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## Abstract

*Policymakers seeking to reduce reliance on single-occupant automobiles are giving serious consideration to methods to price roads during periods of congestion and to increase the cost of parking. Such policies are intended to induce increases in carpooling and in the use of mass transit; however, they may have unintended consequences that counteract these goals in the long run. In particular, actual implementation of such policies may create differential price increases that affect the spatial competition for markets between firms located in the central city and those in the suburbs. Analyzing such policies using the spatial competition models of location theory reveals that they may create incentives for long-run changes in location that subvert the mode choice impact of the policies. Careful evaluation of alternatives, such as cashing out employer-provided parking, may allow for development of policies that achieve the desired mode-choice effects without generating adverse spatial competition effects.*



Key words: transportation economics, congestion pricing, parking policy, spatial competition



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## INTRODUCTION

Since the 1960s, policymakers and academics have increasingly been considering pricing travel and/or parking as a means of reducing reliance on the automobile. The chief argument has been that if users pay the full cost of driving, they will be less likely to drive alone. A number of studies have looked at the feasibility and implications of road pricing (e.g., charging for vehicle miles traveled), and there has been more recent attention to the implications of using parking pricing as a policy tool. Recent work has examined using parking policies to attract auto users to transit, and questions about the economic effects of parking pricing have been addressed *(1)*. Much of the discussion of both road and parking pricing has involved the effect that pricing would have on choice of mode, with the expectation that higher costs would induce more use of transit and carpooling. However, this analysis is largely based on the assumption that travel origins and destinations are fixed and that these policies will affect only mode choice. Central business district (CBD) business interests have historically opposed pricing policies, although analysts and case study examples have suggested that core businesses will in fact benefit from the improved accessibility resulting from reductions in congestion *(2)*. Downtown business interests' concern is that higher charges will make the downtown location less attractive relative to suburban ones. This article looks at models of spatial competition to provide some insight into these concerns of the downtown business interests.

### Policy Context

When the automobile initially became available to Americans, there was virtually

no regulation of its use. Over time, downtown business interests cited congestion as a major problem, but they were also reluctant to embrace restrictions on parking and other aspects of automobile us. Municipalities did not begin installing parking meters until the latter 1930s, and then only very cautiously, as business leaders continued to present strong opposition against any measure that might restrict customers' access. Beginning in the late '40s and early '50s, policymakers began to frame the problem of downtown parking and congestion in terms of urban decline. The concern with competition from the growing suburbs—where parking supply was plentiful and free—compelled downtown decision-makers to see the increased provision of free off-street parking downtown as the key to alleviating congestion and increasing competitiveness.

By the 1970s, transportation policy began to be driven by two strong forces: central city economic competitiveness with the suburbs and a growing concern with energy and the environment. Policymakers began to consider a variety of transportation and parking management devices: carpooling, park-and-ride, and controlling or even "capping" downtown parking supply. By the end of the 1980s, however, it was becoming increasingly apparent to policymakers that these and other "transportation control measures" (TCMs) were not having a significant effect on automobile use in general and, from a federal viewpoint, on pollution levels in particular. Thus, policymakers began to consider additional means of affecting mode choice through "transportation demand management" (TDM) techniques that emphasized not only incentives for reducing auto travel, but disincentives for auto travel as well—including road and parking pricing *(3)*.

Many transportation economists and planners today continue to suggest that if Americans paid a higher price for automobile travel, particularly during peak travel

periods and in congested locations, they would not drive as much. Transportation economists have argued for road pricing for years, since drivers do not think about the time costs they impose on other drivers when they make the decision to drive on congested roads. In addition, most commuters do not face an explicit charge for parking at their place of employment. As Donald Shoup points out, the value of employer-paid parking is so substantial that it virtually "invites commuters to drive to work alone" *(4)*. Transportation economist John Kain considers the effect of free parking for employees to be so significant that the elimination of employer-paid parking incentives should *precede* consideration of road pricing. He even suggests that eliminating parking subsidies might in many instances mitigate the need for road pricing at all *(5)*. Anthony Downs favors market-priced parking over road pricing because it is easier to administer and because it does not pose as much a perceived threat to privacy *(6)*.

## THE IMPACT OF CONGESTION PRICING AND PARKING TAXES ON SPATIAL COMPETITION

Both congestion pricing and various policies to increase the cost of parking are expected to affect mode choice, but this is primarily a short-run consideration. Over longer periods of time, changes in the relative cost of getting to various locations could have substantial impact on the spatial distribution of activity.

Parking and road taxes are location-based taxes. That is, unlike emissions fees, mileage-based fees, or gasoline taxes, they are connected to a specific place. When we consider the effect of location-based transportation taxes such as parking or road pricing, we need to include a consideration of spatial effects. In plain terms, the effect of a

location-based tax in the suburbs may differ markedly from the effect of a location-based tax in the central city, especially if the tax differs in magnitude or coverage, as most road or parking pricing policies would. Unfortunately, models of the impact of transportation prices on mode share are much better developed than models of the impact of transportation prices on location choices. Hence, we can offer only illustrative possibilities and analysis of potential impacts at this point.

Road, or congestion, pricing is expected to work best when the price is varied with the level of congestion. Further, because of the cost of monitoring congestion pricing, there is a good possibility that initial efforts would be limited in coverage to highly congested roads. This could easily result in a relatively higher cost increase for drivers trying to get into a downtown area than for drivers moving from suburb to suburb. In the short-run, this may not create much problem because the downtown locations are also likely to be better served by transit and more convenient for carpooling. However, over the longer term, the relative cost differential may affect location decisions.

Parking policy is even more problematic than congestion pricing since most congestion pricing plans call for regional coverage, while many parking policy changes are left to local governments. For example, some policymakers have considered using parking taxes as a funding source for improved transit service. Although the improved transit service would lower the cost of access for some, the higher parking taxes would increase it for others, and the net effect is not at all obvious.

The full economic impact of a congestion pricing policy or a parking policy will depend on many factors. Our purpose is to illustrate how analysis of a specific policy could be extended to consider the long-run effects of parking and other transportation

charges, and it is to a more in-depth discussion of that topic that this paper now turns.

## Location Theory

There are two basic paradigms of location theory. One, referred to as the *spatial competition*, *central place*, or *market area* model, assumes different nodes of activity within a region, where each node competes with other nodes for resources and customers. The other paradigm, the *monocentric* or *bid-rent* model, assumes a central location that is the most desired of all locations within a region. In some circumstances, the spatial competition model may be more appropriate than the monocentric model for analyzing the effects of transportation pricing in modern metropolitan regions. We briefly discuss these models and then present the different implications of each.

### The Spatial Competition Model

The spatial competition model starts with the assumption of a featureless plain, with transportation costs equal in all directions. Economies of scale and agglomeration lead to concentrations of activity, but each activity location is characterized by its competition with other locations for resources and customers. From this basic model comes the hierarchical characterization of cities, with a regular pattern of nodes corresponding to different levels in the hierarchy *(7)*.

In this model, transportation costs substantially influence function. If a location has a transportation cost advantage, then it is more likely to become a higher-order node. Hence, 18$^{th}$ century U.S. cities with access to waterways or railroads were higher order than cities that were otherwise similar but without such access. Also of importance, improvements in local transportation increased the resources and customers that could be

served at a node and hence increased the market area boundary. In this characterization, both absolute transportation costs and transportation costs relative to competitors are important in determining size and function. While this model was largely developed to explain competition between urban areas, it can readily be adapted to look at competition within urban areas. For simplicity, we treat the case of one downtown firm and one suburban firm competing for customers within the region.

A variety of competitive situations can exist between firms located downtown and those located in suburban areas. For our examples, we assume that firms located in the central city have relatively high production costs, due to the relatively high cost of land, labor, and so on. However, because these firms are centrally located and served by a relatively well-developed transportation network, transportation costs are relatively low. As a result, customers' and employees' cost of travel to the firm is relatively low.

On the other hand, the situation is assumed to be reversed for a suburban firm, which may have relatively low production costs, due to the lower cost of land, labor, etc. However, the cost of travel for customers and employees may be higher because they may have to travel greater distances using less developed transport infrastructure than is the case for the central city location.

Parking and congestion costs are considered to be part of a firm's production costs. If the costs are imposed on workers, then the firm must either absorb them or offer a higher wage in long-run equilibrium; and, if imposed on customers, then the delivered price of the output is effectively increased. Production costs and travel costs work together to determine the market area enjoyed by a firm under the assumption that customers buy from the firm offering the lowest delivered price. It is possible for a firm

with lower transportation costs to have a market area that completely surrounds the market area of a competitor, and we will illustrate this later with an example. The key issue in the spatial competition model is how changes in costs affect the market areas for the two firms.

**The Bid-Rent Model**

The bid-rent model is the one typically used to characterize a metropolitan area. It starts with the assumption of a central location that is the most desired of locations within an area. All other locations are disadvantaged in proportion to their distance from this central location. This gives rise to the bid-rent model of urban form, which has everyone commuting to the center each work day and locations closer to the center always economizing on transportation costs relative to those farther away *(8)*.

This model is illustrated by Figure 1. Bid-rent analysis focuses on the ability to access a central point and analyzes "bids," or willingness to pay, for locations at various distances from the desired central location. The highest bids occur at the center, since it is assumed that everyone wants to access this point. Since locations at greater distances require some expenditure of time and money to gain access, they are less valuable and the bids lower. The slope in the illustration is determined by per-mile transportation costs. When incremental transportation costs per mile are low, the slope is flatter, since bids will not go down as rapidly with distance. This tends to lead to low-density dispersed activity. High per-mile transportation costs lead to steep bid-rent curves to offset the greater disadvantages of distance, and this results in more compact, higher density activity.

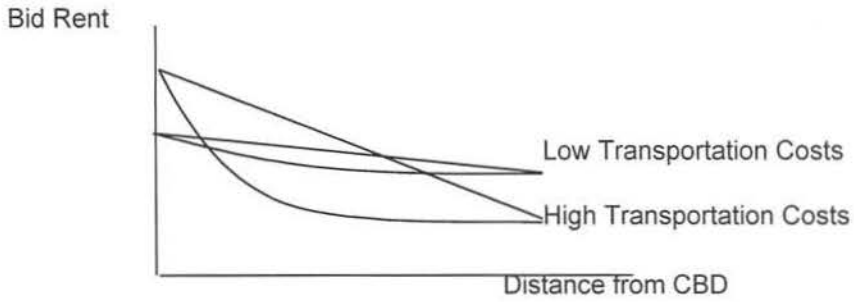



Figure 1. Bid-rent curve.

**Differing Conclusions**

The bid-rent characterization of a metropolitan area made some sense when radial mass transit was the primary method of commuting to work. However, the automobile has made transportation in all directions more feasible and has shifted the paradigm closer to that of the featureless plain assumed by the spatial competition model. In this case, there are hierarchical nodes (e.g., central city and suburban activity centers) that compete with one another based on their relative transportation cost advantage and their ability to draw both workers and customers. Relative transportation cost advantages become important determinants of success or failure, growth or decline.

The two different paradigms explain much about the differences we see in the theoretical analysis of city location patterns and the practical concerns of business interests in the downtown area. The bid-rent model treats the downtown as the focal point of all activity and analyzes how changes in transportation cost affect the location decisions of those wishing to get to this prime location. This is the principal focus of analysis of scholars analyzing the impact of congestion pricing and related policies.

Using this model, Robert Solow and subsequent writers conclude that in the absence of congestion pricing, the urban area will be too dispersed *(9)*. Most such analyses also indicate that the optimal city will be denser and also have a larger total population *(10)*. However, this conclusion is not unanimous. For example, John Yinger concludes that imposition of congestion pricing would lead to a denser urban area, but with a smaller population *(11)*. A basic problem with these models is that they are too complex for analytic solutions. Hence, simplifying assumptions are made that then tend to influence the conclusions of the models. Although much insight can be gained from these models, they must also be treated with caution. In general, the models conclude that higher transportation prices will lead to greater density, but they are based on a presumption that the city center is the only activity point.

Business interests tend to focus on the spatial competition model in their characterization of the effect of changes in transportation costs. They see the CBD as being in competition with a variety of other locations in the region for both customers and workers. Increases in transportation costs then primarily affect where people go to work and shop rather than where they locate.

In reality, it is most likely that neither view is completely accurate as a representation of the relationship between transportation costs and the location of economic activity; however, both must be considered in evaluating the effect of changes in policy that affect transportation costs, since the city center still holds a preeminent position relative to other locations, even though it is also in strong competition with other locations.

## Road Pricing in the Spatial Competition Paradigm

The bid-rent model is the one typically used to analyze the impact of road pricing on urban form and land use. A standard analysis maintains that central locations are made more desirable by a pricing policy that would charge per vehicle mile traveled. The standard bid-rent model shows the higher cost of transportation leading to more centralization to reduce aggregate transportation costs for employees and customers.

Looking at the CBD as being in competition with suburban locations for economic activity can provide a very different analysis of the impact of raising the cost of transportation. In the spatial competition case, this increase in cost may not work to the central city's advantage. It depends on whether costs are increased more for commuting to the central city or to the suburbs. If costs of automobile commuting to the suburbs rise by more than the cost of commuting to the central city, then the conclusions of the bid-rent model are reinforced. However, most urban areas would be expected to have less congestion in the suburbs and many of the policies proposed to raise parking costs would have less impact on the suburban locations. Raising the cost of commuting to the CBD without raising the cost of commuting to the suburban locations will induce decentralization of activity. This will result in fewer people coming downtown rather than more. Hence, transit may capture a larger share of a smaller number of trips. The net impact of this may be to reduce the viability of mass transit as a commuting alternative to the automobile.

In the spatial competition model, increasing the cost of transportation to a specific node has the effect of reducing the market area around that node. This reduction in

market area means that fewer resources are available for production and that fewer customers will find the location attractive. It is clear that many downtown business associations are concerned that congestion pricing or parking policies will raise the cost of commuting to the central city by more than the cost of commuting to the suburbs. To the extent that the modern urban area is a polycentric area of competing business nodes, any policy that raises cost in one node relative to others will cause that node to shrink relative to the others.

An important but unanswered question is the degree to which the two models represent the situation in modern urban areas. If the central city is viewed as having some agglomeration advantage relative to other parts of the urban area, then the difference between the marginal and average cost of commuting is likely to be the largest for the CBD. In other words, if congestion is greatest near the CBD, the charges needed to promote efficient road usage would be highest for trips through these heavily congested areas. Hence, attempts to charge marginal rather than average cost will lead to a relative cost disadvantage for the CBD.

On the other hand, if congestion is similar throughout the metropolitan area, a congestion charge would show up as a general increase in the cost of automobile commuting. This would make all automobile commuting relatively less attractive and transit commuting relatively more attractive. Then the policy may promote the CBD relative to its competitors.

Policies that simply increase the cost of commuting to the downtown will clearly change relative location choices in the long run in a way that is not conducive to mass transit. However, there is also the question of what is done with any revenue raised by

policies related to congestion. Since most such policies will raise revenue, the possibility of using that revenue to offset the price disadvantage of the policy should not be discounted. Here is where the analysis of incidence (that is, which party bears the burden of the tax) becomes very important. For example, suppose that a congestion charge is imposed that varies with the level of congestion and the distance traveled. If this charge is borne entirely by workers, with no impact on central city employment, then those workers will have an incentive to move closer to the city. This is the standard analysis. But if the charge makes central city locations less desirable, employment may decentralize.

In the latter case, the central city will be disadvantaged relative to the suburbs, but if the revenue from that tax is used to improve transit, the relative shift in favor of the CBD may more than offset any relative increase in the cost of automobile access. On the other hand, if the revenue is used to reduce all taxes in the region, then the existing tax burden may determine a different net impact. In particular, if the taxes in the suburbs are reduced more than the taxes in the city, the shift in tax burden may reinforce the impact of the higher commuting costs.

**Illustrative Example of Spatial Effects of Parking Pricing**

This example is based on an urban area with a central city defined by strict geographic limits and a suburban area that extends to the point where value as farm land exceeds value for suburban uses. The cost of road construction and maintenance is financed by a gasoline tax initially. The gasoline tax can be modeled as a per-mile tax on automobile usage, and average tax burden is determined by miles driven. Alternative

forms of congestion pricing or parking pricing can then be compared to the gasoline tax in terms of relative price of getting to different employment locations and average tax burden.

A firm located in the central city may face high production costs due to the relatively high cost of land, labor, and so on. In Figure 2, this relatively high production cost is represented by the long vertical line. However, because the firm is centrally located and served by a relatively well-developed transportation network, customers' cost of travel to the firm may be relatively low. These low transportation costs are represented by the relatively flat-sloped lines of the top of the production cost line.

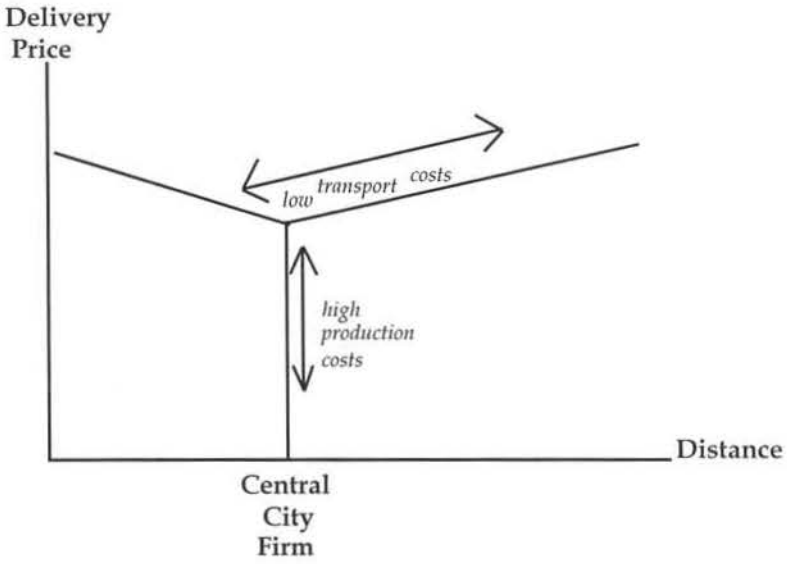



Figure 2. Central city firm's low transport costs and high production costs.

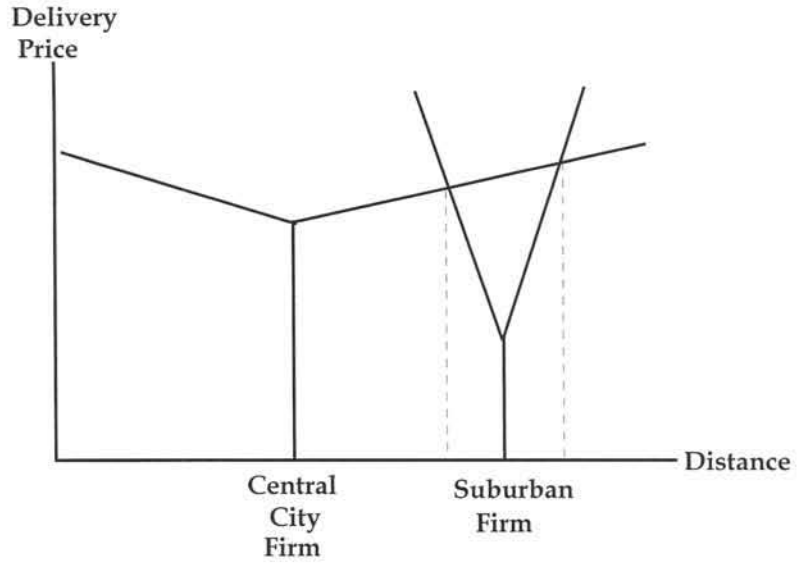



Figure 3. Market areas of central city firm (high production costs, low travel costs) and of suburban firm (low production costs, high travel costs).

On the other hand, the situation may be reversed for a suburban firm, which would have relatively low production costs, due to the lower cost of land, labor, etc. However, the cost of travel for customers might be higher because the transport infrastructure is less developed than is the case for the central city location, e.g., there is less mass transit. This suburban firm's situation, relative to that of the central city firm, is illustrated in Figure 3. Note that for the suburban firm, the vertical production cost line is much shorter, indicating a lower production cost, while the transport lines are much steeper, indicating higher travel costs.

The dotted lines in Figure 3 indicate the boundaries of the suburban firm's market area. Customers located inside those boundaries will tend to prefer shopping at the suburban firm, because for them, that's where the total costs will be lowest. However, customers outside the suburban firm's market area will tend to choose the central city firm—again, because of lower total costs.

What happens, then, if the cost of parking is increased in the central city, but not in the suburban location? An increase in parking price will tend to increase both the cost of production as employees demand higher wages and the fixed cost of transportation for customers coming to the central city, but not for the suburban firm. The effect of the increase in costs for the central city firm will be to lengthen the vertical line representing the production costs. Figure 4 shows the production cost line increased by the amount labeled "increase due to parking price." Notice that the increased length of the production cost line shifts the travel cost lines up, but does not have an effect on their slope.

Notice also how the boundaries of the suburban firm's market area are now increased, as indicated by the dashed lines outside the old dotted lines. Simultaneously, of course, the market area of the central city firm has decreased. Leaving the example for a moment, this increase in the suburban firm's market area as a result of increasing parking prices helps explain why some firms would choose to move to a suburban location in the long run.

To illustrate with some specific numbers, Dueker et al. estimate the effects of various changes in parking prices on the share of workers using transit in Portland, OR *(12)*. They estimate that for a specified set of values for other variables in their model, a parking price of $20 per month would lead to a transit share of 12 percent for urban residents working downtown and 7 percent for suburban residents working downtown. Increasing the parking charge to $100 per month while holding other factors constant would lead to an increase in transit share from 12 percent to 22 percent for urban residents working downtown, and from 7 percent to 20 percent for suburban residents

working downtown. However, they estimate that even with these substantially higher charges, 60 percent of urban residents and 75 percent of suburban residents would still drive to work alone.

The increase of almost $1,000 per year in parking charges for these workers would be expected to have some effect on the wage differential between downtown and suburban locations; and the shifting wage differential would create an incentive for some downtown firms to relocate to the suburbs. The ultimate effect would depend on many factors, such as what is done with the additional parking revenue, who pays for the additional transit subsidies, and so on. However, the parking price increase alone would have the effect of a $1,000 per year tax on over 60 percent of downtown workers; and this ignores the effect that such an increase in parking charges might have on potential customers.

Figure 5 illustrates a somewhat different scenario. Here, parking prices are increased for both the central city and the suburban firm. However, parking prices in the suburban location do not increase by as much as those in the central city location. This would be the case if a tax were imposed on parking revenues, for instance, because suburban parking charges are typically much lower than central city parking charges, if there are any charges at all. Note in this example how the increase in production costs for the suburban firm is less than the increase for the central city firm. While the suburban location's market area increases, it does not increase by as much as in the first scenario, where there was no increase in parking price and hence production costs.

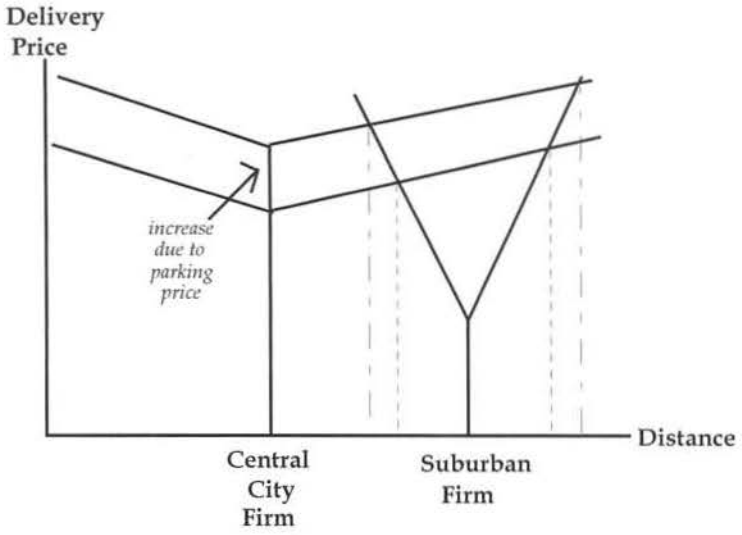



Figure 4. Change in production costs and market areas due to increase in parking price. Parking prices, and hence production costs, increase only in the central city; the suburban location's production costs do not change.

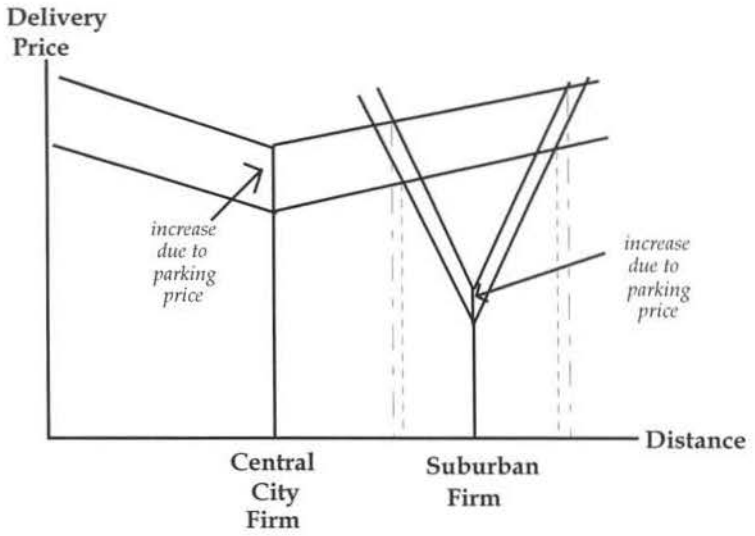



Figure 5. Change in production costs and market areas due to increase in parking price. Parking prices, and hence production costs, increase in both the central city and suburban location, but more so in the central city location.

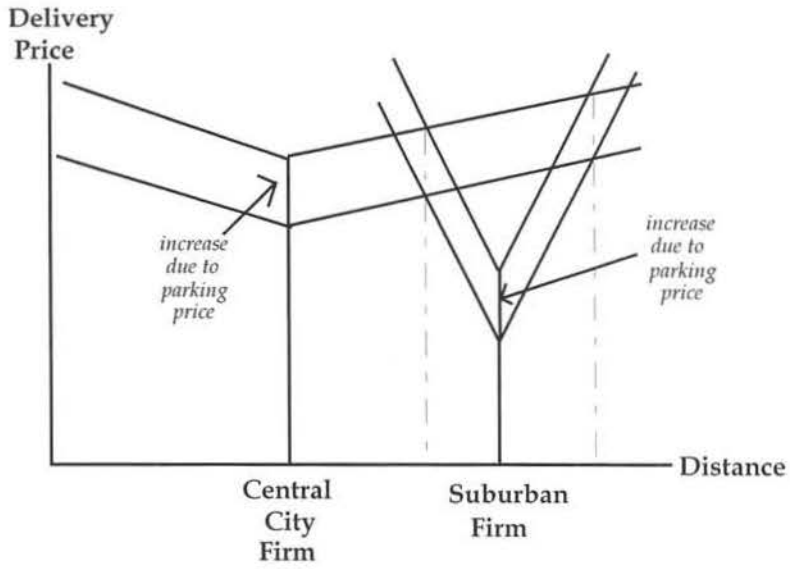
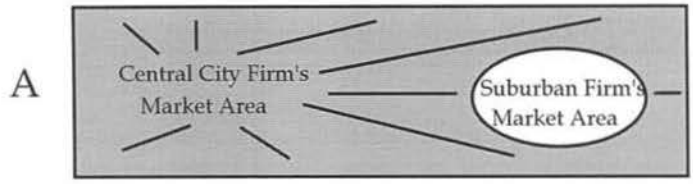


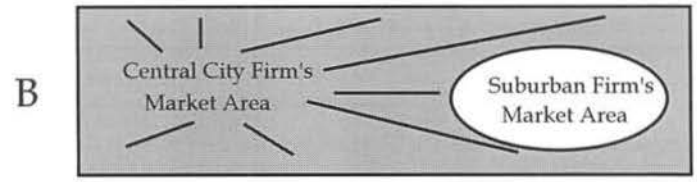

Figure 6. Change in production costs and market areas due to increase in parking price. Parking prices increase by the same amount in both central city and suburban locations.

In the final example, shown in Figure 6, parking prices are increased in both the central city and suburban location by the same amount. This would be the effect, for example, of a regional tax per parking space (as opposed to parking revenues). Note that in this scenario, the market share for the suburban firm does not change. In this case, the impact on the suburban firm is not differentially advantageous.

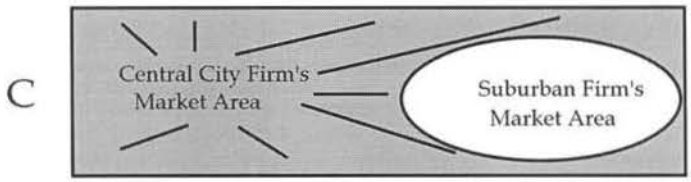
In Figure 7, the egg-shaped circles represent the market areas for a suburban firm, as determined by the production and travel costs under the four different scenarios. The central city firm's market area is represented by the entire gray portion; in each case, the central city firm's market is larger than the suburban firm's. But the extent of the suburban firm's market area changes relative to parking prices.



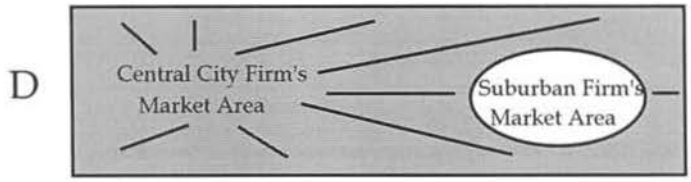

*Base case.*




*Parking prices increase in both central city and suburb, but more of the increase is passed on to the user in the central city.*




*Increase in parking prices for central city users; no increase for suburban users.*




*Parking prices increase in both central city and suburb, and equal amount is passed on to users in each area.*

Figure 7. City center and suburban firm market areas, with differing levels of parking prices *(13)*.

Scenario A in Figure 7 is the base case. Here, the central city firm – with its higher production costs and lower travel costs – has a larger market area than does the suburban firm. In Scenario B, parking prices are increased for both the central city firm and the suburban firm; however, the increase in price to the suburban user is less than the increase in price for the central city user. This differential increase in prices paid by the user results over the long term in a slightly larger market area for the suburban firm.

In Scenario C, parking prices are increased for the central city firm only, and not

at all for the suburban firm. As is clear from Figure 7, in this situation, the suburban firm gains a substantial share of the market, with the central city firm losing market area by a corresponding amount.

The final case, Scenario D, is the one in which the parking price is increased by exactly the same amount for both central city and suburban locations. As is apparent, the effect on market areas is nil, and the illustration is exactly the same as in the base case, Scenario A.

The effect of the imposition of the tax only in the downtown (or at a higher rate there) can then be examined in the bid-rent framework. The higher cost and smaller market area in the downtown will reduce the amount that each firm will bid for city locations while increasing the bid for suburban ones. In the long run, this would imply a shift of activity with some firms relocating to the suburbs.

The above analysis presents one simplified example of the potential effects of replacing gasoline taxes with various types of parking taxes. Clearly there are many types of prices and charges that can affect costs and there are many possible uses of the revenue raised by such policies. This analysis is merely intended to show the possibility of adverse spatial effects from policies intended to affect short-run mode choice. Policymakers should not ignore the possibility of substantial differences between the short-run and long-run when they are designing and evaluating such policies.

Careful evaluation of alternatives may allow for a policy that achieves the desired effect without disadvantaging the downtown location. For example, cashing out of employer-provided, free parking raises the opportunity cost of SOV commuting to downtown but lowers rather than raises the wage premium that workers would require for

working downtown. In this case, the worker still faces the full cost of parking, but the policy leads to an increase in income if parking is not used rather than a decrease in income if parking is used. While this will be important to the worker, it may still induce employers to move to the suburbs if they are forced to pay the higher cost. Hence, the determination of who finances any changes in commuting cost becomes important in determining the relative impact on city versus suburbs. Also, a parking policy that raises the cost of long-term or commuter parking may target employees without raising the parking costs for customers.

Other policies can also be evaluated in terms of the short-run impact between city and suburbs as long as there is some clear differentiation of the cost. Policies that raise costs in some locations but not others or that offset cost increases with different uses of the revenue raised can certainly influence the impact of the policy. As has been frequently noted, congestion pricing will actually lower the overall commute cost for those who value their time very highly. These people are willing to pay more than the congestion fee to reduce the time spent commuting. Hence, their combined time and money cost goes down as the lowered time cost more than offsets the higher money cost.

The changes between money and time as costs of commuting are likely to lead to subtle changes in location patterns. For example, with higher money cost and lower time cost, there is likely to be more concentration of highly paid workers in the central city. Highly paid workers typically value their time more, and the relative shift will make the city a more attractive location.

For policies that generate revenue, the use of that revenue may also have important implications for the outcome of the policy. For example, if the revenue from

the downtown parking tax were used to subsidize mass transit further, the core might be at less of a relative disadvantage than if the money were used to lower regional taxes. This might also offset the relative change in central city attraction for workers who value the money cost of parking fees more than the time savings from reduced congestion. They would have greater opportunities to trade off money for time by using the expanded mass transit system. While such a policy might not promote transportation efficiency, it might offset some of the distributional impacts of a downtown parking tax.

## CONCLUSION

Effective evaluation of congestion pricing and parking policy will require a careful analysis of the potential long-term effects of the policy changes on business location decisions. The policy must then be evaluated both using the monocentric model and the spatial competition model to determine the changes in location incentives that are likely to be created. While the two models lead to similar conclusions in evaluating some policies, they have very different implications for others. In particular, spatial competition seems to be a very important factor for downtown business interests that is not widely discussed in the literature on congestion pricing and parking policy.

There is a substantial body of literature that provides some insight into how changes in pricing are likely to affect mode choice; but this is essentially a short-run analysis that assumes fixed locations and fixed trip patterns. There is much less literature on the effect of transportation costs on the location of economic activity; and this is the type of analysis that is needed to understand the long-run implications of policies that substantially change relative costs of transportation.

This type of analysis is particularly important since most policies will have a spatially differentiated impact on transportation costs; and these differentiated policies can further affect location patterns. In particular, parking charges have received substantial interest due to their high potential to affect mode choice, but most such charges would be levied differentially on downtown locations. Hence, this policy has a clear potential to increase transit mode share in the short run but to lead to decentralization of activity in the long run if there are not offsetting changes in other policies or in the use of the revenues.

Other policies, such as congestion pricing, also have the potential for unintended location consequences. To the extent that such policies have received any analysis with respect to location impact, it has been based on the bid-rent analysis and has largely ignored issues of spatial competition.

## Notes

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