinite number of possible job sites along a linear city in a two-period setting, for example, $E[\tau] = \tau_o(z) + \delta \int_z f(z) \tau(z) \, dz$, where $\tau_o(z)$ is the initial commute expense and $f(z)$ is the probability density function of job locations. This could be extended to a multi-period setting by summing expected commute costs in each period over the time horizon.

hence $\tau_s' = -t$ for $z < z_s$, and $\tau_s(z) = t(z - z_s)$ so that $\tau_s' = t$ for $z > z_s$.

In that case, the sign of the downtown workers' bid rent gradient (4) is the same as

$$-[1 + \delta(1 - 2\beta)] \quad \text{for } z < z_s,$$

and

$$-(1 + \delta) \quad \text{for } z > z_s$$

Note the gradient is negative outside z_s, but *it can be either positive or negative between downtown and the suburbs.* It is definitely negative only where $\delta = 0$ or $\beta \leq 1/2$. That is, if the prospect of a job move to the suburbs is sufficiently likely, the rent profile will actually slope upward with distance from downtown even for workers who now work downtown. (Richardson [29] used a spatial externality argument to derive a similar result.) In the extreme case where the current downtown job is only temporary, and the worker expects to be employed in the suburban center the remainder of their working life, the present value of access to the current job can be quite minimal.

In this example, the sign of the suburban workers' rent gradient (5) is the same as

$$-[\delta(1 - 2\beta) - 1] \quad \text{for } z < z_s,$$

and

$$-(1 + \delta) \quad \text{for } z > z_s$$

Again, the gradient between downtown and the suburb may be positive or negative, and is definitely positive only if $\delta = 0$ or $\beta \geq 1/2$. Note that the slopes of bid gradients for both types of workers outside of z_s are the same, and are independent of β.

This example is illustrated in Figure 1 for a zero discount rate and three different values of β, the likelihood of being employed in the suburbs in the next period. Figure 1a gives the market rent in an economy with two secure job sites, one downtown and a second suburban job site at distance z_s from downtown. Figures 1b and 1c illustrate bid rent gradients over a stochastic job site economy. In

Figure 1b, the bids reflect the belief by downtown workers that they have a 20 percent probability of being employed in the suburban center in the next period. Figure 1c increases that probability to 80 percent. Note that Figure 1c gives an increasing rent gradient with distance from downtown up to the suburban site.

In a stable equilibrium, there can be no advantage to moving and rents will adjust to eliminate the benefits of one site over another. The relationship of the bid rent to the market rent depends on the characteristics of the market population. In the special case where households are equal in every important respect, the market rent will equal each individual's bid rent everywhere in the city, and thus commuters would be indifferent among home locations. However, if bids differ across individuals, households will locate at different locations in equilibrium, which in turn will depend on their individual commute cost profile. In this model, one source of bid variation is the initial location of employment. Another might be differences in expected job stability, represented here by β.

Figure 1a shows both how workers will tend to cluster around their employment site when job locations are both certain and stable. They will continue to do so so long as the expectation of having a job in the same location is greater than one-half; that is, so long as $\beta < 1/2$ for current downtown workers and $\beta > 1/2$ for current suburban workers. With other values of β, other alternatives are possible, some with and some without clustering around either one or both employment sites.

In particular, assume β differs within each group. By (4), downtown workers with the lowest β's (the most stable jobs) will have the steepest bid rent gradients (they slope upward as z increases), will have the winning bids closest to downtown, and will thus locate there. Similarly, from (5), those suburban workers with the largest β's (the most stable jobs) will have the steepest bid rents and will thus locate nearest the suburban employment center. Thus, the model supports the prediction that workers with the most stable jobs will have the shortest commutes.[6]

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[6]I am grateful to the editor for suggesting this result. Note also that in the suburban case, there is no sorting of workers by job stability outside of z_g because the slopes there are independent of β.

Figure 2 provides an illustration of this result for 6 worker types. Say that all workers are split into 3 groups with respect to job stability: highly stable, medium stability, and unstable. Each measure of stability is with respect to their current job location. Thus current downtown workers with $\beta = 0$ have stable jobs, and current suburban workers with $\beta = 1$ also have stable jobs. This gives us 6 groups of workers, 3 initially working downtown and 3 working in the suburbs. Figure 2a shows what the bid rents of the three groups for downtown workers might look like, for three specific values of β. Those with the most stable jobs will have the highest bids nearest the current employment site, and so on. Figure 2b draws the bid rents for suburban workers. Again, those with the most stable jobs -- with respect to their current job site -- will have the highest bids near that site.

Figure 2c shows the resulting market rent, with the winning bids generating a location pattern for the 6 worker types. It reveals a pattern of residential clustering near employment centers by those with the more stable jobs; i.e., shorter commutes. Moreover, these parameter values also demonstrate the possibility that some downtown workers may live farther from downtown than some suburban workers (i.e., zones III and IV), and thus vice-versa as well. Those workers with very unstable jobs look so far ahead in this case as to actually value access to the other job site more than workers currently employed there. This does not mean they will necessarily work in the other location in the next period, only that they have a high expectation of doing so.

A naive analysis of the locational patterns in Figure 2c would suggest a high degree of 'wasteful commuting,' as that term is traditionally defined. However, there is nothing irrational about the behavior constructed in this example. Analysts may also conclude that the presence of some downtown workers living in the suburbs (zone IV) is evidence of housing or labor market discrimination, or lack of it, if these patterns are correlated with either race or gender, or both. While those conclusions might in fact be true the example suggests that job stability,

which itself may well have racial or gender components, could also play a role in explaining these patterns.

3. Life Cycle Factors

The analysis thus far has abstracted from the actual choice of home location. This could be relaxed in several ways. For example, if households can costlessly relocate to the sites of their winning bids, then the size of the city, the employment base for each employment site, and the corresponding density gradients, can be derived by redefining individual commute costs in terms of expected costs as in the previous section. To explain the pattern of individual commutes also requires explaining the choice of site along the hedonic. Modeling the costs of movement explicitly is another strategy. As pursued in Zax [40], for example, that approach might attempt to identify how 'footloose' each household is, based on the costs associated with their individual characteristics.

For example, not everyone faces the same relocation costs even where they generate the same site bids. If a person rents her home, the cost of changing residence may be relatively small. Adjusting to a change in the location of employment is relatively easy in that instance, and we might expect to see such individuals living relatively near where they work -- controlling for the stability of employment location. If a person owns her home, it is more costly to move. That person might be expected to be more sensitive to the likelihood of later jobs being located elsewhere, since it is costly to follow them by relocated one's home. Thus, they may rationally choose a longer current commute to in part anticipate later and different commutes from the same home site.[7] These decisions are naturally affected by the number of workers in each household, the stability of their employment location, and their propensity to move for any and all reasons.

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[7]These assertions are supported by the Wachs, et al. [34] study of commute behavior over time in Southern California. Workers who moved into rental housing tended to move closer to their job site, while workers who moved into a home they owned tended to increase their commute length.

Life cycle factors are particularly important in explaining the variation in the last of these factors, as people occasionally make plans to move for other reasons than following employment. Renters may plan to become homeowners, or a household may hope to move into a larger, or smaller, residence for reasons quite apart from the location of their job. Such planned moves reduce the opportunity cost of a change in job location, if the household was going to move in any event. Thus, the point in the life cycle or life course the household finds itself may influence the observed commute length.

Put another way, the critical spatial tradeoff over one's working life is between the cost of moving and the savings in the discounted <u>stream of commute costs</u> associated with the move. Multiperiod expectations are more complex that the two-period story in the previous section, as the worker can look at the stream of commute cost savings associated with each possible move due to each expected job location change. That is, a particular move may make sense if the job location lasts ten years, but not if it only lasts a month.

The task of actually modeling this decision process is complicated by the knowledge that this may not be the last job change, and that any choice of home location is relevant to future, as yet unknown commute lengths. Put another way, each worker has expectations about how often they will want to move (as their income increases, as their family expands, when they buy a home, etc.) and how often they will be changing jobs (both within a given spatial labor market, and between labor markets). As argued in the previous section, these expectations affect the attractiveness and hence the household value of each location.

4. Implications for empirical research

Most models of urban form assume that the influence of uncertain job mobility on both urban form and the choice of commute length is minimal. Whether that approach is valid is an empirical question to be sure, but this paper argues that residential location may well be based not only on where the current job is located,

but also on the expectation of where future jobs will be within the metropolitan
area, and how often the household plans to move for other reasons. In particular,
this view suggests that controlling for all other differences in workers, those with
relatively shorter commutes also have: A lower probability of changing either homes
or jobs within the local labor market, and higher moving costs. These variables
have rarely, if ever, been included in past empirical specifications of commute
length models. They depend on occupational profile characteristics, in addition to
life-cycle factors, which this paper therefore argues should be given more weight in
empirical studies of the journey to work.

The analysis has implied that workers must have rational expectations over the
spatial and dynamic distribution of future employment for these results to matter,
but that assumption is made for convenience only. The empirical question at hand is
not the rationality of expectations. It is whether we believe that people
subjectively assess the risks of committing themselves to a particular home or
apartment when they consider moving, in the sense they consider the possibility that
the site may prove less than ideal for later job or other opportunities. Though
their practical significance has yet to be demonstrated, these considerations will
certainly be more important as employment continues to decentralize in major
metropolitan areas.

References

1. J. K. Brueckner, A dynamic model of housing production, *Journal of Urban Economics*, **10**, 173-182 (1981).

2. J. K. Brueckner, The structure of urban equilibria, (E. Mills, ed.) "Handbook of Regional and Urban Economics, Vol. 2," Elsevier, Amsterdam, 821-845 (1987).

3. R. Cervero, "America's Suburban Centers: The Land Use-Transportation Link." Unwin Hyman, Boston (1989).

4. G. R. Crampton, The trade-off model, 'wasteful commuting' and the labour market search process, Discussion Paper No. 40, Department of Economics, Reading University (1988).

5. G. R. Crampton, Labour market search and urban residential structure, Discussion Paper, Working Paper, Reading University (1992).

6. D. Ellwood, The spatial mismatch hypothesis: Are there teenage jobs missing in the ghetto? in "The Black Youth Employment Crisis," (R. Freeman and H. Holzer, eds.) University of Chicago Press, Chicago (1986).

7. M. Fujita, "Urban Economic Theory." Cambridge University Press, New York (1989).

8. S. Gabriel and S. Rosenthal, Commute times, compensating differentials, and racial discrimination: An analysis of black and white workers, unpublished, University of Southern California and University of British Columbia (1992).

9. G. Giuliano, Is jobs-housing balance a transportation issue?, *Transportation Research Record*, **1305**, 305-312 (1991).

10. G. Giuliano and K. A. Small, Subcenters in the Los Angeles region, *Regional Science and Urban Economics*, **21**, 163-182 (1991).

11. G. Giuliano and K. A. Small, Is the journey to work explained by urban structure? *Urban Studies*, **30**, 1485-1500 (1993).

12. P. Gordon, A. Kumar and H. Richardson, The influence of metropolitan spatial structure on commuting time, *Journal of Urban Economics*, **26**, 138-151 (1989a).

13. P. Gordon, A. Kumar and H. Richardson, Gender differences in metropolitan travel behavior, *Regional Studies*, **23**, 499-510 (1989b).

14. P. Gordon, A. Kumar and H. Richardson, The spatial mismatch hypothesis — Some new evidence, *Urban Studies*, **26**, 315-326 (1989c).

15. P. Gordon, A. Kumar and H. Richardson, The commuting paradox — Evidence from the top 20, *Journal of the American Planning Association*, **57**, 416-420 (1991).

16. B. Hamilton, Wasteful commuting, *Journal of Political Economy*, **90**, 1035-1053 (1982).

17. M. A. Hughes and J. Madden, Residential segregation and the economic status of black workers — New evidence for an old debate, *Journal of Urban Economics*, **29**, 28-49 (1991).

18. K. Ihlanfeldt and D. Sjoquist, Job accessibility and racial differences in youth employment rates, *American Economic Review*, **80**, 267-276 (1990).

19. K. Ihlanfeldt and D. Sjoquist, The role of space in determining the occupations of black and white workers, *Regional Science and Urban Economics*, **21**, 295-315 (1991a).

20. K. Ihlanfeldt and D. Sjoquist, The effect of job access on black and white employment — A cross-sectional analysis, *Urban Studies*, **28**, 255-265 (1991b).

21. K. Ihlanfeldt and M Young, The spatial distribution of black employment between the central city and the suburbs, Working Paper, Georgia State University and Converse College (1993).

22. J. F. Kain, Housing segregation, Negro employment, and metropolitan decentralization, *Quarterly Journal of Economics*, **82**, 175-198 (1968).

23. J. Madden and C. Lic, The wage effects of residential location and commuting constraints on employed married women, *Urban Studies*, **27**, 353-369 (1990).

24. J. Madden and M. White, Spatial implications of increases in the female labor force, *Land Economics*, **56**, 432-446 (1980).

25. E. Mills, An aggregative model of resource allocation in a metropolitan area, *American Economic Review*, **57**, 197-210 (1967).

26. R. F. Muth, "Cities and Housing," University of Chicago Press, Chicago (1969).

27. P. Nijkamp, P., L. van Wissen and A. Rima, A household life cycle model for residential relocation behavior, *Socio-Economic Planning Sciences*, **27**, 35-53 (1993).

28. R. Price and E. Mills, Race and residence in earnings determination, *Journal of Urban Economics*, **17**, 1-18 (1985).

29. H. Richardson, On the possibility of positive rent gradients, *Journal of Urban Economics*, **4**, 60-68 (1977).

30. W. Simpson, "Urban Structure and the Labour Market: Worker Mobility, Commuting, and Underemployment in Cities," Clarendon Press, Oxford (1992).

31. K. A. Small and S. Song, 'Wasteful' commuting: A resolution, *Journal of Political Economy*, **100**, 888-898 (1992).

32. B. D. Taylor and P. M. Ong, Racial and ethnic variations in employment access: An examination of residential location and commuting in metropolitan areas, University of California Transportation Center Working Paper No. 175 (1993).

33. B. von Rabenau, Optimal growth of a factory town, *Journal of Urban Economics*, **3** (1976).

34. M. Wachs, B. Taylor, N. Levine and P. Ong, The changing commute: A case-study of the jobs-housing balance over time, *Urban Studies*, **30**, 1711-1729 (1993).

35. M. J. White, Firm suburbanization and urban subcenters, *Journal of Urban Economics*, **3**, 323-343 (1976).

36. M. J. White, Urban commuting journeys are not 'wasteful', *Journal of Political Economy*, **96**, 1097-1110 (1988).

37. K. F. Wieland, An extension of the monocentric urban spatial equilibrium model to a multicenter setting: The case of the two-center city, *Journal of Urban Economics*, **21**, 259-271 (1987).

38. J. Yinger, City and suburb: Urban models with more than one employment center, *Journal of Urban Economics*, **31**, 181-205 (1992).

39.   J. S. Zax, Race and commutes, *Journal of Urban Economics*, **28**, 336-348 (1990).

40.   J. S. Zax, When is a move a migration? *Regional Science and Urban Economics*, **24**, 341-360 (1994).

41.   J. S. Zax and J. F. Kain, Commutes, quits, and moves, *Journal of Urban Economics*, **29**, 153-165 (1991).

Figure 1: Transportation Cost and Bid Rent Gradients for Downtown Workers
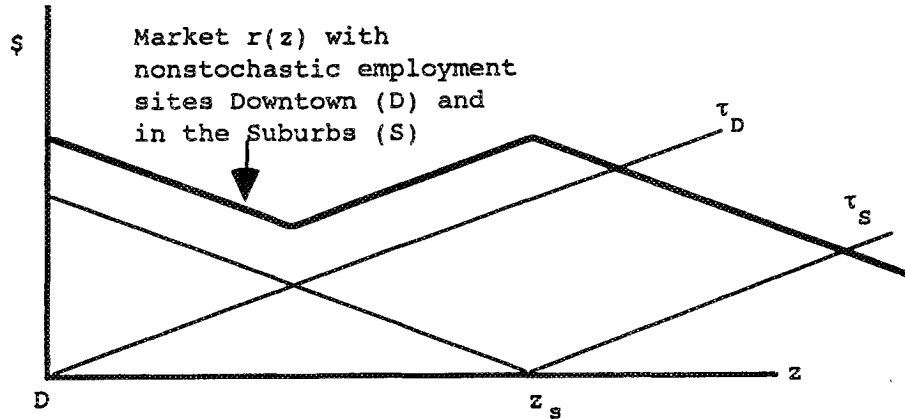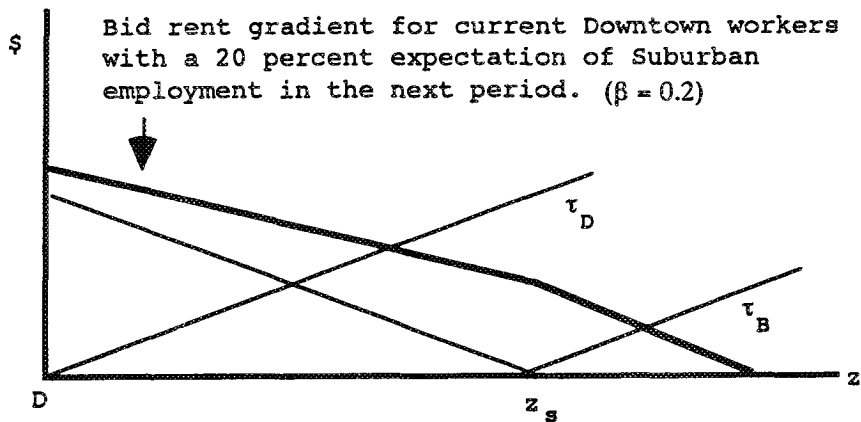in a Linear City with Employment Centers at *Downtown (D)* and *the Suburbs* (z_s)

$

Market r(z) with
nonstochastic employment
sites Downtown (D) and
in the Suburbs (S)

τ_D

τ_S

z

D z_s

Figure 1a

$

Bid rent gradient for current Downtown workers
with a 20 percent expectation of Suburban
employment in the next period. ($\beta = 0.2$)

τ_D

τ_B

z

D z_s

Figure 1b

$ Bid rent gradient for current Downtown
workers with an 80 percent expectation of
Suburban employment in the next period. ($\beta = 0.8$)

τ_D

τ_S

z

D z_s
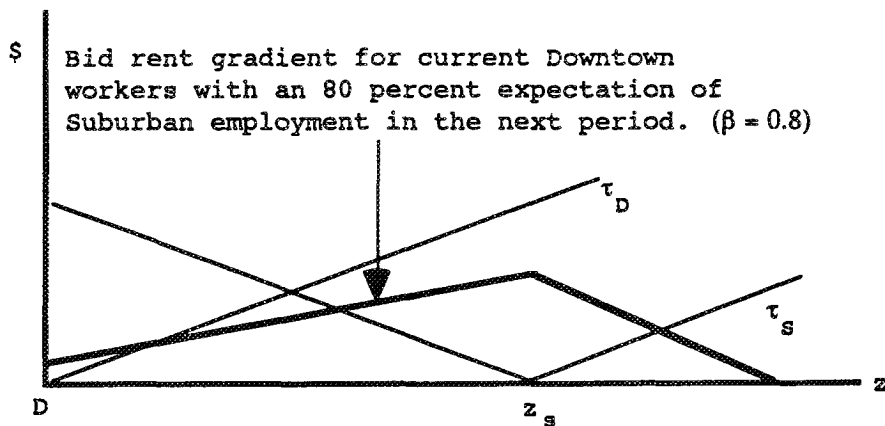
Figure 1c

Figure 2: An Example of When Stable Jobs Result in Shorter Commutes

Bid rent of Downtown
worker with high job
stability ($\beta = 0$)

Bid rent of Downtown worker
with medium job stability ($\beta = 0.2$)

Bid rent of Downtown
worker with low job
stability ($\beta = 0.8$)

z_s
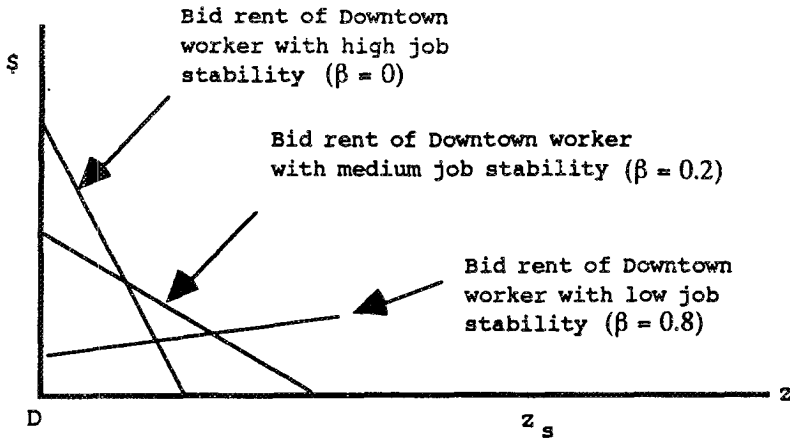
Figure 2a: Bid Rents of 3 types of
Current Downtown Workers

Bid rent of Suburban
worker with high job
stability ($\beta = 1$)

Bid rent of Suburban
worker with medium job
stability ($\beta = 0.8$)

Bid rent of Suburban
worker with low job
stability ($\beta = 0.2$)

z_s
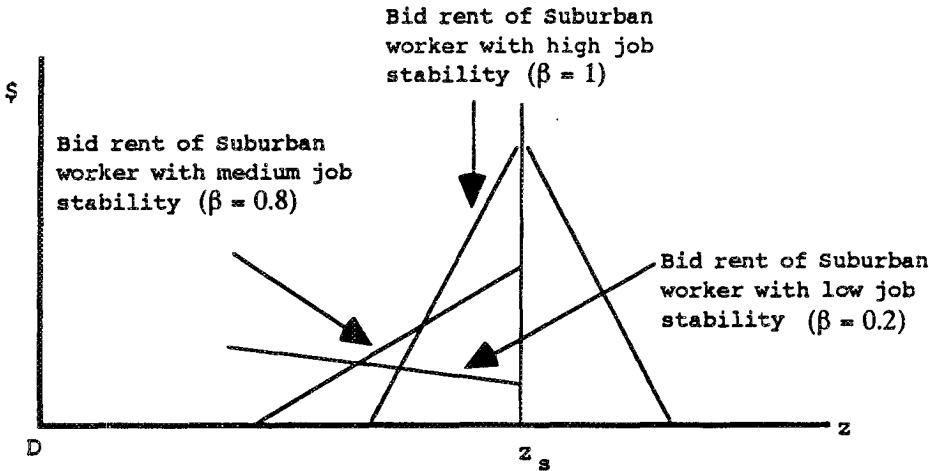
Figure 2b: Bid Rents of 3 types of
Current Suburban Workers

Market Rent

z_s

KEY to Location Codes

I: Downtown workers with stable jobs.
II: Downtown workers with medium job stability.
III: Suburban workers with unstable jobs.
IV: Downtown workers with unstable jobs.
V: Suburban workers with medium job stability.
VI: Suburban workers with stable jobs.
VII: Unsorted Suburban workers
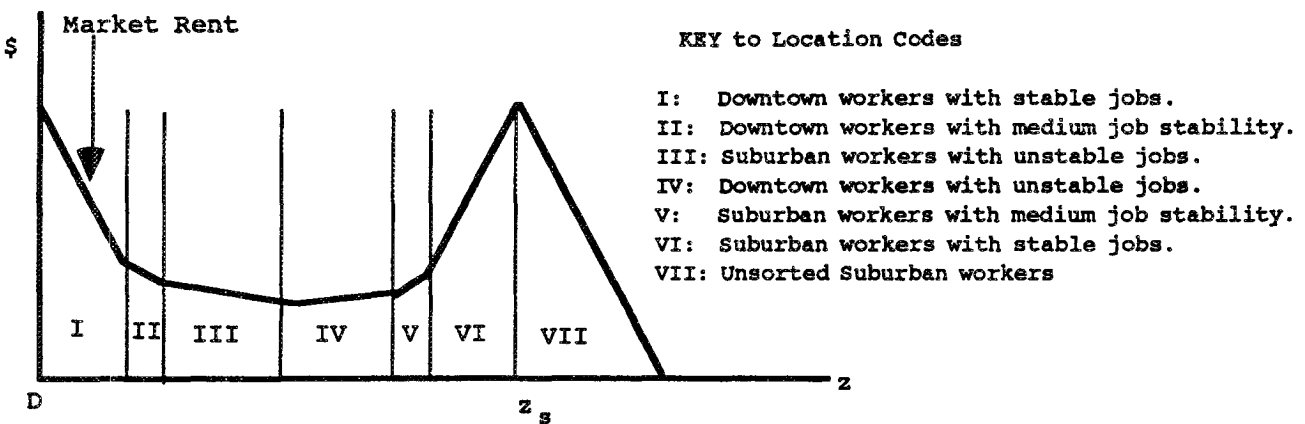
I | II| III | IV | V | VI | VII

Figure 2c: Resulting Market Rents and Locations
Corresponding to Parameters in Figures 2a and 2b.