ing ordinance required a garage building on the same lot as the main building, sufficient to accommodate one automobile for each apartment. Garages (covered parking) were required to insure that the space would remain available for cars. Planners suspected that if only surface parking were required, it could easily be converted to other uses, such as a garden, without a permit. Los Angeles still requires covered parking for residential uses, and this requirement surely contributed to the postwar epidemic of dingbats with off-street parking spaces that are covered but not out of sight (Figure 5-6). Journalist Mark Frauenfelder says of these dingbats: "You couldn't make an uglier building if you tried. Los Angeles is full of dingbats—boxy two-story apartments supported by stilts, with open stalls below for parking."[31] One can easily see a dramatic difference between apartment buildings built before and after 1935. Tall buildings on small sites are obviously pre-1935, while the later buildings are smaller. The better post-1935 apartment buildings have separate garages that take up a significant share of the land and are designed to match the architectural style of the apartment buildings (like salt and pepper shakers), but the humble dingbats simply perch directly above their "covered" parking spaces.

By restricting the supply of housing, parking requirements inevitably increase rents. It is difficult, however, to find data on how parking requirements increase the construction cost of housing. Because developers must provide the required parking to obtain a building permit, they don't usually calculate the cost of the parking separately, just as they don't separate out the cost of the walls or ceilings. The parking is an inescapable part of the building. Nevertheless, five studies that did separate the cost of parking from the cost of buildings show that parking requirements significantly raise housing prices, reduce land values, and encourage sprawl. The cost of structured parking sometimes exceeds the cost of the land for multifamily housing.[32]

Study 1: Apartments in Oakland

A study in Oakland, California, showed the effects of introducing a parking requirement where none existed before. In 1961, Oakland began to require one space per dwelling unit for apartment buildings. To examine the effects of this change, housing economist Brian Bertha collected data for 45 apartment projects developed in the four years before Oakland required parking and for 19 projects developed in the two years afterward.[33] Table 5-2 shows the changes in housing costs, housing density, housing investment, and land values after the requirement was adopted.

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With the advent of parking requirements, the construction cost per apartment increased by 18 percent, and the number of apartments on a typical lot fell by 30 percent.[34] Bertha explains:

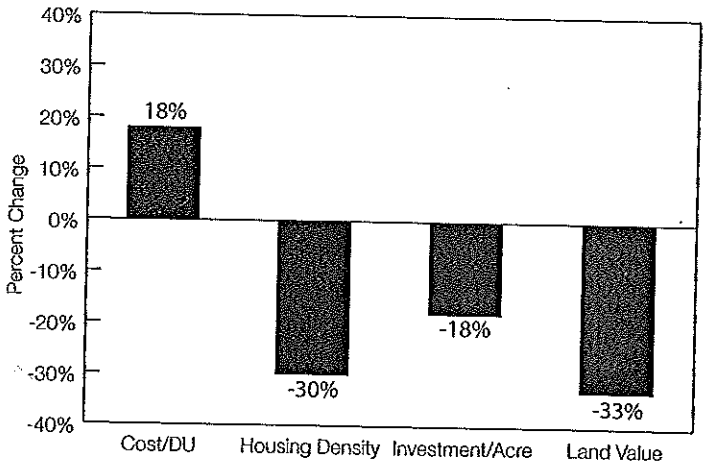
> The zoning change made prior densities impossible without underground garages. This increased the cost of development if the same density were to be achieved before and after the zoning change.... The developers interviewed stated that the increased pre-development land costs encouraged development of an apartment with a higher rent structure, and in order to be able to receive higher rents in the market, the developer tried offering the tenants larger units.[35]

Developers said that *adding* an apartment required another parking space but *enlarging* an apartment did not; they therefore built fewer but larger

Table 5-2. Effects of Introducing a Parking Requirement for Apartments (Oakland, California)

Variable	Before requirement	After requirement	Change	
			Absolute	Percent
Construction cost ($/dwelling unit)	$6,613	$7,805	+$1,192	+18%
Housing density (dwelling units/acre)	77.5	54	-23.5	-30%
Housing investment ($/acre)	$513,000	$421,000	-$92,000	-18%
Land value ($/acre)	$217,000	$145,000	-$72,000	-33%

Source: Brian Bertha (1964, 113-120).



apartments. Reluctant to build expensive underground garages, developers reduced the number of apartments and devoted more land to surface parking.

The parking requirements also triggered another effect. Because the required parking increased development costs and reduced feasible density, land values fell by 33 percent. The decline was greatest in the area that had the fewest parking spaces per unit before the zoning change because in this area the parking requirement reduced density and increased costs the most. Conversely, land values fell least in the area with the most parking spaces per unit before the zoning change.[36] Property tax revenues also fell because both land values and the construction of taxable improvements declined.[37]

Oakland's modest requirement of one parking space per apartment dramatically affected land use, but some cities have much higher requirements. In Los Angeles, for example, the Specific Plan for North Westwood Village requires 3.5 spaces per unit for apartments with more than four habitable rooms—and even a kitchen counts as a habitable room. Consider also the Park Mile Specific Plan on Wilshire Boulevard: "For dwelling units, there shall be at least two and one-half parking spaces for each dwelling regardless of the number of habitable rooms contained therein." If requiring one space per apartment in Oakland increased housing costs by 18 percent and reduced density by 30 percent, imagine how requiring 3.5 parking spaces per apartment must increase the cost and reduce the supply of housing in Los Angeles.

Study 2: Houses in San Francisco

Wenyu Jia and Martin Wachs at the University of California, Berkeley, studied the conflict between housing affordability and parking availability in San Francisco, where many working people cannot afford a house or apartment, and where finding a place to park is almost as difficult. To ease the parking problem, San Francisco requires one off-street parking space for each new dwelling unit, but this parking solution intensifies the housing problem.

Jia and Wachs found that single-family houses *without* off-street parking sold for an average of $348,000, while otherwise similar houses *with* an off-street space sold for $395,000. A parking space thus increased the price of a house by $47,000.[38] Only dwelling size and the number of bathrooms affected housing prices more. Because a one-car garage for a single-family house requires a curb cut that reduces the on-street parking supply by almost one space, the off-street parking requirement does little to increase the total supply; instead, it vacates the on-street space to provide access to the off-street space; that is, the off-street requirement converts public curb

parking spaces into private off-street spaces. As Columbia University planning professor Moshe Adler says, "For people who have garages, street parking is almost private property. No one is permitted to block the entrance to a garage, and the effect of this privilege on other potential users is the same as if a garage were a privately owned parking spot on the street, at the entrance to the garage."[39] Because the curb cuts are not available for on-street parking, and because the off-street spaces are often unused during the weekdays when residents are at work, the required off-street parking spaces effectively reduce the available parking supply. To increase the curb parking supply, a few cities allow residents to purchase a driveway parking permit to park on the street in front of their own driveway, so the length of the curb cut becomes a reserved on-street parking space for the resident.[40]

Jia and Wachs also estimated how the required parking increased the income necessary to buy a house. The annual family income necessary to qualify for a mortgage was $67,000 for a house without parking, and $76,000 for one with parking. As a result, 24 percent more San Francisco households could afford to buy houses if they did not include the required on-site parking space. The parking requirement therefore significantly reduces housing affordability in San Francisco.

Study 3: Offices in Southern California

Richard Willson conducted case studies of parking demand and supply at suburban office projects in 10 Southern California cities and used the data to estimate how parking requirements affect land values and development density.[41] Land devoted to the required parking is not available as building area, open space, or for other productive uses. To examine how parking requirements affect development density, Willson created two scenarios based on the characteristics of the typical case study site: a four-story office building on a site of 190,000 square feet with surface parking (see Table 5-3). One scenario shows the project as built: a 95,000-square-foot building with 3.8 parking spaces per 1,000 square feet (column 2). The second scenario illustrates how much more building area the same site could accommodate if the parking requirement were reduced to 2.5 parking spaces per 1,000 square feet, which Willson estimated was more than sufficient to meet the peak demand for free parking (column 3). In both cases, 17 percent of the site was devoted to landscaping and setbacks.

The comparison shows that if there were no other constraint on density, reducing the parking requirement by 34 percent would allow a 42 percent increase in the size of the office building (see column 4). Willson then developed a pro-forma analysis to calculate the land values the project

would support at the two parking ratios. Assuming the developer's goal is an investment return of 15 percent a year and the market rent for the office building is $1.60 a month per square foot, he estimated that reducing the parking requirement by 34 percent would increase land values by 48 percent and property tax revenues by 37 percent. Note the estimated effects of parking requirements on office buildings in Southern California in 1995 were almost identical to the effects observed for apartment buildings in Oakland 34 years earlier.[42]

Study 4: Apartments in Los Angeles

Although developers usually do not separate the cost of parking from the other costs of a building, a new apartment project on the UCLA campus does provide these two costs separately. The housing and the parking were planned as a single development (with the housing above the parking), but the Campus Housing Administration financed the apartments, and the Campus Parking Service financed the parking spaces, so the two separate costs were carefully calculated. Weyburn Terrace cost $148 million—$118 million for 848 apartments and $30 million for 1,430 parking spaces.[43] The mix of two-bedroom and efficiency (one-room) apartments on the 12.5-acre site provide 1,362 bedrooms for graduate students, with one parking space for each bedroom and 68 additional parking spaces for staff and visitors (see Table 5-4).[44]

The cost of the Weyburn Terrace housing was $139,000 per apartment, and the cost of the parking was $21,000 per space. Because there are 1.7 parking spaces per apartment, the parking therefore added $35,000 per apartment to the project's construction cost. The project provides 73 square feet of parking for every 100 square feet of housing, and the parking increased the cost of construction by 25 percent.

Although one parking space per bedroom seems more than enough for on-campus student housing, the project provides 21 percent fewer spaces than the zoning requires.[45] UCLA can provide less than the code-required parking because it is exempt from the city's regulations. A private developer would have to provide 1.5 spaces for each efficiency apartment, and 2.5 spaces for each two-bedroom apartment.[46] The right-hand column in the lower panel of Table 5-4 shows the cost of parking construction had the campus complied with the city's zoning. The project would provide 92 square feet of parking for every 100 square feet of housing. The required parking would cost $44,600 per apartment (greater than the land cost for a typical apartment) and would increase the cost of construction by 32 percent.[47]