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**Parking Management and Downtown Land Development:
The Case of Downtown Berkeley, CA**

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Abstract

This paper presents findings from a study of land use, parking, mode choice, and housing and jobs development in downtown Berkeley, CA, a medium-sized city with four decades of experience with parking management and transit-oriented development. The paper sheds light on the multiple roles that parking management, including reduced parking requirements and parking pricing, can play in a downtown area. It also illustrates the performance of transit-oriented development in smaller cities. Originally developed as a streetcar suburb, Berkeley has long supported high quality transit, restricted parking, and provided walking and biking facilities. This has resulted in transit, walk, and bike usage far higher than US averages. Nevertheless, traffic is heavy, parking is full, and concerns about infill development persist. Merchants are also concerned that parking constraints may limit economic development. Surveys of downtown shoppers, workers, and residents show that relatively few drive downtown. Workers and downtown residents are a large share of downtown commercial enterprises' customers. Residents have intentionally chosen to live in a transit and pedestrian friendly area and own and use cars far less often than average. Parking shortages are caused in large part by overtime parking, facilitated by broken meters and by meter feeding by employees. Overall, transit-oriented development has been successful in reducing auto ownership and use, but is accompanied by tight parking and a certain amount of congestion. Parking enforcement and better use of off-street spaces would relieve the former problem. Many cities are contending with these issues, so the Berkeley case should provide useful insights.

250 words

Introduction

For the past forty years, Berkeley, CA, a city of 100,000 on the eastern shore of the San Francisco Bay, has struggled to manage traffic and promote walking, biking, and transit use, especially to and from its downtown and the adjacent campus of the University of California. In the 1960s the former streetcar suburb stopped freeways proposed for its southern and western edges, halted arterial widening projects, and taxed itself to put BART underground. In the '70s, the City implemented traffic calming in many of its residential districts. City plans and zoning laws during this period were changed to reduce parking requirements and, in some areas, eliminate them altogether. In the early 1980s the City and University together founded Berkeley TRiP, a commute store offering discount transit passes and ridesharing assistance. At the same time the University, the largest trip generator in the East Bay, began raising its parking prices and limiting parking supply. The City timed traffic signals to give priority to bus streets, installed parking meters throughout its commercial districts, and implemented resident permit parking for most of the neighborhoods within a mile of the downtown and campus. In the 1990s Berkeleyans voted in transportation sales taxes to keep AC Transit bus service strong, built bike boulevards, and added traffic calming to commercial streets. By the end of the decade, the University and AC Transit had negotiated a Class Pass giving students unlimited bus use, and the City and AC had implemented a similar pass for City employees. The City also was in the process of revising its Downtown Plan to encourage substantial infill and redevelopment, especially housing.

Table 1 provides a list of the traffic and parking management strategies that Berkeley has implemented over the decades. The cumulative effect of all these activities has been to make Berkeley a multi-modal city, particularly in the downtown-UC core. Parking is supplied at half or less that of many suburban locations, and transit, walking and biking are several times more common than in the typical small city. Still, parking is tight in many neighborhoods, and many residents complain about traffic. Whenever a new development is proposed, concerns are almost sure to be raised about the added cars and competition for parking.

Complaints reached a peak of sorts in 2002, when a group of residents placed an initiative on the fall ballot that would have limited heights and restricted most new housing developments greater than 10 units. The initiative went down to resounding defeat, but city leaders observed that it was the excessive restriction on housing that voters rejected; the concern about transportation issues was widely held.

Merchants in the downtown as well as residents of surrounding neighborhoods were especially concerned about parking and infill development issues. As a result, members of the Berkeley City Council asked the authors to study downtown transportation and its relationship to development as part of a studio conducted at the University in fall 2002. This paper presents the results of that study, focusing on land use, parking supply and use, mode choices, and housing and jobs development. The paper sheds light on the multiple roles that parking management can play in a downtown area as well as on the efficacy of transit-oriented development in smaller cities such as this one.

Study Approach

Figure 1 presents a map of the City of Berkeley, showing the location of the downtown and the University of California campus. The study focused on the downtown core and was conducted over a 14 week period September through November, 2002. We undertook the following tasks:

- An analysis of census housing, employment, and mode to work data for Downtown Berkeley
- An analysis of transit supply and use
- Accident analysis and operations studies of traffic flow and bike travel
- An inventory of on-street and off-street parking in the study area
- On street and off-street commercial parking occupancy and turnover studies
- An inventory of new housing and mixed use projects added in the past decade
- A travel and activity survey of occupants of new housing developments
- A survey of shoppers in the downtown
- A survey of downtown employees

In this paper we focus on the parking, mode choice, and land development elements of the study, which proved to be the least tractable of the transportation issues facing downtown Berkeley. Controversy persists over how much parking is needed, how successful commute alternative programs have been, and whether transit-oriented housing development actually generates fewer auto trips than other housing in the city. While traffic and parking spillover are "hot buttons" for many residents, our findings suggested a different interpretation. In contrast to complaints, we found that traffic flowed reasonably well in and around the downtown and University for much of the day, although vehicle travel was slow during peak periods when auto, bus, bike and pedestrian movements all are heavy. Half a dozen intersections have high accident rates, and several others are difficult for pedestrians and bicyclists to cross because of complex traffic movements and limited sight distances; city officials are working on improvements. Bus stops are overcrowded in some locations and buses had difficulty maneuvering tight turns on one route; the City and AC Transit were planning changes. Parking is quite full, but enforcement of time limits and fees is fairly lax. We concluded that rather than traffic and parking supply, it is parking management, mode choice and infill development issues that need the most attention. These issues also are ones that many other cities are contending with, so a study of the Berkeley case should provide insights for other cities.

Background: Berkeley Demographics and Employment, Land Use and Transportation

The 2000 Census reported that the City of Berkeley had 102,743 residents. The population is diverse with 59% white, 14% black, 16% Asian, and 10% of two or more races. Incomes are highly varied, with 32% of households (many of them students) earning \$25,000 or less and 21% reporting over \$100,000 income. (1)

About 54% of the City's residents are employed. More than 60% of those employed residents are in management, professional, and related positions, and another 20% are in sales and office occupations. This significant white-collar population works both in Berkeley and other Bay Area cities. As might be expected in a university town, 33% of the residents work in the education, health and social service sectors. (1) Jobs in Berkeley are found in the retail, manufacturing, and professional services industries as well as in education, health and social services. Manufacturing is concentrated in the southern and western portions of the cities near major freeways. Retail is more widely distributed, with shopping districts in several parts of the city in addition to the downtown.

Estimates of downtown Berkeley employment are put at approximately 9,000 in the 79 acre core area (Berkeley General Plan, 2001), and at over 32,000 in the 1.3 sq. mi. area including the major public sector employers, UC Berkeley, the Lawrence Berkeley Laboratory, the Berkeley Unified School District, and the City government itself. (2) According to Berkeley's most recent Land General Plan, office and commercial land uses make up just over half (51%) of the downtown's 79 acres. Auto-related uses such as gas stations, parking lots, and parking garages use 17% of the land, and residential uses, including downtown hotels, use 12%. Institutional land uses account for the remaining 10%. Total floor space (all uses) totals just over 4 million square feet. (2)

In the downtown core, the largest number of business establishments offer small specialty and retail services. Boutique clothing shops, luggage stores, cell phone stores, and fast food establishments predominate in the retail sector. Few major chain stores are present though there are several national food, clothing, computer, telecommunications, and drugstore franchises. According to Downtown Business Association records, business and personal service establishments constitute a majority (58%) of businesses in the downtown and account for 72% of the private sector employees; dining and food service establishments are second at 21% of businesses, 15% of private sector jobs. With sales tax receipts increasing 11% in the last five years, shopping is increasingly successful downtown; it constitutes 15% of downtown businesses and 7% of jobs (3) In addition, a growing arts and entertainment sector represents about 4% of businesses and 5% of jobs.

Small businesses thus make up the vast majority of employers in the downtown area, but nearby large employers such as UC, LBL, the City, and the School District provide the most jobs. Some 72% of businesses in the dining and business/personal service sectors employ 10 or fewer persons; for downtown shopping establishments, this share increases to 85%. Virtually all private employers downtown have fewer than 100 employees. (3) With many older, small buildings constituting the downtown, the possibilities for large employers locating there are somewhat limited.

While commercial and institutional uses dominate, Downtown Berkeley is also home to about 3,500 residents, living in 2,211 housing units (1). Downtown residents are slightly younger, lower-income and more racially diverse than the city overall. Their employment rate is about the same as city average. The downtown has seen increased housing construction during the past ten years, following a decade in the 1980s when population sharply declined. In recent years, more than 500 new housing units have been added downtown, mostly as infill on former parking lots and as replacements for low-rise buildings. Several hundred new housing developments are in planning stages (4)

A variety of transportation modes serve the city and the downtown, though freeway access is limited. (The closest freeways run along the Bay shore and the Oakland-Berkeley border, 2.1 mi. and 1.6 miles, respectively, from downtown.) Multi-lane arterials connect with the freeways to the west and south, but access to the downtown grid from the north and east is along smaller, mostly two-lane streets, many of which are predominantly residential. Transit service is in contrast very extensive. Berkeley has three BART stations, including one in the center of the downtown core; it also is well served by AC Transit, which provides 11 lines serving downtown Berkeley. The downtown Berkeley BART station alone generates over 23,000 trips each weekday, with two thirds arriving on foot and most of the rest using bus access (6). The AC Transit bus services carry about 8000 daily boardings and alightings from seven bus stops in the Berkeley core (7). Although downtown sidewalks are wide, several of the bus stops are crowded. Pedestrian crossings to transit stations and stops are a major factor in low auto speeds downtown.

Berkeley does provide parking for auto users, but, in contrast to most cities, almost all of Berkeley's parking outside of residential areas is priced. (Parking is restricted by resident permit parking in large portions of the city's residential areas.) The 42 block area in and around the downtown core contains about 4600 parking spaces (7). 1712 metered spaces are priced at 75 cents an hour and most are time-limited to one hour during the workday. There also are 2900 off-street spaces available for public use whose prices vary, but are not much different from metered rates. Some of these spaces are rented to building tenants for their employees or are leased by individuals. Nearby UC has substantial parking facilities, but Central Campus parking is limited to faculty and senior staff and is currently priced at about \$100 a month. Parking data from the off street, public facilities and observations of other off street spaces indicate a high level of occupancy, remaining 80-90% full much of the day.

The emphasis on traffic management and good travel alternatives is reflected in Berkeley journey to work data. According to the 2000 Census, nearly one in five Berkeley commuters made their journeys to work by transit, while only 43.2% drove alone. The latter figure is well below Census estimates at the regional and national level. In addition, nearly 15% of Berkeley residents walked to work and nearly 10% carpooled. Downtown, the numbers using alternative modes of travel are higher, with less than a third of the workers driving. At the same time, concerns about parking shortages and their deleterious effects on retail sales and residential neighborhoods continue to be voiced, motivating the studies discussed below.

Travel Behavior, Parking, and Transit-Oriented Development: Detailed Analyses

In order to better understand the specific transportation issues facing downtown Berkeley, the study team conducted four special studies during October and November 2002. Three were surveys: a survey of workers, a survey of shoppers, and a survey of residents of new housing in the downtown. The fourth study was a detailed analysis of on-street parking occupancy and turnover.

For the worker and shopper surveys, we used the intercept survey method, randomly selecting for an interview one in every ten persons that passed by surveyors who were stationed at intersections throughout the downtown. Surveyors read the

questions to respondents and recorded their responses, a process which took 2-3 minutes per survey. 152 workers and 153 shoppers completed the surveys. The surveys gathered employment and demographic information, data on travel to downtown Berkeley, and number of shopping locations visited on the survey day.

The resident surveys focused on occupants of downtown housing developments that had opened after the 2000 Census data had been collected. Community activists concerned about infill development and low parking requirements downtown - 1 space per three units - had expressed concerns that the new buildings would attract affluent residents with many cars and a tendency to use them for their daily travel. To investigate new residents' travel patterns, we distributed surveys door to door at two new buildings in the downtown. We received 42 responses from the 106 residences. A dozen supplementary interviews with residents were conducted to flesh out the findings about resident characteristics and behavior.

Worker Survey

The worker survey respondents were fairly representative of the overall workforce population downtown. Over 3/4 (78%) work full-time; more than half (55%) were in professional or supervisory/management positions. Clerical workers constituted 12% of survey respondents. Over 52% had household incomes of \$60,000 or more. 37% of all workers came in from Berkeley, and another 22% came from Oakland. Nine percent were San Francisco residents.

Over 60% of the downtown workers responding to the survey stated that they commute using non-auto modes. About 30% take transit, 23% walk, and 7% bike. Only 37% of workers stated that they usually reached downtown Berkeley by automobile. A few use different modes from day to day.

While 37% of downtown Berkeley workers said they drive alone or with others and park in the downtown, only 22% reported that they receive some form of off-street parking subsidy. The rest must find parking for themselves. Of those who arrive by car (26% of total respondents) most - 70%- park off-street. The remaining workers said that they parked on-street, many of them illegally "feeding" the meters. This implies that of the approximately 9000 downtown workers, as many as 700 may engage in meter feeding while at work.

Berkeley workers are active participants in some of the downtown's business activities. About 2/3 of all workers surveyed reported that they eat out at least twice per week. More than 3/5 handle banking and other personal business downtown at least once a week. However, only one quarter shop downtown at least once per week, and 45% said they shopped downtown less than once per month. Reasons for the low level of downtown shopping mostly relate to the market orientation of the shops downtown, focused mostly on young adults. Many workers commented that they wished there were higher-end shops available.

Shopper Survey

Shoppers in downtown Berkeley were significantly different from workers. First, many were young, with large numbers of UC Berkeley and Berkeley High students among the

respondents. Over one-third reported household incomes below \$22,350, and nearly half reported incomes under \$37,250. Conversely, about one-fifth of all shoppers surveyed reported household incomes exceeding \$89,000.

Over 80% of the shoppers surveyed stated that they live in Berkeley or close-by East Bay cities; Berkeley alone accounted for 52% of the sample, and Oakland another 14.4%. In addition, nearly 2/3 of all shoppers surveyed stated they were Berkeley workers and/or students. Over half stated that their shopping trip originated from home, while 1/5 each came from work or school. Consistent with these responses, 42% of all shoppers were walking to their shopping destination. 28% took transit to downtown Berkeley, and 20% had driven and parked downtown, with about 2/3 parking on-street.

About 58% of all shoppers intended to visit only one place on their shopping visit, and another 24% planned to visit two places. Furthermore, about 58% of all shoppers intended to stay downtown for less than one hour. Eating out made up the largest share of shopping trip purposes in the downtown. Two-thirds of all shoppers stated that they would visit a restaurant, bar, or other establishment serving fast food, snacks, or coffee.

Resident Survey

The 2000 Census showed that residents of downtown Berkeley have lower vehicle availability and higher transit and walking use than other residents of the city. Census data indicate that 42% of study area households have no vehicle available, compared to 16% for the entire city; the average number of vehicles per household in the study area is 0.6, versus 1.24 for the citywide average. Similarly, only 23% of downtown residents drive alone to work, far lower than the already low 43% of Berkeley residents as a whole. 32% of downtown Berkeley residents walk to work, compared to 15% city-wide. And 27% commute by transit, vs. 18% citywide. Most notably, there was a significant drop in the proportion of commuters driving alone to work between 1990 and 2000,

The survey of residents of new buildings, while small, indicates that contrary to their neighbors' fears, the new residents had even lower levels of automobile ownership than that residents of the downtown as a whole, with 55% of respondent households having no car at all and another 40% having one car only. Further, some of those who reported owning a car stored it at a remote location, for example at a relative's or friend's home. As a result, the parking supply at the new buildings was more than adequate to meet resident demand, and some vacancies persisted.

The new residents made even higher use of non-auto commute modes than their downtown counterparts, with 57% walking to work or school, 30% taking transit, 9% biking, and only 4% driving alone to work. And even more than workers, the downtown residents are patrons of downtown establishments. They use the downtown for eating out, shopping, going to movies or plays, and handling personal services. As with workers, many commented that they would like to see more high-end shopping opportunities in downtown Berkeley, and wish a grocery store were closer. Grocery shopping and occasional medical appointments are the non-work activities to which residents are most likely to drive.

Asked specifically where they were parking their cars, 70% of the car owners reported that they were paying to park in their building, a rate that was verified in follow-up interviews with building managers. Another 7% were paying to park in another off-

street lot, and 17% percent were parking outside of the downtown, primarily at the home of family or friends, where the car could be retrieved for occasional use. Six percent were parking on street at various locations around the downtown. All of the off-site parkers could have been accommodated in the spaces provided by the buildings surveyed, which - despite parking supplies well under one per unit - had parking vacancies during the study period.

Finally, it was interesting to note that despite their low auto ownership rates, not a single respondent was a member of the local carsharing organization, even though spaces in each building served as carsharing parking. Follow-up interviews with building residents revealed that most carless residents had picked the downtown location in large part because they were UC students or downtown employees, did not want to have to purchase or rent a car, and felt that they could take care of most of their needs by walking or using transit.

Parking Occupancy and Turnover Study

Parking occupancy and turnover for each space in the study area were checked hourly between the hours of 9 and 5 on weekday survey days. While this method will miss some very short term parking, it is likely to provide a reasonable first cut estimate of space utilization.

The survey found that on average, on-street legal spaces were occupied about 80% of the time. However, additional cars were observed to be parked illegally - for example, in no parking zones or blocking driveways. Had these cars taken legal spaces, overall occupancy in the legal spaces would have been over 90%.

One hour spaces had a turnover rate (number of cars observed over the survey period) of about 4.2; two hour spaces had a turnover rate of about 3.5. Together with the occupancy rate, this relatively low turnover rate shows that many cars are overstaying the time limits on signs and meters in the downtown. Indeed, had each car stayed the maximum permitted time and no longer, at an occupancy rate of 80-90% nearly twice the number of cars could be accommodated. Actual violations also were observed; for example, in the one-hour metered spaces, 32% of the vehicles observed exceeded the time limit. For the two hour metered spaces, 27% of the cases parked overtime.

Why were the violation rates so high? Broken meters, some of them vandalized, are part of the answer. The broken meter rate varied from 27% to 37% during the survey period. Many cars were observed to park for long periods or even all day at these meters. During a pre-dawn visit to the study area, we observed that most spaces were empty, but the broken meters soon filled up as restaurant workers on the early shift arrived by car and parked at them. In addition, we observed that a large part of the meter feeding activity was carried out by retail employees, who knew the routes and schedule that enforcement officers followed and added a small amount of change to their meters (and wiped away tire chalk marks) shortly before the meter vehicle turned the corner. Finally, a number of vehicles were parked for long periods across driveways with no apparent consequences; discussions with some of the parkers indicated that people were blocking their own driveways in most instances.

While better enforcement and better maintenance of parking meters would increase the effective parking supply for shoppers and other short term visitors, it would

displace the longer term parkers who are currently violating time limits. If all of these longer term parkers moved to parking lots and garages, those facilities would approach 100% occupancy. However, since many would then have to pay the full rate for parking (rather than parking for free at a broken meter or paying a few cents every time the meter attendant is spotted), it seems likely that at least some of these parkers would decide to take transit, walk, or bike rather than drive. Over the longer term, of course, if Berkeley continues to add development downtown, it will have to either add parking or find additional ways to reduce auto use. One possibility for the latter is to extend the city and university transit discount program to the City's many small employers. Monitoring parking use and adjusting price will also remain an important management tool.

Conclusions

This paper sheds light on the multiple roles that parking management, including reduced parking requirements and parking pricing, can play in a downtown area. It also illustrates the performance of transit-oriented development in a small city. Berkeley's long support of high quality transit, restricted parking, and walking and biking facilities has resulted in transit, walk, and bike usage far higher than US averages. These high mode shares are found among residents, workers, and shoppers. Nevertheless, traffic is heavy, parking is full, and concerns about the parking and traffic impacts of infill development persist.

The surveys of downtown shoppers, workers, and residents and the study of parking occupancy and turnover show that infill projects perform well in terms of traffic, transit use, and economic development, and justify the low parking requirements that the city has adopted for such developments. Residents have intentionally chosen to live in a transit and pedestrian friendly area and own and use cars far less often than average. Workers and downtown residents are a large share of downtown commercial enterprises' customers. Further, parking shortages are caused in large part by overtime parking, facilitated by broken meters and by meter feeding by employees; the effective supply of on-street parking could be increased through better enforcement. Enforcement, in turn, would divert some street parkers to garages and others to less expensive walk, bike and transit modes.

Overall, parking management and transit-oriented development have been successful in supporting reduced auto ownership and use in Berkeley. The university population with its large numbers of students is partly responsible for the high walk and transit use and low auto use, but many non-students also have chosen to live where they can walk, bike and use transit, and a lively downtown is supported by employee as well as resident activities. A tight, priced parking supply and a certain amount of congestion appear to encourage the use of alternative modes, but require ongoing monitoring and adjustment. Having a variety of good travel options does not cause congestion to vanish, but appears to make it tolerable for many.

References

- 1) US Census, 2000

- 2) City of Berkeley General Plan, Berkeley CA 2001
- 3) Downtown Business Association Employer Survey, Berkeley CA 2001
- 4) Berkeley Economic Development Office, unpublished data, Berkeley CA, accessed 2002.
- 5) BART Ridership Statistics, Oakland, CA, 2002
- 6) AC Transit Ridership Statistics, Oakland, CA 2002
- 7) City of Berkeley Department of Finance, Parking Statistics, Berkeley CA 2001.

Note: The full report for the studio is Deakin, E. et al., Transportation and Land Development Issues in Downtown Berkeley, CP218 Studio Report, Berkeley, CA, December 2002.

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Table 1. Traffic Management and Parking Strategies – Berkeley, CA

Traffic Management Strategies

- City tax support for BART and AC Transit
- End to road widening and freeway building in the city
- Traffic calming – diverters, speed humps, traffic circles
- Bike lanes, bike boulevards, bike parking
- Sidewalk widening, zebra striped crossings, intersection bulb-outs, street trees and planters, pedestrian signals and countdown signals, flashing light pedestrian crossings
- Traffic signal timing giving priority to bus streets
- Discount transit passes for employees (City) and students (University of CA)
- Carpool and vanpool matching assistance
- Traffic management and mitigation requirements and fees on new development

Parking Management

- Reduced or eliminated parking requirements on new development
- Shared parking (City zoning provisions, UC policy)
- Parking pricing in city-owned garages and lots to favor short term users
- Market rate pricing for longer-term use, with periodic increases (City and UC)
- Discount parking for carpools and vanpools (City and UC)
- Metered parking on street
- Resident Permit Parking to deter spillover parking in neighborhoods

