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Urban Parking Economics and Land Consumption:
A Case Study of
New Haven, Connecticut and Cambridge, Massachusetts

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Abstract:

It has become increasingly apparent that providing copious off-street parking has deleterious effects on urban form and function. This study compares parking policy in New Haven, Connecticut and Cambridge, Massachusetts that have pursued very different types of parking policies that have resulted in different outcomes in terms of land use. Since 1951, off-street parking provision has increased by nearly 400% in New Haven, meanwhile both employment and residential population have declined in the city. In contrast, off-street parking provision in Cambridge has risen around 140% since 1952, while employment and residential populations in the city have increased by 50% and 67% respectively. The turning point in these trends occurs in the 1980’s, when the city of Cambridge adjusted its transportation priorities. Cambridge had been following a similar trajectory to New Haven in terms of parking provision and automobile dependency until this point in time. From the 1980s onward, parking facility proliferation stabilized or decreased in Cambridge while residential and employment populations became denser and automobile dependency decreased. New Haven exhibited the opposite trends; residential and employment populations became more sparse while automobile dependency increased. This study builds on these alarming observations by analyzing the financial aspects of parking facilities in New Haven and Cambridge. The paramount finding of this study was the wide disparity in the property taxation of parking facilities in the two cities. In illustrating this finding, this study aims to alert cities to the incentivization of parking facility proliferation ingrained within parking tax policies.
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1 Background Information

1.1 THE HISTORY OF MUNICIPAL PARKING IN THE UNITED STATES

There are many economic factors involved in a city’s decision of how much parking to provide residents and visitors. On one hand, because of the United States’ widespread automobile dependence, sufficient parking is required so that citizens can access daily destinations with an automobile. On the other hand, infrastructure for automobile consumes a significant amount of urban space that could be occupied by residential and commercial buildings. The automobile has been a viable transportation mode since the 1910s, but the concept of municipalities providing parking in cities was not commonplace until the 1940s.

When it became apparent that automobiles would become the primary mode of transportation in America, municipalities began establishing policies for the provision of parking facilities. The purpose of government intervention in parking was not for supplying all parking, but to supply parking where it was needed. Parking in cities started as a private business, located on vacant lots. The prices of the early parking lots were extremely variable, and they were not guaranteed to be parking lots from day to day. Government did not play a part in the financing and control parking facilities until the rise of the suburban market.

Early commercial parking lots in cities tended to be located on the periphery of the city, where land was likely to be vacant, but too far away from the stores and offices for people to walk after parking their cars. Peripheral parking lots did little to help downtown stores to compete with the growing number of suburban retailers, many of whom offered customers at-the-door free parking (*I*). Commercial vendors decided that it was necessary to construct
parking facilities in city centers, and consequently buildings were demolished to make room for parking provision. In cities across America, building demolition for parking lot development had substantially reduced city tax rolls, deflating municipal tax revenues accordingly (1). Therefore, municipal governments had a vested interest in providing parking on government land, to standardize parking prices and reliability, to create parking and access to struggling downtowns in order to compete with suburban markets, and to reduce the tax revenue loss from private vendors knocking down buildings for parking. Municipal subsidy and intervention was required for center core parking, especially if this parking were to be low-cost or even free.

Governments ran into in a number of problems providing parking for urban centers. Challenges included the poor aesthetics created by the addition of parking lots, the further crowding of already congested city streets with more automobiles, and the need for new legislation in order to create this new zoning for parking. In Philadelphia, a 1942 public assessment of the parking in downtown saw that the aesthetics of parking, or lack thereof, began to be problematic. According to the assessment:

Many of the parking lots have become eyesores because of unsightly makeshift shelters provided for attendants, the erection of unsightly fences and barriers, and the exposed walls [of adjacent buildings] with broken plaster and dirty wall paper showing after razing of buildings for parking lots’ purposes”(1).

The lack of aesthetics would prove to be a common problem in cities, and have a detrimental effect on city cores. Parking lots located in city centers would have an effect on traffic. In dense city cores, where the streets were already crowded, the addition of parking allowed more people to drive into these areas, inducing even more traffic congestion. To mitigate this effect, cities created zoning ordinances requiring parking facilities to be located off-street in order to decrease traffic congestion. Columbus, Ohio, became the first city to require off-street parking in the
city’s 1923 zoning ordinance. In terms of zoning ordinances, it had to be decided what zoning category parking would fall under. As Frank B. Williams wrote in the *American City* in 1934:

> The business of conducting open-air garages or parking spaces for profit is a recent innovation in city life. However desirable these parking spaces may be in a congested business district in helping to relieve street traffic, they should not be permitted to invade residential districts and depreciate the value of residential property (1).

![Motor Vehicle Ownership in the U.S.A.](image)

**Figure 1.1: Motor Vehicle Ownership in the U.S.A. since 1900 (2)**

These early issues with parking lead to the creation of minimum parking requirements. As car ownership rose (Figure 1.1), the pressure to add parking grew. Municipalities responded to this pressure by increasing the supply of both off-street parking and on-street curbside parking. The increase in parking likely induced greater demand for driving and parking. For
decades after the advent of the automobile, city engineers and planning elites strongly opposed curbside parking because it was an inefficient use of public space and impeded traffic. The act of “cruising” – driving around an area repeatedly until an open parking space is found – generates an enormous amount of traffic congestion. In a case study by Donald Shoup on Westwood Village in California, he found these results:

Underpriced curb parking creates a mobile queue whose members drive around rather than wait in line. The study of cruising for parking in Westwood Village found these results:

1. The average time to find a curb space was 3.3 minutes
2. Search times increased when curb parking became free.
3. Solo drivers cruised more than did drivers of higher-occupancy vehicles.
4. In a day, cruising for parking created 3,600 excess Vehicle Miles Traveled (VMT), which is greater than the distance across the U.S.
5. In a year, cruising created 945,000 VMT – equivalent to driving around the earth 38 times. It wasted 100,000 hours of drivers’ time, consumed 47,000 gallons of gasoline and produced 728 tons of CO₂ (3)

Cruising creates a clear issue in urban centers because of the associated traffic congestion, and municipalities consequently decided to adopt policies that would result in parking being located off street. Parking was banned in “The Loop”, Chicago’s Central Business District in 1928, and overnight parking was banned in Manhattan, New York City, until the late 1940s (4). As the demand grew, though, curbside parking bans were lifted, huge numbers of private and publically funded parking garages appeared, metered curbside parking arose, and municipalities began to require that both new residential and commercial development include off-street parking. By 1960, almost all U.S. cities had some form of minimum parking requirement, which irrevocably influenced urban and suburban land use (4). Once minimum parking requirements became the norm in city zoning ordinances, a shift was seen to a city-planning design for an
automobile-centric transportation system. Thus city ordinances began to require sufficient parking space to serve the highest projected parking demand under the assumption that all visitors would arrive by private automobile and that parking would be free (4).

Before municipalities could venture into providing public parking, they needed to be legally enabled through state legislation. By 1941, seven states had specifically empowered cities to own and operate off-street parking lots and garages for public use; in addition, three states had expressly authorized the collecting of fees for this service (1). In Iowa, the local municipalities were even allocated funds to acquire real estate for public parking. Finally, given the ability to create public parking, governmental organizations were required to oversee the construction, operation, and other responsibilities associated with parking facilities. Many cities established local parking authorities; ‘non-political’ bodies created through state legislation. Parking authorities operate like local governments and have prescribed police powers including the ability to tax and issue bonds. Among the earliest parking authorities established were those in San Francisco, Baltimore, Pittsburgh, and Richmond. The first one authorized in New York State (in 1947), at White Plains in Westchester County—30 miles to the north of New York City—had the power to acquire land by purchase, lease, or condemnation; construct and operate off-street parking facilities; and lease or rent those facilities to private concessionaries (1). With municipalities now given the legal authority by states, public parking lots began to spring up across the country. By 1942, approximately one in five cities with a population of more than 10,000 people operated at least one downtown parking lot for public use. In about half of those cities land had been specifically purchased or leased for public parking purposes (1).

After the agencies were legally established, the attention now came to how public parking would be funded. Municipalities fund parking in one of three ways: issuing bonds, taking out mortgages from a bank, and offering businesses more tax revenue in exchange for paying the up-
front costs associated with parking. Of these funding mechanisms, the most common was issuing bonds with interest and amortization charges carried in a number of ways: by general tax levy, by assessment against properties that benefited from the parking, by using surplus funds, by proceeds from parking meters, or by fees charged for use of the parking spaces created (1). General obligation bonds, were backed by the municipality’s “full faith and credit”, carried low risk, and therefore paid low interest rates. Revenue bonds, which paid a percentage of the parking revenue, were usually placed on the general market, and were associated with both higher risk and higher interest rates. In addition, public parking could also be financed in the private sector through conventional mortgages obtained from insurance companies, pension funds, savings and loan associations, and commercial banks (1). The municipalities could also act as the banker and issue loans to private entrepreneurs to develop parking. This public-private venturing became very popular after 1970, with a significant increase in federal monies through Revenue Sharing. Another strategy was for the municipality to make a down-payment for parking in new developments, to meet minimum parking requirements, seeing it as an investment strategy for further tax revenue in the future that would more than pay for the investment. Tax increment financing was especially important, and part of the increased tax revenue generated by new development within a taxing district was committed to the underwriting of public parking (1).

Once projects were funded, the parking lots needed to be located. Many municipalities first moved into the public parking business simply due to the fact that they had unused land. Whether the land was empty due to it being part of a public park, leftover land acquired through widening of downtown streets, or downtown real estate taken by municipalities during the Great Depression due to unpaid taxes, the land was suitable for car storage and cost the city nothing. Cities continue today to commit otherwise unused publicly owned land to parking, such as space
beneath elevated freeways (1). If previously owned land was not available, parking authorities had the power to purchase land. Where allowed, some cities condemned land through powers of eminent domain, but mainly cities competed in the open market for available property (1). At first, few cities were willing to buy, clear, and convert land to parking in the heart of downtown. Only parking garages could promise truly conveniently located parking, as they could be built integrally to buildings. If parking garages were not integrated into or connected with new office buildings, for example, they were necessarily located close-by in order to satisfy a level of anticipated parking demand necessary for funding (1). Therefore, parking became more and more commonly located in the city core. Many plans, though, were proposed to locate parking in places that would hide its poor aesthetic value. The Milwaukee Plan proposed a partial clearing of blocks so that large blocks could be created with parking at the center surrounded by buildings. The plan was to create a downtown filled with parking quadrangles (1). The plan is outlined in Figure 1.2. A more practical plan involved using space in nearby lots and back alleys for parking. San Mateo, California, created a linked system of center-of-block parking lots though a special assessment on adjacent properties (1). The plan is outlined in Figure 1.3, with parking areas crosshatched.
Figure 1.2: The Milwaukee Plan of City Core Parking Placement

Figure 1.3: The San Mateo, California Plan of City Core Parking Placement
Once municipalities became involved in public parking, they became responsible for the economic impacts of the parking on their cities. This paper examines the economics of parking from the perspective of a city in terms of taxes. There is a focus on a city with a forward looking and sustainable transportation plan, Cambridge, Massachusetts, with comparisons being drawn to a city with a more traditional transportation plan, New Haven, Connecticut.

1.2 THE CITY OF NEW HAVEN, CONNECTICUT

New Haven is a mid-size city (with a 2011 population of 129,585 and a land area of 18.7 square miles) located in southwestern Connecticut, adjacent to the Long Island Sound (5). It is the second most populous city in Connecticut (behind Bridgeport). New Haven is recognized by the American Institute of Certified Planners (AICP) as a National Historic Planning Landmark for its “Nine Square Plan”, and is often referred to as the first colonial city to plan for land use development (6). Two interstate expressways (I-91 and I-95) intersect in New Haven, making it a prominent travel hub between Boston and New York City. It is also a vital port city along the Long Island Sound, making it another important hub for commercial and industrial shipping traffic.
One of New Haven’s defining characteristics is the presence of the world class Yale University, a private Ivy League research university founded in 1701. Especially since the 1970’s, Yale has taken an ever more prominent role in the politics and finances of the City of New Haven. The university takes up over 2% of New Haven’s land, and because of its educational (non-profit) status, does not pay property taxes on any parcels considered to be educational land. This is a common cause for complaint among citizens in cities with universities, but one must not forget that Yale and Yale New Haven hospital are New Haven’s first and second largest employers of city residents. The State of Connecticut also pays a significant amount of money (out of state tax dollars) to the City of New Haven to offset the loss of the property tax. Still, Yale has created difficulties for property owners and the city in its increasing consumption of city land over the years. Douglas Rae (a Yale Professor of Political
Science) gives an extensive commentary on the difficult relationship New Haven has developed with the ever growing university:

Yale was, of course, problematic as a patron of City Hall. It would produce no miracles of public education, and most of its faculty would express little if any enthusiasm for solving urban problems. And the university’s labor relations – troubled, and visibly so in the national press – were a major irritant. The institution’s wealth would invite populist attention whenever city budgets fell short of aldermanic hope. A slow learning process at Yale and City Hall – How shall such very strange bedfellows divide their covers? – would promise to stretch into the distant future. Thus would New Haven begin a course of change, rare among cities built by smoke and steam. New Haven’s story – its urbanism, and the end of that urbanism – up through what about 1980 had been broadly representative of older American cities. But what happened as Yale became the city’s dominant export industry is far from representative (7).

This excerpt exposes one of the primary differences between New Haven and other similarly sized American cities – the presence of Yale University. While this may prove a point of contention for comparison to other cities, it makes New Haven aptly comparable to Cambridge – home of Harvard University and the Massachusetts Institute of Technology – which will be spoken about in further detail in the following section.
1.3 THE CITY OF CAMBRIDGE, MASSACHUSETTS

Cambridge is a small city (with a 2011 population of 106,038 and a land area of 6.4 square miles) located north of Boston across the Charles River (8). It is part of the greater Boston metropolitan area and shares its transit system. In general, Cambridge has a very sustainable transportation system because of its excellent bike-ability and walkability. This is partly because of its high density – around 16,000 residents per square mile, one of the densest cities in the country – and partly because of the city’s commitment to providing for vulnerable road users.

![Map of Cambridge's Location within Middlesex County and Massachusetts](image)

**Figure 1.5: Cambridge’s Location within Middlesex County and Massachusetts**

Cambridge is also home to two of America’s most esteemed universities, Harvard University and the Massachusetts Institute of Technology. The presence of these two major universities draws a wealth of young residents, which has an impact on the local mode shares because of the younger generations’ affinity for walking, biking, and public transit use (8). This
can be observed in the modal split for the city of Cambridge between 1960 and 2010. More details about Cambridge’s sustainable transportation goals will be presented in section 1.5.

![Cambridge Mode Shares](image)

**Figure 1.6: Modal Split for Resident Commuters over Study Period in Cambridge, Massachusetts**

1.4 **THE URBAN PARKING PROBLEM: NEW HAVEN AS A “MODEL CITY”**

*Parking is like world hunger. There’s plenty of food, but the problem is where it goes.*

-John Gorman, Chairman of New Haven Chamber of Commerce Parking Task Force (9)

Parking spaces are a necessary piece of any automobile transportation system, but off-street parking’s often disregarded impact on cities can be a powerful determinant of urban form and function. Recent studies have brought a wealth of new information about parking and its
effects to the forefront of urban planning issues. Researchers Michael Manville and Donald Shoup say “Parking spaces themselves are ubiquitous (we notice them most when they are absent), and they are ubiquitous in part because cities require parking almost everywhere.” (10) The parking requirements required by municipal zoning codes are misguided because the requirements do not only serve parking demand, they induce it. In other words, because of the automobile’s hold over the transportation sector, policies are written to ensure adequate parking is always present and consequently users have come to expect it.

Past studies conducted by various members our research cluster at the University of Connecticut have examined the cities of New Haven, Connecticut and Cambridge, Massachusetts (among others) in order to assess the relationships between the amount of off-street parking, changes to the built environment, travel behavior, and demographic trends in each city over a period of fifty years. When selecting cities for study, New Haven’s leveling off of automobile use since the 1990’s warranted further investigation (Figure 1.7). In contrast, automobile use in Cambridge began to decline significantly around the same time. A key purpose of this study was to illustrate the differences between the two cities that coincided with these two different travel behavior trends. This study examines the differences between the economic and political mechanisms in New Haven and Cambridge that have influenced each city’s parking supply and demand.
Beginning in the 1950’s, New Haven was seen as an example for other developing American cities in what would later be termed the “Urban Renewal Era”. Urban renewal is the name given to the process of slum clearance and city center reconstruction that was taking place in cities across the country after World War II. After the war, America’s economy was stronger than ever and the Federal Government was poised for a massive investment in the reconstruction of America; a grand gesture of economic strength, innovation, and “American Exceptionalism”. In 1950’s, oil was cheap and plentiful, and America had much more than it could use; for a time. This factor lent credence to the enormous federal investment in rapidly increasing suburbanization and the construction the interstate highway system; via the 1949 Housing Act and the 1956 Interstate Highway Act, respectively. Suburbanization and the Interstate Highway System were interdependent and reliant on the temporarily plentiful energy source, oil. With these instruments of federally funded reconstruction in hand, many cities were left only with the
choice of where to put their highways and public housing developments. This was relatively easy, because of the racism induced slum creation present in nearly every city center. Urban renewal aimed to make the city more automobile accessible to keep hold of affluent property owners and shoppers that were fleeing the trouble stricken city for the homogenous, artificial suburban housing development.

New Haven was called the “Model City” (11) during the urban renewal era, when cities across the country were being retrofitted for automobile oriented transportation and suburban amenities. Urban Renewal’s redevelopment programs significantly altered New Haven’s urban fabric. The mayor during 1954-1970, Richard Lee, told New Haven’s Board of Aldermen in November 1960 that his goal was to make New Haven “A slumless city – the first in the nation” (11). Sizable amounts of federal money were secured for the New Haven Redevelopment Agency’s various urban renewal programs; in fact, “city urban renewal cash spending from locally generated revenues [] amounted to as little as 5 percent of total urban renewal costs during the Lee era as a whole” (7). This led to many low-income housing areas considered “blight” to be demolished and replaced with highways, luxury apartments, and strip mall style shopping centers in an effort to draw back the taxpayers who had been trickling out of the city since the late 1940’s to take refuge in the new American dream: the suburb.

The Federal Highway Act of 1956 commissioned interstate highways to connect a country that was rapidly expanding from its urban centers after a rapid rise in automobile ownership, and construction began on the interstate highways I-91 and I-95 that would link New Haven to other nearby metropolitan areas. Commuters and visitors from suburbs expected adequate and abundant parking spaces near downtown shopping centers and other areas of interest in cities like New Haven, so modern parking structures and surface lots were built over many of those areas leveled for redevelopment. Since parking requires a considerable amount
of land which, according to the theories of land economics would be highly priced in urban centers, the only way to accommodate a multitude of activities in a small common area was to use land more intensely (12). Large-scale office buildings and multiple story parking garages dominated the skyline of “renewed” American cities while adequate crosswalks, calm traffic, and other pedestrian amenities took secondary priority. New Haven’s historic town green was trimmed back for more on-street parking and an additional travel lane, and for many years there was even talk of building a parking garage directly under the green (13); though that plan was eventually abandoned after much protest.

In 1959, a piece of CT Route 34 merging with I-95 called the Oak Street Connector (officially known as the Richard C. Lee Highway) was completed, routing a highway directly into downtown New Haven and offering suburban shoppers expedited access to the (now closed) Macy’s and Malley’s department stores as well as the rest of the central business district. Over the next few decades, several parking garages were built on surrounding streets to offer a secure destination, culminating in the colossal 2,400 space Air Rights Garage in 1982 (examined in this study), built directly over the terminus of the Oak Street Connector to serve the nearby Yale-New Haven Hospital. While all of this development might have provided the proposed access into the city, access to community resources such as employment, shopping, and leisure areas, had resultantly decreased, as is substantiated in Figure 1.8. This was because of increased traffic and decreased land available for non-transportation related activities, which is modeled well the following charts. As land used for transportation increases, the land used for all other activities decreases.
The Greater New Haven area had experienced a significant increase in automobile dependency in the 1960’s (Figure 1.9) in response to the highway projects that purportedly would connect American cities and draw people back to more urban lifestyles. Many cities used the momentum of the automobile revolution to continue building profitable shopping centers and attractions for suburbanites (that came with more parking lots) and left their urban environments harsh to vulnerable road users (bicycles and pedestrians); consequently continuing to increase their automobile dependency in a recursive process.
These changes in urban design and thought left New Haven a very different place physically, socially, and economically. Many residents who had the financial means to leave did so while its poorer citizens were shuffled around the city at the whim of the newest clearance of “slums” (7); this phenomenon is often referred to in a general sense as “white flight” (14). Minorities were largely among those left in slums because of institutionalized and overt racism that not only subjugated people of color to low income jobs, but caused them to be denied mortgage financing. The working class (composed overwhelmingly of minorities) population was left with limited choices and insufficient access to the resources necessary for the new lifestyle that had been forced upon them. Their frustration was blatantly clear in the Dixwell Avenue sit-out protests and the riots during the summer of 1967 in the Hill neighborhood, or the extensive protesting of another 5,000 car garage on State Street which never came to fruition.
Many citizens were strongly opposed to New Haven’s new direction, but the majority of renewal continued as planned; fueled by the rhetoric of the ephemeral “common good” of bringing residents, prosperity, employment, and life back to the city being the ostensible goal of urban renewal.

As space for off-street parking (and other automobile infrastructure) increased, the population and available employment in the city steadily decreased (Figure 1.9); meanwhile the city fell further into debt. For example, the (now demolished) New Haven Coliseum (a concert hall and sports arena) was constructed to attract large crowds, but partly because it was never fully financed (and consequently the building was never finished as intended), it never pulled in the desired revenue and thus became another bill levied onto the shoulders of an already financially burdened city. In 1967, the city of New Haven convened their board of Alderman “in an apparent move to hold down [the city’s] bonded indebtedness, already one of the highest in the state, New Haven [asked the] General Assembly permission to appropriate funds in its annual operating budgets to help pay off bonds that [would] be sold to finance the proposed new municipal parking garage [attached to the Coliseum]” (15). There were several other cases like the Coliseum that created significant financial issues for the city, but still evident in the years that followed was the thought that more access for automobiles related directly to progress and economic growth.

In 1982, it was reported that “there is more downtown parking in New Haven than in any other Connecticut city – more than twice that provided in Hartford and Stamford”. In response, the current mayor, Biagio DiLieto, said, “I am very gratified with this information and I remain strongly committed to maintaining and improving parking facilities for workers, shoppers, and visitors in the downtown area” (16). The city had still not paid off its debts, but politicians continued to rally around the modernized accessibility of New Haven to the automobile. This
was a common story; in cities like New Haven and Hartford, the accumulation of debt and the proliferation of parking facilities seemed to be synonymous.

In Yale Professor Douglas Rae’s *City: Urbanism and Its End*, the author gives a castigating commentary on the decline of New Haven after urban renewal:

In the years immediately after Dick Lee’s reign, it became apparent that New Haven would not become the slumless city once advertised, that its fabric of enterprise was in tatters, that its industrial might was all but gone, that the vitality of its civic fauna was being supplanted by professionally staffed service organizations, that crime was a growing problem, especially in lower-income neighborhoods, and that the inner city would continue to house the neediest households in the region in wildly disproportionate numbers. (7)

As of this writing (April 2013), New Haven is the second poorest city in Connecticut, with 28.65% of its residents’ incomes below the poverty line (17). Sometime during the Urban Renewal Era, through pilferage, mismanagement, and other unaccounted-for monetary leaks, the revenue set aside to pay back New Haven’s federal debt was lost, and redevelopment slowed in the 1980’s. (18) Suburbanites were never really drawn back to the city, and as illustrated in Figure 1.11, the city population steadily decreased during the redevelopment era. Meanwhile, New Haven’s urban fabric had changed irrevocably, thrusting its community, willingly or not, into the automobile age.

The modern automobile-oriented transportation system that was expected to revitalize New Haven had coincided with an increasing number of residents, employers, and employees leaving the city, as well as socioeconomic decline. A previous study examining Hartford and Cambridge has shown that as an urban environment becomes more fragmented by automobile infrastructure, pedestrian activity becomes discouraged (19). This research holds true on the
streets of New Haven as well. As illustrated below in Figure 1.10, this postulate holds true in all the cities contained in our body of research (24); automobile dependency degrades the amount of vitality (in the form of residential and employee density) available in a city. As New Haven now works towards more sustainable transportation systems and lifestyles, the obstacles created by numerous off-street parking facilities will be difficult to overcome.

![Figure 1.10: Concentration of Activities vs. Automobile Dependence](image)

Community leaders’ decisions to construct automobile oriented buildings and infrastructure throughout the urban renewal era in an attempt to compete with the growth of suburbs reflect the growing importance of automobiles in urban transportation systems. Only recently, as society faces the realities of climate change, rising fossil fuel prices, and the prospect of “Peak Oil” (see *The Long Emergency* by James Howard Kunstler (20)), has the sustainability
of automobile-oriented transportation systems been the subject of growing scrutiny. New Haven has made efforts to move towards a more sustainable transportation system with improvements to their bicycle network and renovations on the Union and State Street train stations. The recent award-winning *City of New Haven Complete Streets Design Manual* mentions walkable, safe, and sustainable street planning as some its primary goals (21). There are also projects promoting calmer traffic and a more connected downtown, such as the up-and-coming Downtown Crossing plan to trim back a section of Route 34 that divides the city’s downtown area from the Yale-New Haven Hospital and medical centers (22). Federal funds have also been awarded to Connecticut and Massachusetts to construct a New Haven-Hartford-Springfield commuter rail line, which will connect these three metropolitan areas using an alternative mode to the automobile (23). In recent years, the city has experienced a leveling off of automobile use (from 73.5% in 2000 to 72.2% in 2010), as well as a slight increase in population (123,626 in 2000 and 128,970 in 2010). By continuing with efforts like those mentioned above and curtailing future off-street parking construction, New Haven can encourage more sustainable living and transportation standards.

Not all cities followed the same trend in automobile dependency (in terms of both parking provision and automobile mode share) as New Haven (Figure 1.11 below). Cities like New Haven, Lowell, and Hartford continued to become significantly more automobile dependent while cities like Cambridge, Massachusetts and Berkeley, California decreased or stabilized their automobile dependency (Reference). Coinciding with these transportation trends are disconcerting social and economic trends: automobile dependent cities have experienced declines in population and median income, while non-autodependent cities have seen their populations and median incomes increase significantly.
Figure 1.11: Percentage Change in Parking between 1960 and 2000 in Studied Cities

Figure 1.12: Comparison of Cities with Most and Least Parking (24)
American cities are now facing obstacles posed by past government choices that favored automobiles as the predominant mode of transportation. Through the research contained within this thesis, city planners and policy makers can be made aware of the significant disconnection between parking supply and urban development, and use this knowledge to reassess the assumptions underlying transportation and parking policies. New Haven is an important city to study because it is now undergoing vast changes as sustainable transportation and city planning becomes more prevalent, and Cambridge is one of the leading cities in the country in terms of sustainable transportation policies and practices. The comparison of the two cities leads to productive conclusions about how off street parking has proliferated.

1.5 CAMBRIDGE’S SUSTAINABLE TRANSPORTATION PLAN

Sustainability in transportation planning involves a comprehensive planning process with consideration for a wide variety of transportation modes. Cambridge, MA is a progressive city that takes pride in its breadth of sustainable transportation policies. One of the most radical steps that the city has taken is to set maximum parking requirements. In 1981, the new zoning code in Cambridge introduced maximum parking limits, or parking caps. Until then, the city had imposed parking minimums, just like virtually every other municipality in the United States. However, with the increasing densification of the city and an emphasis on shifting away from automobile travel, community leaders sought to limit the amount of land that would be used for parking (19). The philosophy behind the maximum parking requirements is explicitly stated in the current zoning code. From Article 6 of the 2012 City of Cambridge, Massachusetts Zoning Ordinance, “This Article 6.000 requires development of adequate parking facilities to meet the
reasonable needs of all building and land users without establishing regulations which unnecessarily encourage automobile usage. The parking standards contained herein are intended to encourage public transit, bicycle usage and walking in lieu of automobiles where a choice of travel mode exists” (25). Today, these maximum parking requirements are often less than, or close to the minimum standards of many cities and suburbs. For example, the city of Waterbury, Connecticut, requires five parking spaces per 1,000 ft\(^2\) of general retail construction. In some areas of Cambridge, the maximum number of spaces allowed is 1.7 per 1,000 ft\(^2\) of general retail—at least two-thirds fewer total spaces (19).

<table>
<thead>
<tr>
<th>Required Parking Spaces</th>
<th>Cambridge</th>
<th>Lowell</th>
<th>New Haven</th>
<th>Waterbury</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Retail (per 1000 sq. ft.)</td>
<td>Min</td>
<td>1.1 – 2.0</td>
<td>1.1 – 2.0</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>1.7 – 2.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Single Family Res. (per dwelling unit)</td>
<td>Min</td>
<td>1.0</td>
<td>2.0</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Multi-Family Res. (per dwelling unit)</td>
<td>Min</td>
<td>1.0</td>
<td>1.0</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dining (per 1000 sq. ft.)</td>
<td>Min</td>
<td>3.3 – 10*</td>
<td>10 - 20*</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>5.0 – 20*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>General Office (per 1000 sq. ft.)</td>
<td>Min</td>
<td>1.0 – 1.25</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>2.0 – 2.5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Secondary School (per classroom)</td>
<td>Min</td>
<td>5.0</td>
<td>6.0</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Cambridge’s Transportation Demand Management Plan (TDM) also sets it apart from other cities. In 1998, Cambridge instituted its Transportation Demand Management Plan (TDM) Ordinance, a policy that seeks to lower travel by private automobile by mandating that new developments seeking to add parking to their sites provide alternative transportation resources, such as transit pass subsidies, bicycle parking, priority carpool parking, and other measures (4). The policy’s objective is to reduce the amount of automobile trips with only one occupant by 10 percent, relative to 1990 levels. Under Cambridge's regulations, developers must draw up a
transportation demand management (TDM) plan to achieve this 10 percent cut, pledging measures such as appropriate parking supply, subsidized transit passes, and parking charges (26). In addition, parking maximums in the city’s zoning ordinance were revised for both office and research and development land uses to reflect the 10 percent reduction. Cambridge employs a TDM officer to annually assess the performance of parking facilities that are subject to the TDM ordinance.

They city of Cambridge is very progressive in its encouragement of transit, walking, and biking. Cambridge officials acknowledged that modes other than driving are crucial to the city’s functioning and that the city could thrive without ever increasing the supply of parking. The city’s Pedestrian Advisory Committee, established in 1995, and Bicycle Committee, established in 1991, have led to significant measures for improving non-automobile facilities and networks (19). Many of the plans and policies in Cambridge have been put forth in order to encourage multi-modal transportation and have been very successful.

Specific examples of policies include the Pedestrian Plan, the Five Year Reconstruction Plan, and CitySmart. The Pedestrian Plan’s primary goal was to encourage walking in the city by making it easier, safer, and more attractive to pedestrians. It did so by providing design features and policies that prioritized pedestrians. Specific examples of these policies include: a 30 mph speed limit on most roads, a maximum wait time for pedestrians at crosswalks of 80 seconds, and a 20 ft. minimum parking distance from an intersection. The 5 Year Reconstruction Plan is currently under development with the objective of identifying streets and sidewalks for reconstruction within the next five years. One of the primary goals is to redesign streets with an emphasis on “complete” streets, meaning that it provides access to all users including but not limited to pedestrians, cyclists, and motorists. Finally, the CitySmart program has provided the residents of Cambridge with a resource and tool to access valuable information such as: maps,
guides, and schedules. The program started in 2009 and once a year, a packet was sent to city residents which provided information about the program and included an order form for a free information kit with transportation options available in the area. Cambridge has a very unconventional transportation plan in that it shifts the focus away from automobile dependence.

1.6 LAND CONSUMPTION BY OFF STREET PARKING

Figure 1.13 Off-Street Parking Provision over Study Period in Six Cities (New Haven and Cambridge bolded)
<table>
<thead>
<tr>
<th>City</th>
<th>Year</th>
<th>Number of Parking Spaces</th>
<th>Uncertainty (+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Surface Lots</td>
<td>Structures</td>
</tr>
<tr>
<td>New Haven</td>
<td>1951</td>
<td>21,690</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1986</td>
<td>69,830</td>
<td>8860</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>93,140</td>
<td>13,270</td>
</tr>
<tr>
<td>Cambridge</td>
<td>1952</td>
<td>18,760</td>
<td>2,810</td>
</tr>
<tr>
<td></td>
<td>1985</td>
<td>45,400</td>
<td>9,360</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>38,660</td>
<td>13,190</td>
</tr>
</tbody>
</table>

There are significant discrepancies between demographic trends, automobile use, and the amount of off-street parking in New Haven. Off-street parking coverage increased by 329% between 1951 and 2009 (Table 1.2), while the number of residents driving to work had a net increase of only 8% between 1960 and 2009 (Table 1.3). Also, the number of commuters driving increased by 21%. These results are alarming in the sense that although the amount of resident drivers in New Haven has experienced relatively little net change, the amount of land used for parking has increased significantly. As evidenced by the increase in commuters driving, these parking spaces are not serving residents living within the city.

In 1951, off-street parking covered 1.49% of the city’s land, while in 2009 it covered 6.60%. Especially noticeable was the amount of land converted to parking in the neighborhoods surrounding downtown area (Figure 1.13). Studies have shown that the increase in land used proprietarily for off-street parking along with other automobile infrastructure decreases the amount of available land for other activities, creating spaces only inhabitable by and useful for automobiles(12).
### Table 1.3: Summary of Population, Employment, and Commute Data

<table>
<thead>
<tr>
<th>City</th>
<th>Year</th>
<th>Population</th>
<th>Total Commuters</th>
<th>Drivers (%)</th>
<th>Total Commuters</th>
<th>Drivers (%)</th>
<th>Parking Spaces per Resident</th>
<th>Parking Spaces per Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Haven</td>
<td>1960</td>
<td>152,048</td>
<td>55,979</td>
<td>58%</td>
<td>84,541</td>
<td>64%</td>
<td>0.23</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>1970</td>
<td>137,707</td>
<td>53,748</td>
<td>68%</td>
<td>63,566</td>
<td>76%</td>
<td>0.35</td>
<td>0.57</td>
</tr>
<tr>
<td></td>
<td>1980</td>
<td>126,107</td>
<td>48,144</td>
<td>69%</td>
<td>77,683</td>
<td>77%</td>
<td>0.50</td>
<td>0.68</td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td>130,647</td>
<td>54,954</td>
<td>73%</td>
<td>84,843</td>
<td>83%</td>
<td>0.64</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>123,626</td>
<td>46,592</td>
<td>73%</td>
<td>73,873</td>
<td>85%</td>
<td>0.75</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>123,314</td>
<td>53,696</td>
<td>66%</td>
<td>-</td>
<td>-</td>
<td>0.86</td>
<td>1.26</td>
</tr>
<tr>
<td>Cambridge</td>
<td>1960</td>
<td>107,916</td>
<td>40,108</td>
<td>42%</td>
<td>65,948</td>
<td>56%</td>
<td>0.23</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>1970</td>
<td>100,361</td>
<td>44,828</td>
<td>43%</td>
<td>69,991</td>
<td>60%</td>
<td>0.33</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>1980</td>
<td>95,322</td>
<td>46,397</td>
<td>42%</td>
<td>80,928</td>
<td>60%</td>
<td>0.43</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td>95,802</td>
<td>50,518</td>
<td>47%</td>
<td>107,445</td>
<td>63%</td>
<td>0.54</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>101,355</td>
<td>51,923</td>
<td>43%</td>
<td>109,823</td>
<td>60%</td>
<td>0.48</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>108,776</td>
<td>60,234</td>
<td>41%</td>
<td>-</td>
<td>-</td>
<td>0.48</td>
<td>0.61</td>
</tr>
</tbody>
</table>

Parking spaces per resident have increased from 0.23 spaces per resident in 1960 to 0.86 spaces per resident in 1986 (a 360% increase). This is significant when considering the aforementioned 8% increase in residents driving and reinforces that these parking spaces do not serve residents, but commuting employees. It is important to note that this study only accounted for visible off-street parking lots, so parking in driveways or on-street parking around a resident’s home is not included, so the estimate above is very conservative. It is also worth noting that the increase in parking per resident between 1951 and 1986 came during a time when New Haven’s population decreased by 19% and commuters decreased by 13%, illustrating how parking growth did not coincide with the city’s population or job growth.

In Cambridge, a different outcome has emerged. Parking spaces per resident have increased from 0.23 in 1960 to 0.48 in 2009 (a 108% increase). Meanwhile, the amount of residents driving has decreased slightly (1%). The population in Cambridge has remained stable,
increasing 1%, while the amount of commuters in Cambridge has increased 67%. It is significant to note that Cambridge’s commuters increased while New Haven’s commuters decreased, but New Haven increased their off street parking provision by 329% while Cambridge only increased their off street parking provision by 107%.

The important point identified here is the disconnection between the city’s growth and the expansion of its off-street parking infrastructure. Parking facilities accompany commercial developments because of zoning requirements to serve anticipated demand, but research has shown that requiring this parking actually induces additional demand (2). While the amount of off-street parking in New Haven has risen significantly since the 1950’s, other data do not show growth in population or employment (Table 1.3). The population and commuting employees of New Haven have both decreased, while the amount of residents and outside commuters driving to work has only increased marginally (as previously mentioned). These declining effects illustrate the disconnection between parking provision and urban growth.
2 Research Methodology

2.1 NEW HAVEN PARKING FACILITIES ASSESSED

The New Haven parking facilities assessed in this study were selected in order to get a representative sample of publicly and privately owned parking facilities. Brief descriptions of each facility—along with a photo—are below.

2.1.1 City Owned, Privately Operated

1) Coliseum Garage (now demolished)

This parking facility is a special case for study, primarily because it is now demolished. Despite this fact, the effects of its financial struggles and subsequent destruction per the decision of New Haven’s (then and current) mayor John DeStefano are still evident in the city’s urban fabric and its peoples’ opinions of city construction efforts. The New Haven Coliseum was a sports and entertainment arena located at the edge of downtown New Haven. It was constructed in 1972 with an elaborate 2400 vehicle parking garage sitting above the arena, accessible by equally elaborate double helix access ramps. As will be discussed later, the Coliseums’ enormous expenses of construction lead to the
incomplete opening of the building. This created significant engineering and financial issues for the Coliseum proprietors and consequently the City of New Haven.

2) Coliseum Lots

While the Coliseum site awaits future redevelopment, two surface lots constructed in 2008 cover the previous building footprint, amounting to a total of 571 spaces. The temporary lot is operated by LAZ Parking, and serves primarily as spillover parking for the train stations.

Figure 2.2: Coliseum Lots

3) Air Rights Garage

The Air Rights Garage was constructed in 1981 as a six story parking structure in downtown New Haven at the end of the Route 34 section of freeway (AKA The Oak Street Connector) leading into the heart of the city. It primarily serves Yale New Haven Hospital employees and patients.

Figure 2.3: Air Rights Garage
4) **Union Station Garage and Lot**

The Union Station Lot was constructed in 1982 and the Union Station Garage was constructed in 1987 on the site of the original lot. This is a high parking demand area as it is the only train station in town (1 of 2) having parking facilities for intermodal use. It is essentially cut off from the downtown area in regards to pedestrian travel because of the extensive automobile facilities – primarily the Oak St. Connector – between the station and New Haven’s center.

5) **Broadway Plaza Lot**

The Broadway Plaza Lot was constructed in 1988 and lies at the center of the Yale open air mall area. Its primary use is transient for the access of the many nearby shops and restaurants.

6) **Crown Street Garage**

The Crown Street Garage was constructed in 1974 in downtown New Haven. It primarily serves the nearby theater district at night and nearby offices during the day.
7) Temple Street Garage

The Temple Street Garage was constructed in 1962 as a six story parking structure in downtown New Haven. It used to serve the renowned Malley’s department store until 1982, when Malley’s was closed. Several other tenants occupied the Malley’s building until its demolition in 1997. The site was recently redeveloped as a downtown branch of the local Gateway Community College, and the Temple Street Garage now serves the college’s students and staff.

2.1.2 Privately Owned, Privately Operated

1) Grove Street Garage

The Grove Street Garage was constructed in 1986 as a five story parking structure across from the Connecticut Financial Center. It sets itself apart from many of the other parking facilities in this study because of the commercial uses on its first floor.
2) **Chapel-York Garage**

The Chapel-York Garage was constructed in 1989 as a seven story parking on York St near Yale University. It is owned by Yale and primarily serves drivers associated with the university.

![Figure 2.9: Chapel-York Garage](image)

3) **City Hall/Financial Center Garage**

The City Hall/Financial Center Garage was constructed as a two level subterranean garage in 1972 under the Connecticut Financial Center (the high building photographed to the right) and the New Haven City Hall (the spire of the City Hall’s façade is just visible in the photo to the right). It is the only underground parking facility examined in this study. It primarily serves the employees and visitors of the Financial Center and the City Hall.

![Figure 2.10: City Hall & Financial Center Garage](image)
4) **360 State Street Garage**

360 State Street is a luxury high-rise apartment building constructed in 2009 at one corner of downtown New Haven. It includes a four level parking structure at the base of the 32 story building. It serves the residents of the apartment building as well as brief users of the grocery store and other shops on the street level.

![Figure 2.11: 360 State Street Garage](image)

**Table 2.1: Summary of New Haven Parking Facilities Assessed**

<table>
<thead>
<tr>
<th>Parking Facilities</th>
<th>Address</th>
<th>Owner</th>
<th>Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Rights Garage</td>
<td>60 York St.</td>
<td>City of New Haven</td>
<td>NHPA</td>
</tr>
<tr>
<td>Coliseum Garage (now Demolished)</td>
<td>275 S. Orange St.</td>
<td>City of New Haven</td>
<td>City of New Haven</td>
</tr>
<tr>
<td>Coliseum Lots</td>
<td>275 S. Orange St.</td>
<td>City of New Haven</td>
<td>Propark</td>
</tr>
<tr>
<td>Union Station Garage and Lot</td>
<td>170 Union Ave.</td>
<td>City of New Haven</td>
<td>NHPA</td>
</tr>
<tr>
<td>Broadway Plaza Lot</td>
<td>56 Broadway</td>
<td>City of New Haven</td>
<td>NHPA</td>
</tr>
<tr>
<td>Crown Street Garage</td>
<td>213 Crown St.</td>
<td>City of New Haven</td>
<td>NHPA</td>
</tr>
<tr>
<td>Temple Street Garage</td>
<td>21 Temple St.</td>
<td>City of New Haven</td>
<td>NHPA</td>
</tr>
<tr>
<td>360 State St. Garage</td>
<td>360 State St.</td>
<td>Private</td>
<td>Private</td>
</tr>
<tr>
<td>City Hall/Financial Center Garage</td>
<td>175 Church St.</td>
<td>Private</td>
<td>LAZ Parking</td>
</tr>
<tr>
<td>Chapel St. York St. Garage</td>
<td>150 York St.</td>
<td>Private</td>
<td>LAZ Parking</td>
</tr>
<tr>
<td>Grove Street Garage</td>
<td>55 Grove Street</td>
<td>Private</td>
<td>LAZ Parking</td>
</tr>
</tbody>
</table>

### 2.2 CAMBRIDGE PARKING FACILITIES ASSESSED

The parking facilities assessed in the study were selected to get a representative sample of parking garages and lots, publicly and privately owned facilities, and facilities selected based on their location in the city. Of the eight facilities, two were located near the Harvard University area, two were located near the Massachusetts Avenue area, two were located near the Massachusetts Institute of Technology area, and two were located in north-eastern Cambridge.
2.2.1 Private Parking Garages

1) Cambridge Center East Garage

The Cambridge Center East Garage was constructed in 1985 as a 5 story parking structure located near Kendall Square at the intersection of Broadway and Main St. It has 875 spaces and serves the Boston Marriot Cambridge, the Aurora Flight Sciences Corporation, Novartis Venture Funds, the Kendall/MIT Station on the Red Line of the T, and the north-eastern portion of the MIT campus.

2) Harvard Square Parking Garage

The Harvard Square Parking Garage was constructed in 1985 as a five story parking structure located near Harvard Square on John F. Kennedy St. It has 208 spaces and serves the many shops and restaurants located in Harvard Square, as well as the southern tip of the Harvard University campus.
3) **University Park at MIT**

The University Park at MIT parking garage was constructed in 1999 as a 6 story parking structure located off of Massachusetts Avenue on Pilgrim St. It has 579 spaces and serves the mixed use community of the University Park at MIT. This community includes apartments, research laboratories, office buildings, retail, restaurants, and a park.

2.2.2 **Public Parking Garages**

4) **First Street Garage**

The First Street Garage was constructed in 1987 as a six story parking structure located in eastern Cambridge on Thorndike Street. It has 1110 spaces and serves Lechmere Canal Park, the CambridgeSide Galleria mall, and the Middlesex County Court building.
5)  **Green Street Garage**

The Green Street Garage was constructed in 1969 as a four story parking structure located off of Massachusetts Avenue on Green Street. It has 290 spaces and serves the Cambridge Public Library.

![Figure 2.16: Green Street Garage](image)

### 2.2.3 Public Parking Lots

6)  **Parking Lot 12**

Parking Lot 12 was constructed in 1984 in north-eastern Cambridge off of Cambridge St on Warren Street. It has 29 spaces and serves bars and restaurants in this primarily residential area.

![Figure 2.17: Parking Lot 12](image)
2.2.4 Private Parking Lots

7) MIT N10 Annex Lot

The MIT N10 Annex Lot was constructed in 1986 on the Massachusetts Institute of Technology campus on Massachusetts Avenue. It has 50 spaces and serves the MIT Fuel Cell Laboratory.

Figure 2.18: MIT N10 Annex Lot

8) Church Street Lot

The Church Street Lot was constructed in 1998 right outside Harvard Square on Church Street. It has 130 spaces and serves the many shops and restaurants located in Harvard Square.

Figure 2.19: Church Street Lot
Table 2.2: Summary of Cambridge Parking Facilities Assessed

<table>
<thead>
<tr>
<th>Parking Facilities</th>
<th>Address</th>
<th>Owner</th>
<th>Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambridge Center East</td>
<td>4 Cambridge Ctr.</td>
<td>BP East Garage LLC</td>
<td>Central Parking Systems</td>
</tr>
<tr>
<td>Garage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvard Square Parking</td>
<td>65 JFK St.</td>
<td>Kennedy and Eliot Realty Trust</td>
<td>Trinity Property Management</td>
</tr>
<tr>
<td>Garage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University Park at MIT</td>
<td>30 Pilgrim St.</td>
<td>MIT</td>
<td>ABM</td>
</tr>
<tr>
<td>First Street Garage</td>
<td>14 Thorndike St.</td>
<td>City of Cambridge</td>
<td>Republic Parking</td>
</tr>
<tr>
<td>Green Street Garage</td>
<td>240 Green St.</td>
<td>City of Cambridge</td>
<td>Republic Parking</td>
</tr>
<tr>
<td>Municipal Parking Lot 12</td>
<td>7 Warren St.</td>
<td>City of Cambridge</td>
<td>City of Cambridge</td>
</tr>
<tr>
<td>MIT N10 Annex Lot</td>
<td>135 Massachusetts Ave.</td>
<td>MIT</td>
<td>MIT</td>
</tr>
<tr>
<td>Church Street Lot</td>
<td>47 Church St.</td>
<td>Harvard University</td>
<td>Pilgrim Parking</td>
</tr>
</tbody>
</table>

2.3 CONSTRUCTION COSTS

In order to estimate an average cost of constructing urban parking structures on a per space basis in New Haven, constructions costs of as many facilities as possible (within the set of assessed facilities) were collected from various sources. These sources include a 1989 New Haven Parking Authority Inventory (27), newspaper articles, and costs reported directly from the developer. This data is invaluable in quantifying the capital cost of urban parking structures, and might later serve as an important piece of urban parking space lifecycle cost analysis.

These data for Cambridge were not able to accessed within the time frame of the project and will be a topic for future research endeavors.
2.4 OPERATION COSTS AND REVENUES

Besides capital costs of construction, parking facilities have periodic operation costs. They also collect revenues, as these should (in theory) cover the lifecycle costs of the facility. The operation costs and revenues collected were taken from annual accounting reports for New Haven’s public parking facilities; given to the study by Brian Seholm, CFO of the New Haven Parking Authority (NHPA). Operation costs and revenues were not available for private parking facilities because of each company’s privacy policy.

These data for Cambridge were not able to accessed within the time frame of the project and will be a topic for future research endeavors.

2.5 LAND ASSESSMENT DATA

The primary data supporting the conclusions of this study is the wealth of information gleaned from the property assessment databases in New Haven and Cambridge. Through each city’s online database gross assessments, land assessments, plot sizes, building areas, and building heights were able to be obtained. From the assessment information and each city’s respective mill rates property taxes were calculated.
2.6 CAPACITY AND OCCUPANCY

Capacities and occupancies for each parking facilities were primarily assembled from Milone and MacBroom’s 2009, 2010, and 2011 Point-In-Time Parking Surveys. While the occupancies are not used extensively in the following analysis, having a measure of the observed demand of the parking facilities is still invaluable. Capacities were necessary to develop financial characteristics for the studied parking facilities on a per space basis.

2.7 PAST RESEARCH DATA

*Much of the data presented in Chapter 1 was collected previously for other studies conducted by members of our research cluster. Below is a brief summary of the methodology used in collecting that data.*

The parking provision data presented is based on Geographic Information System (GIS) maps of the off-street parking in New Haven during 1951, 1986, and 2009. The GIS mappings were generated from a collection of geo-referenced aerial photos taken during each time period (see figures 2.1 and 2.2 below). All visible off-street parking facilities were identified and the total area for each year was calculated using the ESRI software ArcMap. This measurement does not account for underground facilities, on-street parking, and private driveways, so this is a conservative estimate. Depending on the quality of the photographs, some questionable areas were marked as unsure and minimum and maximum areas were calculated accordingly. From those minimums and maximums, an average amount of parking was calculated and this was used
to estimate the number of off-street parking spaces. This last calculation was based on the assumption that the average area of a parking space (plus space to maneuver) is 350 square feet (32.5 square meters). This estimate was determined from a sample of over 100 surface lots identified in this study. The average height of parking structures was assumed to be 4.5 levels in New Haven as a result of a survey of the city’s parking structures.

Data concerning demographics and commute trip behavior were aggregated from U.S. Census records (28, 29, 30), the American Community Survey (31), the Census Transportation Planning Product (32), and the National Historic Geographic Information System (33). A summary of this data is contained in Table 1.3.

Extensive background investigation of New Haven was performed by reviewing history books and relevant newspaper articles from the New Haven Register. Multiple current and former city officials were interviewed about the history of parking in New Haven, and the Free Public and City Plan libraries were also consulted for further historic research. Using the numerical data and established background information, relationships were assembled to show the disconnection between parking supply and urban growth in New Haven over the last sixty years.
Figure 2.20: Map of Parking Coverage in New Haven circa 1951 (Left) and 2009 (Right)

Figure 2.21: Map of Parking Coverage in Cambridge circa 1952 (Left) and 2009 (Right)
3 Results

3.1 CONSTRUCTION COSTS

Table 3.1: Summary of Construction Cost Data for Parking Facilities in New Haven

<table>
<thead>
<tr>
<th>Garage</th>
<th>Year Built</th>
<th>BCI</th>
<th>Construction Cost Original</th>
<th>Construction Cost 2012$</th>
<th>Capacity (spaces)</th>
<th>Construction Cost Per Space 2012$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Rights Garage</td>
<td>1981</td>
<td>2097</td>
<td>$26,480,000</td>
<td>$65,708,788</td>
<td>2601</td>
<td>$25,262.89</td>
</tr>
<tr>
<td>Coliseum Garage (now Demolished)</td>
<td>1972</td>
<td>1048</td>
<td>$23,000,000</td>
<td>$114,201,145</td>
<td>2400</td>
<td>$47,583.81</td>
</tr>
<tr>
<td>Coliseum Lots East and West</td>
<td>2008</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Union Station Garage and Lot</td>
<td>1987</td>
<td>2541</td>
<td>$10,000,000</td>
<td>$20,478,552</td>
<td>1145</td>
<td>$17,885.20</td>
</tr>
<tr>
<td>Grove Street Garage</td>
<td>1986</td>
<td>2483</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Broadway Plaza Lot</td>
<td>1988</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Chapel St. York St. Garage</td>
<td>1989</td>
<td>2634</td>
<td>$7,420,000</td>
<td>$14,658,585</td>
<td>474</td>
<td>$30,925.28</td>
</tr>
<tr>
<td>City Hall/Financial Center Garage</td>
<td>1972</td>
<td>1048</td>
<td>-</td>
<td>-</td>
<td>668</td>
<td>-</td>
</tr>
<tr>
<td>Crown Street Garage</td>
<td>1974</td>
<td>1205</td>
<td>$5,210,000</td>
<td>$22,498,553</td>
<td>720</td>
<td>$31,247.99</td>
</tr>
<tr>
<td>Temple Street Garage</td>
<td>1962</td>
<td>580</td>
<td>$6,250,000</td>
<td>$56,073,276</td>
<td>1235</td>
<td>$45,403.46</td>
</tr>
<tr>
<td>360 State St. Garage</td>
<td>2009</td>
<td>4769</td>
<td>$24,000,000</td>
<td>$26,187,125</td>
<td>467</td>
<td>$51,391.86</td>
</tr>
</tbody>
</table>

Average Cost per Space $35,671.50

3.2 OPERATION COSTS AND REVENUES

Presented below are the average annual operation costs and revenues associated with five public parking garages in New Haven. From those two quantities, the annual profit or loss for each garage was computed. All three of these quantities were divided by the capacities of the
garages to obtain operation cost, revenue, and profit on a per space basis. An average profit per space of $854.65 was calculated from the sample, although there were significant variations within the sample. These variations are likely attributed to the use of each garage – i.e. the Air Rights Garage is primarily used for Yale New Haven Hospital employees while the Union Station Garage is serves passengers for the train station – as well as the surrounding land uses; i.e. proximity to the CBD plays a significant role. Based upon the average revenues and operations costs, the average cash per space accounts for 26% of the revenue.

As mentioned earlier, this data was not available for the private garages within the study, but this data still serves as a benchmark for measuring the financial performance of urban parking facilities in New Haven.

<table>
<thead>
<tr>
<th>Parking Facility</th>
<th>Capacity (Spaces)</th>
<th>Annual Operation Cost</th>
<th>Annual Operation Cost per Space</th>
<th>Annual Revenue</th>
<th>Annual Revenue per Space</th>
<th>Annual Cash</th>
<th>Annual Cash per Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Rights Garage</td>
<td>2601</td>
<td>$6,728,823.00</td>
<td>$2,587.01</td>
<td>$8,167,012.33</td>
<td>$3,139.95</td>
<td>$1,438,189.33</td>
<td>$552.94</td>
</tr>
<tr>
<td>Union Station Garage</td>
<td>887</td>
<td>$2,107,762.33</td>
<td>$2,376.28</td>
<td>$3,895,794.33</td>
<td>$4,392.10</td>
<td>$1,788,032.00</td>
<td>$2,015.82</td>
</tr>
<tr>
<td>Broadway Plaza Lot</td>
<td>140</td>
<td>$376,954.33</td>
<td>$2,692.53</td>
<td>$471,095.33</td>
<td>$3,364.97</td>
<td>$94,141.00</td>
<td>$672.44</td>
</tr>
<tr>
<td>Crown Street Garage</td>
<td>720</td>
<td>$1,798,399.67</td>
<td>$2,497.78</td>
<td>$2,063,156.67</td>
<td>$2,865.50</td>
<td>$264,757.00</td>
<td>$367.72</td>
</tr>
<tr>
<td>Temple Street Garage</td>
<td>1235</td>
<td>$2,609,016.67</td>
<td>$2,112.56</td>
<td>$3,429,488.33</td>
<td>$2,776.91</td>
<td>$820,471.67</td>
<td>$664.35</td>
</tr>
<tr>
<td>Averages</td>
<td></td>
<td>$2,453.23</td>
<td></td>
<td>$3,307.89</td>
<td></td>
<td>$854.65</td>
<td></td>
</tr>
</tbody>
</table>

Below is the rate information for the five garages documented above. While the rates for the Union Station Garage don’t vary much from the rates of the other garages (Table 3.3), the cash
the garage earns is significantly higher. This can somewhat be accounted for by the fact that the garage is consistently full (refer to Table 3.6); as the 2011 peak parking occupancy is 100%.

Table 3.3: Rate Information for Five Public Parking Garages in New Haven

<table>
<thead>
<tr>
<th>Garage</th>
<th>Rates</th>
<th>Charge ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Rights Garage</td>
<td>Hourly $3.00</td>
<td>$12.00</td>
</tr>
<tr>
<td></td>
<td>4-10 Hour Max $12.00</td>
<td>$18.00</td>
</tr>
<tr>
<td></td>
<td>Monthly $95.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monthly Off Peak $47.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hourly $2.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 Hour (in by 6 am, Out by 10pm) $13.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Daily Max $18.00</td>
<td></td>
</tr>
<tr>
<td>Union Station Garage</td>
<td>First 1/2 hr $0.75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Per 1/2 hr thereafter $0.75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>After 4th hr or after 6th hr with Restaurant receipt $35.00</td>
<td></td>
</tr>
<tr>
<td>Broadway Plaza Lot</td>
<td>Monthly $130.00</td>
<td>$105.00</td>
</tr>
<tr>
<td></td>
<td>Monthly $130.00</td>
<td>$105.00</td>
</tr>
<tr>
<td></td>
<td>First Hour $4.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subsequent Hours $3.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Special Events $8.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evening Rate $8.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Early Bird $10.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overnight Max $13.00</td>
<td></td>
</tr>
<tr>
<td>Crown Street Garage</td>
<td>Monthly $140.00</td>
<td>$140.00</td>
</tr>
<tr>
<td></td>
<td>Monthly $140.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>First Hour $4.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subsequent Hours $3.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Special Events $8.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evening Max $8.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Early Bird $13.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Daily Max $16.00</td>
<td></td>
</tr>
<tr>
<td>Temple Street Garage</td>
<td>Monthly $140.00</td>
<td>$140.00</td>
</tr>
<tr>
<td></td>
<td>Union Station Rail Commuter (Monthly) $95.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hourly $4.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evening Max $8.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Special Events $8.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Early Bird $13.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Daily Max $16.00</td>
<td></td>
</tr>
</tbody>
</table>
3.3 LAND ASSESSMENT DATA

The results of the land assessment for the parking garages in the study (New Haven summarized in Table 3.4 and Cambridge summarized in Table 3.5) show the plot size (sq. ft), building area (sq. ft), building height (stories), gross assessment ($), land assessment ($), and property tax ($/year).

<table>
<thead>
<tr>
<th>Garage</th>
<th>Plot Size (sq. ft)</th>
<th>Building Area (sq. ft)</th>
<th>Building Height (stories)</th>
<th>Gross Assessment ($)</th>
<th>Land Assessment ($)</th>
<th>Property Tax ($/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Rights Garage</td>
<td>186,437</td>
<td>883,461</td>
<td>6</td>
<td>$32,065,530.00</td>
<td>$4,990,790.00</td>
<td>$1,246,707.81</td>
</tr>
<tr>
<td>Coliseum Lots East and West</td>
<td>202,554</td>
<td>200,000</td>
<td>1</td>
<td>$9,679,950.00</td>
<td>$9,539,950.00</td>
<td>$376,356.46</td>
</tr>
<tr>
<td>Union Station Garage and Lot</td>
<td>319,295</td>
<td>330,175</td>
<td>6</td>
<td>$17,821,020.00</td>
<td>$2,313,570.00</td>
<td>$692,881.26</td>
</tr>
<tr>
<td>Grove Street Garage</td>
<td>46,609</td>
<td>265,518</td>
<td>5</td>
<td>$5,868,450.00</td>
<td>$825,580.00</td>
<td>$228,165.34</td>
</tr>
<tr>
<td>Broadway Plaza Lot</td>
<td>53,143</td>
<td>45,000</td>
<td>1</td>
<td>$2,153,270.00</td>
<td>$2,112,530.00</td>
<td>$83,719.14</td>
</tr>
<tr>
<td>Chapel St. York St. Garage</td>
<td>32,234</td>
<td>170,568</td>
<td>7</td>
<td>$5,632,690.00</td>
<td>$1,099,070.00</td>
<td>$218,998.99</td>
</tr>
<tr>
<td>City Hall/Financial Center Garage</td>
<td>53,579</td>
<td>254,618</td>
<td>2</td>
<td>$8,513,680.00</td>
<td>$1,664,880.00</td>
<td>$331,011.88</td>
</tr>
<tr>
<td>Crown Street Garage</td>
<td>55,321</td>
<td>254,618</td>
<td>7</td>
<td>$10,834,460.00</td>
<td>$1,469,790.00</td>
<td>$421,243.80</td>
</tr>
<tr>
<td>Temple Street Garage</td>
<td>74,923</td>
<td>521,796</td>
<td>6</td>
<td>$16,365,720.00</td>
<td>$1,327,060.00</td>
<td>$636,299.19</td>
</tr>
<tr>
<td>360 State St. Garage</td>
<td>#N/A</td>
<td>207,986</td>
<td>5</td>
<td>$13,426,630.00</td>
<td>$0.00</td>
<td>$522,027.37</td>
</tr>
</tbody>
</table>
### Table 3.5 Cambridge Parking Garage Assessment Data

<table>
<thead>
<tr>
<th>Garage</th>
<th>Plot Size (sq. ft)</th>
<th>Building Area (sq. ft)</th>
<th>Building Height (stories)</th>
<th>Gross Assessment ($)</th>
<th>Land Assessment ($)</th>
<th>Property Tax ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambridge Center East Garage</td>
<td>31,757</td>
<td>48,045</td>
<td>5</td>
<td>$26,045,600</td>
<td>$7,939,300</td>
<td>$579,813.86</td>
</tr>
<tr>
<td>Harvard Square Parking Garage</td>
<td>15,678</td>
<td>28,328</td>
<td>5</td>
<td>$22,944,100</td>
<td>$13,334,100</td>
<td>$490,609.11</td>
</tr>
<tr>
<td>University Park at MIT Garage</td>
<td>39,043</td>
<td>27,384</td>
<td>6</td>
<td>$15,051,900</td>
<td>$2,920,400</td>
<td>$321,851.76</td>
</tr>
<tr>
<td>First Street Garage</td>
<td>75,739</td>
<td>81,822</td>
<td>6</td>
<td>$42,435,300</td>
<td>$8,179,800</td>
<td>$881,805.53</td>
</tr>
<tr>
<td>Green Street Garage</td>
<td>55,828</td>
<td>165,908</td>
<td>4</td>
<td>$42,799,300</td>
<td>$9,044,100</td>
<td>$889,369.45</td>
</tr>
<tr>
<td>Municipal Parking Lot 12</td>
<td>10,500</td>
<td>10,500</td>
<td>1</td>
<td>$367,500</td>
<td>$367,500</td>
<td>$7,636.65</td>
</tr>
<tr>
<td>MIT N10 Annex Lot</td>
<td>9,535</td>
<td>9,535</td>
<td>1</td>
<td>$845,700</td>
<td>$812,900</td>
<td>$17,463.33</td>
</tr>
<tr>
<td>Church Street Lot</td>
<td>31,774</td>
<td>31,744</td>
<td>1</td>
<td>$4,145,600</td>
<td>$4,138,100</td>
<td>$89,843.06</td>
</tr>
</tbody>
</table>

A map of New Haven in Figure 3.1 shows the gross assessment of each land parcel in the city. Similarly, Figure 3.2 shows the gross assessment of each land parcel in the city of Cambridge. When comparing New Haven to Cambridge, it is important to note the socioeconomic differences presented in these figures. As the scales for gross assessment are the same, it is important to note that, in general, the property values are much higher throughout the city of Cambridge as compared to New Haven. This reflects a difference in income of the cities. In New Haven, the per capita income in the past 12 months (2011) is $22,814, the median household income (2011) is $39,094, and the percentage of people below poverty level (2011) is 26.3% (6). In Cambridge, the per capita income in the past 12 months (2011) is $46,242, the median household income (2011) is $69,017, and the percentage of people below poverty level (2011) is 15.1% (8). The per capita income in Cambridge is twice that of New Haven, and the median household income in Cambridge is 1.8 times that of New Haven.

It is also interesting to note the lack of a central business district in Cambridge. In New Haven it is clear to see that the downtown area, where all of the parking garages in the study are
located, in the center portion of the city is where all of the high priced properties are (refer to Figure 3.1). This is clearly the central business district of New Haven, and the surrounding areas are mostly residential. In contrast, Cambridge does not have one single central business district. High priced properties exist in eastern Cambridge, near the Massachusetts Institute of Technology, central Cambridge, near Harvard University, and northwestern Cambridge near Fresh Pond. Residential areas are mixed in between these pricier areas (refer to Figure 3.2).

Figure 3.1: New Haven Total Property Assessment Map
Figure 3.2: Cambridge Total Property Assessment Map
3.4 CAPACITY, OCCUPANCY, AND BUILDING HEIGHTS

Table 3.6: Summary of Capacity, Building Height, Occupancy Information of Parking Facilities in New Haven

<table>
<thead>
<tr>
<th>Garage</th>
<th>Capacity (Spaces)</th>
<th>Number of Stories</th>
<th>Average Peak Hour Occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Rights Garage</td>
<td>2601</td>
<td>6</td>
<td>94%</td>
</tr>
<tr>
<td>Coliseum Garage (now Demolished)</td>
<td>2400</td>
<td>4</td>
<td>N/A</td>
</tr>
<tr>
<td>Coliseum Lots East and West</td>
<td>571</td>
<td>1</td>
<td>94%</td>
</tr>
<tr>
<td>Union Station Garage and Lot</td>
<td>1145</td>
<td>5</td>
<td>100%</td>
</tr>
<tr>
<td>Grove Street Garage</td>
<td>599</td>
<td>5</td>
<td>67%</td>
</tr>
<tr>
<td>Broadway Plaza Lot</td>
<td>140</td>
<td>1</td>
<td>68%</td>
</tr>
<tr>
<td>Chapel St. York St. Garage</td>
<td>474</td>
<td>7</td>
<td>93%</td>
</tr>
<tr>
<td>City Hall/Financial Center Garage</td>
<td>668</td>
<td>2</td>
<td>93%</td>
</tr>
<tr>
<td>Crown Street Garage</td>
<td>720</td>
<td>7</td>
<td>95%</td>
</tr>
<tr>
<td>Temple Street Garage</td>
<td>1235</td>
<td>6</td>
<td>93%</td>
</tr>
<tr>
<td>360 State St. Garage</td>
<td>467</td>
<td>4</td>
<td>90%</td>
</tr>
</tbody>
</table>

3.5 PROPERTY TAX CALCULATIONS

The results of the property tax analysis of both cities are summarized in Figures 3.3-3.5. Figure 3.3 shows for Cambridge the property tax (normalized by gross building area) of different land uses in a 0.25 mile radius (measured from the centroid of the land parcel) of each parking garage in the study. It shows the property tax per gross building area of residential, commercial, parking lot, and parking garage land uses. In general, parking garages are taxed much more highly than any other land use, except for the Cambridge Center East garage, located in the Cambridge Center district with high priced commercial development, such as the adjacent Aurora Flight Sciences Corporation. Also, residential land use is not taxed very heavily, which is a consequence of the difference in mill rates for residential and commercial uses. The mill rate, or property tax rate per thousand dollars of gross assessment, is $20.76 for...
commercial/parking land uses, but is $8.48 for residential land use. Also, parking lots are taxed by far the least in the city, due to the fact that they do not any building value, and the gross assessment is based solely on the land assessment.

Similarly, Figure 3.4 shows for New Haven the property tax (normalized by gross building area) of different land uses in a 0.25 mile radius (measured from the centroid of the land parcel) of each parking garage in the study. It shows the property tax per gross building area of residential, commercial, mixed use, parking lot, and parking garage land uses. In general, the trends are less finite in New Haven than in Cambridge. The major difference, though, is with parking garages. In New Haven, parking garages are taxed very similarly to both residential and commercial land uses, and in many instances (City Hall, Coliseum, Crown, Grove and Temple)
are taxed even less. Also, residential, commercial, and mixed land uses are taxed similarly, which a consequence of the mill rate is being a standard $38.88 across the every land use. Also, just as in Cambridge, parking lots are taxed by far the least in the city, due to the fact that they do not any building value, and the gross assessment is based solely on the land assessment.

Figure 3.4: Property Tax per Gross Building Area in New Haven

Figure 3.5 shows for the difference between the property tax (normalized by gross building area) of the entire cities of Cambridge and New Haven. It shows the property tax per gross building area of residential, commercial, mixed, parking lot, and parking garage land uses. It is important to note that the data for mixed land use for Cambridge was not available. The
largest difference is the taxation of parking garages in the two cities. While Cambridge taxes parking garages at a rate of $11.29 per sq. ft of building area, New Haven only taxes parking garages at a rate of $1.48 per sq.ft of building area, a more than seven-fold difference. Also, parking lots are taxed higher in Cambridge, but not as staggering of a rate. Cambridge taxes parking lots at a rate of $1.80 per sq. ft, while New Haven only taxes parking lots at a rate of $1.08 per sq. ft, a 66.7% increase. The residential rates are similar, $2.55 per sq. ft in Cambridge to $2.03 in New Haven, though the commercial rates are much different. Cambridge charges an average of $5.85 per sq ft, while New Haven charges only $2.10, a 176% increase. This is most likely due to the differential in mill rates in Cambridge ($20.76 for commercial, $8.48 for residential) and the standard rates in New Haven ($38.88 for both).

Figure 3.5: Property Tax per Gross Building Area Compared by Land Use between Cities
3.6 OPPORTUNITY COST

In the field of economics, opportunity cost is defined as the “cost” (as a lost benefit) of forgone products after making a choice (34). When a parking facility (surface lot or structure) occupies a site that could potentially be occupied by a land use that pays more property tax revenue to a city (namely any land use besides parking), the city is losing a significant portion of their potential tax base via opportunity cost. This is primarily because parking is taxed lower than other uses, which may incentivize the proliferation of parking facilities. Just as this can be solved by manipulating two interrelated variables, parking facility tax rates and the land use of a particular property, the problem was created by taxing parking facilities at too low of a rate and allowing productive land uses to be replaced with parking facilities.

The property tax (normalized by plot area per story) of different land uses for both cities was analyzed and presented in Figure 3.6. It shows the property tax per gross building area of residential, commercial, parking lot, and parking garage land uses.

![Property Tax per Plot Area per Story](image)

**Figure 3.6: Property Tax per Plot Area per Story Compared between the Cities**
The property tax per plot area per story was used to calculate the opportunity cost. First, the total tax revenue for each city from parking lots was calculated using land use data. The total area in each city taken up by parking lots was multiplied by the rate of property tax per plot area per story and then by one story for a surface parking lot. The total tax revenue for each city from replacing all parking lots in the city with commercial use was found by multiplying the total area taken up by parking lots by the rate of property tax per plot area per story for commercial use by four stories, assuming that to be the average height of a commercial building. The same process was done for both residential use and mixed use, which was assumed to be an equal split between commercial and residential use with an average building height of four stories.

Figure 3.7: Opportunity Cost Compared between the Cities
3.7 TEAR DOWN INCENTIVE

Not only do low taxation rates for parking incentivize the construction of parking facilities on presently vacant land, but they also motivate property owners and developers to tear down abandoned or poorly performing buildings to build parking facilities. Whether or not a building contains profitable businesses or residential spaces, a property owner is still taxed according to the gross assessment of the property. Since parking facilities are assessed at significantly lower value (and consequently levee a much lower tax rate), it is financially prudent for a property owner to demolish a building to construct a low tax and revenue earning parking facility rather than maintaining a highly taxed building that does not earn enough revenue to support itself.

Table 3.7: Land Use Documentation along Crown Street Illustrating Conversion of Land Uses to Parking Lots

<table>
<thead>
<tr>
<th>Year</th>
<th>101</th>
<th>103</th>
<th>105</th>
<th>107</th>
<th>109</th>
<th>111</th>
<th>113</th>
<th>115</th>
<th>117</th>
<th>119</th>
<th>121</th>
</tr>
</thead>
<tbody>
<tr>
<td>1913</td>
<td>Residence</td>
<td>Saloon</td>
<td>Deli</td>
<td>Hotel &amp; Residence</td>
<td>Caged Bird Store</td>
<td>Barber</td>
<td>Restaurant</td>
<td>Residence</td>
<td>Club &amp; Residence</td>
<td>Saloon &amp; Office</td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>Rooming House</td>
<td>Electric Supply</td>
<td>Restaurant</td>
<td>Hotel &amp; Residence</td>
<td>Banking</td>
<td>Caged Bird Store</td>
<td>Optician</td>
<td>Hotel &amp; Residence</td>
<td>Wall Paper Store</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1940</td>
<td>Coal Dealer</td>
<td>Sporting Goods</td>
<td>Hotel &amp; Residence</td>
<td>Typewriter</td>
<td>Coal Dealer</td>
<td>Optician</td>
<td>Banking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>Rooming House</td>
<td>Electric Supply</td>
<td>Sporting Goods</td>
<td>Hotel &amp; Residence</td>
<td>Typewriter</td>
<td>Coal Dealer</td>
<td>News and Candy</td>
<td>Appliance Stores</td>
<td>Rooming House</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>Electric Supply</td>
<td>Sporting Goods</td>
<td>Dental Lab</td>
<td>Coal Dealer</td>
<td>News and Candy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>Electric Supply</td>
<td>Sporting Goods</td>
<td>Dental Lab</td>
<td>Coal Dealer</td>
<td>News and Candy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>Entire Space is a Parking Lot for Cars by 1980</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The second order issue with this phenomenon is the observation that, as parking facilities proliferate, local economic decline is exacerbated, and thus a negative feedback loop is created: property owners exchange buildings for parking lots because their buildings are not performing financially, which causes neighboring buildings to perform poorly, motivating the construction of more parking. For example, in Douglas’ Rae’s land use documentation chart along Crown St.
in New Haven depicted above (Table 3.7), one can see how the conversion of productive uses to parking lots (the gray spaces) influences the spread of more parking.

![Property Tax per Plot Area per Story](image)

**Figure 3.8: Tear Down Incentive Along Crown St.**

What we have termed here the “Tear Down Incentive” is illustrated well by the above graph (Figure 3.8). The graph depicts 2011 property taxes for parcels along Crown St. in the Nine Squares area (between York St. and State St.), which contains the same properties documented by Douglas Rae above. Taking into account the intensity of development by dividing the property tax per square foot by the number of stories (and taking parking lots as one story), one can see that parking is taxed the least of all land uses in the area. This is significant when considering the fact that parking accounts for 51% of the plot area of parcels along Crown
St. in the study area. There is clearly a disconnection between land value and what is valuable for use by the city, its residents, and its commuters.

3.8 CASE STUDY: THE COLISEUM

As touched upon earlier, the New Haven Veterans Memorial Coliseum was a special case in the history of construction and urban development in New Haven. It was completed in 1972 and served as one of the primary sports and music venues in the state for some time. It held 11,171 people at full capacity and occupied 4.5 acres of land adjacent to the Knights of Columbus building. It occupied a city block in the southwestern portion of New Haven’s Nine Squares, defined by George St. to the north, North Frontage Rd. along the south, State St. to the east, and South Orange St. to the west. It was a modernistic structure hewn from concrete piers, exposed steel trusses, and brown facing tile. One unique part of its design was the parking garage that was constructed over the arena facility because of the area’s low water table. This was because it was constructed on reclaimed land that had been filled in prior to the construction of the interstate highways during the 1950’s. The low water table ruled out the construction of subsurface parking, which was the current trend in urban parking provision of the time. The raised parking facility was accessible via two helix ramp structures on George St. and State St. A site plan of the building is depicted below.
The Coliseum was officially closed on September 1st, 2002 by Mayor John DeStefano Jr., and subsequently demolished by implosion after much controversy which resulted from public and political disagreements about whether the building should be demolished. During the 1980s the structure of the parking facility had deteriorated to the point where large pieces of concrete occasionally sheared off the facade and dropped onto the sidewalk below, creating a safety issue. Several other major issues also arose, such as the spalling of the helix traffic surfaces, the deterioration of the parking garage slabs, and the corrosion of reinforced steel in several areas of the structure. One of the primary reasons for this deterioration was the fact that the building was never constructed as intended. The Coliseum was originally designed to be
constructed with a roof over the top parking garage level, but as the construction project drew to a close and unintended costs piled up, the roof was left unconstructed to save money on the project.

Another factor that led to the demolition of the Coliseum was the growing competition it faced in similar nearby venues in better condition and with additional entertainment options. The Coliseum was purported to have commercial uses on the ground level to enrich the street life around the structure, but these never came to fruition. The Meadows Music Center (located in Hartford, CT and now called the Comcast Center), the Oakdale Theater (located in Wallingford), and the arenas contained within the Mohegan Sun Resort Casino (located in Uncasville) and the Foxwoods Resort Casino (located in Ledyard) all boasted superior facilities to the coliseum. All these venues have suburban locations with easy access via automobile or bus; meanwhile the Coliseum’s parking facilities and accessibility pale in comparison because of the nature of urban places. All these venues are depicted on a map in Figure 3.10 below.
Figure 3.10: Map of Entertainment Venues in Connecticut

A.) Veterans’ Memorial Coliseum (New Haven)
B.) Comcast Center (Hartford)
C.) Oakdale Theatre (Wallingford)
D.) Mohegan Sun Resort Casino (Uncasville)
E.) Foxwoods Resort Casino (Ledyard)

The high costs of constructing urban parking structures (earlier estimated to be about $36k per space in New Haven) was compounded in the case of the Coliseum by an overly complex design that tried to (literally) balance an enormous parking lot on top of an urban entertainment venue. Much of the urban renewal efforts of the latter half of the 20th century were aimed at competing with suburban amenities, which simply cannot be and should not be done in an urban context. Urban places have their own benefits to offer, but free and copious parking is not one of them.
3.9 **CASE STUDY: 360 STATE STREET**

The development of 360 State Street yielded the largest privately financed residential building in Connecticut and one of the only major new residential construction projects in New Haven in decades (36). Here is a brief background on the development:

In the summer of 2006, the City of New Haven decided to fill in what it saw as a gaping hole in its urban fabric. For over 40 years, the site of the once-grand Shartenberg Department Store had sat, flat and unimproved, as a surface parking lot, the unfortunate consequence of the city’s urban renewal efforts of the 1960s and 70s. For city planners, the continued existence of a run-down parking lot where a New Haven iconic structure had once stood was a reminder of the economic decline of the city in the latter half of the twentieth century, and a cautionary tale about the perils of inappropriate city planning. Yet the site also represented a unique opportunity for large-scale development in the heart of the city’s downtown – an accidental asset that presented a chance to do something new, different, and transformative. After years of waiting for something positive to emerge from the site, many city officials wanted an ambitious re-conception of a long-neglected block. “We were looking for the home run project.” What emerged was 360 State Street, a $190 million, 32-story residential apartment complex with 500 units and plans for a high-end grocery store on the street level. It is the largest private residential building in Connecticut. Perhaps most notably for a site long plagued with construction miscalculations, the building was completed on-budget and ahead of schedule, and has enjoyed a relatively positive response from renters and city resident (36).

360 State Street represents an attempt to heal the damage caused during the urban renewal era to urban density levels and mixed use zoning in New Haven. As mentioned by the above excerpt, the parking lot that sat where the Shartenburg Department store met its untimely demise was a symbol of the damage that suburbanization and urban reconstruction had imposed on American cities. By redeveloping the site into something profitable for the developer and the city – still with plenty of parking – 360 State St. gives us a look at what the future can hold for New Haven if the city is willing to skirt constrictive zoning codes like it did for the now
successful development. The building’s integrated parking garage represents a transition from the truly wasteful urban parking spaces of the urban renewal era to a more context sensitive approach. In the future, transit oriented developments should be able to further dispense with parking spaces so as to encourage alternative mode use, but 360 State Street still represents a step in the right direction.
4 Discussion

4.1 THE EFFECTS OF PARKING TAX POLICIES

The low taxation rates on parking in New Haven (relative to other land uses within the city and Cambridge) coincide with extensive parking facility proliferation. In contrast, Cambridge taxes parking, are on average, over five times more than New Haven per square foot of building area (refer to Figure 4.1), and Cambridge has much less parking coverage. New Haven’s approach to parking policy in the past has been demand driven (like the majority of American cities), while in 1998 Cambridge instituted its Transportation Demand Management Plan (TDM) Ordinance, a policy that seeks to lower travel by private automobile by mandating that new developments seeking to add parking to their sites provide alternative transportation resources, such as transit pass subsidies, bicycle parking, priority carpool parking, and other measures (4). Cambridge took a decidedly more demand driven approach to the transportation needs of the city. This has coincided with social and economic prosperity. Conversely, New Haven taxes parking much less than other uses, and has done little to stave off excessive parking coverage with their demand oriented parking policies. This has coincided with social and economic decline.
The above graph has combined the two types of parking (surface and structured) into one average for each city to further show the disparity in taxation. While residential and commercial uses are taxed comparably, New Haven’s parking taxation rate is clearly out of touch with the market value of the property. Instead of treating parking as a necessary consequence of development or a prudent transient land use— or not so transient in the case of many parcels in New Haven— cities should treat parking as a valuable commodity. If it was treated as any other consumer commodity, market pricing could allocate a fair assessment to the land so it is taxed accordingly to the true value of the land parcel.

Cambridge, on the other hand, has a very progressive parking policy, intentionally limiting the amount of parking in the city. In 1974 Cambridge instituted the Resident Permit Parking Program which required that anyone parking on the street in Cambridge to be a citizen and apply for a parking pass. In 1981 they city changed the zoning code and introduced
maximum parking restrictions, or parking caps, on certain land uses. In 1993 Cambridge released a growth management document entitled *Toward a Sustainable Future* which called for restrictions and higher fees on parking to discourage the use of all parking spaces for long-term commuter parking. Through these progressive policies Cambridge has explicitly adopted the goal of reducing automobile use, recognizing that the city could thrive without ever-increasing supplies of parking.

4.2 PARKING PROVISION VS. SOCIOECONOMIC DEVELOPMENT

As already established, extensive parking facilities coincide with socioeconomic decline. There is a correlation between the amount of parking provision in a city and the socioeconomic status of a city. Parking lots in and around central business districts were intended to save traditional downtowns and thus save the traditional city. Taken to excess, however, their impact was in most instances quite the opposite (*I*).

One issue regarding parking lots and urban development is that parking lots are part of an erosional development pattern. An erosional development pattern is one which involves more demolition and the removal of activities rather than construction and the addition of activities. The act of placing a parking lot in a city, for example, does not reflect an act of creation as much it reflects the act of the removal of existing development. Largely, parking lots are created, through demolition of an existing building, as evidenced by what we’ve termed the “tear down incentive”. [Many parking lots] resulted from violent action, with infrastructure of the traditional pedestrian city destroyed in accommodating the automobile (*I*). As parking lots became more prevalent in city cores, they had negative effects on the socioeconomics of the
area. Downtown business districts were thinned out and redefined by the new voids. It was not new structure, a built form that greeted the eye, so much as new vacancy, specifically the vacancies of new parking lot voids, fraught with the uncertainties of temporary expedience (1). This type of erosional development, which was intended to save the traditional central business districts of cities, ironically had the opposite effect.

Along with the erosional development patterns associated with the addition of parking lots, their lack of aesthetic value further intensified the detrimental impact of too much parking on the socioeconomics of cities. This has to do with the debilitating appearance of parking compared to other land uses. Typically, parking lots carry little aesthetic value. They occupy the gaps between buildings, and are located where other buildings had once been. Unlike other kinds of open space in cities, parking lots did not, by in large, help to weave together an overarching sense of place. Quite to the contrary, they destroyed the traditional fabric of place. Often, in the process, they precluded redevelopment rather than inviting it (1).

There are many factors as to why the addition of parking in cities has debilitating effects on the socioeconomic value of the city. The list is long: mounting traffic congestion downtown, lack of adequate curbside parking, competition of newer outlying business districts, a resulting leveling off and even decline of downtown business activity, accompanying decline of downtown property values, a marginality of redundant downtown property values, a marginality of redundant building stock, rise of a commercial parking industry, and increasing demand for off-street public parking, among other factors (1). In conclusion, limiting parking in the downtown of cities, while encouraging other modes of transportation such as public transit, walking, and biking, are shown to lead to a city with a higher socioeconomic value.
4.3 OPPORTUNITY COST OF ALTERNATIVE LAND USES

Opportunity Cost, as previously defined, is the cost incurred by a city by having parking lots as a land use rather than a land use that produces more tax revenue. The analysis looked at replacing all parking lots in both Cambridge and New Haven with all commercial land use, all residential land use, and a more realistic mix of both commercial and residential land uses. Cities that do not tax parking enough are not only incentivizing the proliferation of parking facilities, but they are losing a large amount of property tax income, as evidenced in. In terms of the economy of the city, this low tax rate on parking makes it attractive for land owners and developers to have parking on their land, as evidenced by the previously mentioned tear down incentive. The more parking land use in a city, the more the city budget is losing in tax revenue, hurting the city economy. In the long term, a city that replaces commercial and residential uses with parking is also creating a negative feedback loop that is destructive to an urban economy.

In addition, the opportunity cost is so high, not only do to the difference in tax rates of the land uses, but also due to many other factors. Replacing residential and commercial land uses have negative social costs, reducing the amount of activities in a city. On the other hand, by increasing commercial land use, there is inherently opportunity for more jobs to be created in the city. The more jobs available in the city increases the likelihood that each citizen is employed, and therefore may lead to an increase in income tax revenue for a city. Also, by increasing residential land use, more citizens can move into the city, providing a larger base for income tax revenue for the city.
4.4 PARKING AND DOWNTOWN REDEVELOPMENT

The trend by the mid-twentieth century was that cities were decentralizing as a result of downtown traffic congestion intensified by a lack of parking in the city core. As parking lots rose in the areas peripheral to central business districts of these cities, land that was previously allocated to residential areas - space to house people- became space to park cars. This trend leads to thinner downtown cores and skyscraper buildings. Although city centers sported many elaborate new office towers during the 1920s, areas peripheral to downtown witnessed only decline; wastage induced by parking lot expansion (1). This thinning of the urban core can be seen in Figure 9.

![Figure 4.1: Thinning out of the Urban Core by 1940](image)

The construction of taller buildings, also known as the intensification of land use-initiated a vicious cycle of inducing more traffic in the city center which leads to greater minimum parking requirements, and the proliferation of parking facilities which leads to further intensification of land use; this cycle can only continue until certain social and economic limits
are reached, the consequences of which Detroit is currently contending with. Nowhere was the thinning of the urban core more evident than in Detroit, MI. What had been one of the nation’s finest streetcar systems was dismantled. In 1965, based in the amount of space consumed, parking dominated the renewed and renewing riverfront. So also did parking ring the downtown, amplifying the process of parking lot intrusion that began in the early 1920s. Perhaps the city’s central business district may have suffered an exaggerated case of parking lot conversion, given the decades of economic hard times suffered by the city. Detroit also suffered from rampant racism that precipitated massive white flight to the suburbs. Throughout Detroit’s downtown many remaining office and retail buildings stood empty in 1999 (1).

Figure 4.2 View of Detroit north from the Renaissance Center, 1977
Expanding industry needed more space for management, with corporate owners preferring to separate office locations from factory locations in part to amplify interaction not only among themselves but, most prudently, with banks and other sources of financing (1). Impressive skyscrapers rose in city cores, and became symbols of power. Many corporations built skyscrapers for their symbolic value, but also for the space they provided. A study conducted by Dong-Eui University in South Korea, Land Consumption Impacts of a Transportation System on a City, concluded that, “A policy of infrastructure expansion to accommodate the increasing number of autos reduces the amount of land available for more fundamental activities that transport is intended to support, not displace. To prevent this displacement, land intensity of areas used for all other activities must increase” (12). Essentially, increasing the amount of land consumed by transportation, i.e. adding parking, causes building uses to become more intense, i.e. skyscrapers, in order to keep the same amount of activities in a city. Most cities have zoning codes designed to ameliorate what was and is seen to be the skyscraper’s most negative spillover effect: parking to accommodate its users (1). With so many people working in these buildings, large amounts of parking were necessary to assuage the demand. Municipalities began to write into zoning codes for skyscrapers that the proprietors needed to provide minimum amount of parking so as to not overload current parking facilities. Of course, what tall buildings inclined other property owners to do, especially those at the peripheries of downtown, was demolish low buildings for parking lots (1). This caused a vicious cycle where parking garages were placed integrally to skyscrapers, taking up room, requiring the need of tall intense buildings to create room for activities in cities.

These minimum parking requirements, which were then imposed on all land uses, have had deleterious effects. Donald Shoup, a professor of urban planning at the University of California Los Angeles, examined this effect in The Trouble with Minimum Parking
Requirements. Shoup says, “Urban planners typically set the minimum parking requirements for every land use to satisfy the peak demand for free parking. As a result, parking is free for 99% of automobile trips in the United States. Minimum parking requirements increase the supply and reduce the price, but not the cost of parking. They bundle the cost of parking spaces into the cost of development, and thereby increase the prices of all the goods and services sold at the sites that offer free parking” (37). He also goes on to explain that parking requirements are just a recipe for more cars. Minimum standards require unlimited free parking, which attracts more cars and leads to less dense development. Shoups says, “Like lead therapy, minimum parking requirements produce a local benefit – they ensure that every land use can accommodate all the cars drawn to the site. But this local benefit comes at a high price to the whole city. This price is paid in the form of traffic, congestion, and a less dense, auto-oriented city” (26).

4.5 TRANSIT VS. AUTOMOBILE SOLUTIONS

The issues involved with needing to provide parking in the center of cities can be solved by reducing the demand for parking. Two ways to reduce the demand for parking are providing viable transit and Park and Ride facilities.

Before parking was commonly placed in city cores, there was a push to preserve the city core and push parking to the fringes of cities. Fringe lots were rationalized in many ways. Parking fees could be set lower than in lots at the heart of downtown, as a function of cheaper land costs. Peripheral parking would divert commuters with daylong parking needs, thus opening up spaces at the heart of downtown for shoppers and others with short-term needs. Accordingly, congestion downtown would be reduced, and buses would be allowed to operate
more efficiently, thus remaining a viable alternative to auto use (1). Although these lots provided shuttle bus services, they were out of sight of the downtown and seemed, therefore, too far away to be convenient. Though with frequent and reliable bus service, fringe parking could work.

Fringe parking lots with transit service to central business districts are known as a Park and Ride facilities. Park and Ride facilities are vehicular parking lots which are located at some intermediate point along the route of a trip being made partially by a second vehicle for the balance of the trip (1). These facilities have become popular in the UK and other European countries where space is at a premium in city cores. There are many benefits of Park and Ride facilities over city core parking. The most important benefit of park and ride is an economic and environmental enhancement of the city core. In political terms, a successful park and ride scheme can also help to win support for other plans for transforming town center environments, such as pedestrianization, which might otherwise be resisted (38). Some vehicle traffic can be removed from the urban road network inside the city core. This provides local congestion relief, reduced energy consumption, and some reduction in air pollution (38). Also, by shifting parking to the city fringe, parking in the core can be removed, allowing for development in its place. The parking space provided at the edge of the city can increase the overall supply, whilst allowing central land to be used for a more economically beneficial purpose (38).

Another more sustainable strategy for removing city core parking would be providing a reliable transit system to reduce auto-dependency. There are many advantages to providing transit over automobile-dependency. The decline in public transit’s share of metropolitan travel has been a nearly universal trend; however, nowhere has it been more precipitous than in the United States (39). Lewis Mumford, in 1964 book The Highway and the City decried the rise of auto-mobile dependency for many reasons. Firstly, he argues that a transportation system cannot
be sustained by one single mode. “The result is that we have actually crippled the motorcar, by placing on this single means of transportation the burden for every kind of travel. Neither our cars nor our highways can take such a load. This over concentration, moreover, is rapidly destroying our cities, without leaving anything half as good in their place” (40). He suggests a balanced system with different modes to meet the different needs of different citizens. “A good transportation system minimizes unnecessary transportation; and in any event, it offers a change of speed and mode to fit a diversity of human purposes” (40). Mumford also argues that the automobile is a very inefficient mode compared to others. “In our entrancement with the motorcar, we have forgotten how much more efficient and how much more flexible the footwalker is. Before there was any public transportation in London, something like fifty thousand people an hour used to pass over London Bridge on their way to work; within a single artery. Railroad transportation can bring from forty to sixty thousand people per hour, along a single route, whereas our best expressways, using far more space, cannot move more than four to six thousand cars” (40).

Lewis Mumford recognized in 1964 the advantages of reducing auto-dependency. He even suggests moving parking to the fringe of cities (i.e. park and ride facilities), citing the economic benefits. “It is on relatively cheap land, on the edge of the city, that we should be building parking areas and garages: with free parking privileges to tempt the commuter to leave his car and finish his daily journey on the public transportation system” (40).
4.6 THE ECONOMICS OF PARKING IN TERMS OF EMPLOYERS AND DEVELOPERS

The automobile as the dominant form of transportation is a force for the communities of the present and future to contend with. The American love affair with the convenience and freedom offered by the automobile is simply too ingrained in American culture to imagine that in the near future auto-dependence will not be the norm in American cities. Therefore, parking will remain an economic concern for some year to come. From the perspective of private industry, parking provision is merely seen as a necessary capital expenditure. Providing ample parking is included in the cost of doing business in most American cities. Employers and retailers universally subsidize parking for employees and customers, passing parking costs along in higher prices for goods and services (1). Even though the cost of parking is paid for by everyone - though this is particularly an unfair system for those who don’t drive - transit and other alternative modes do not seem financially prudent because of the extra out-of-pocket cost, especially considering that most employees and customers own cars anyways (1). If employers and retailers were to also subsidize other forms of transportation, employees and customers may decide to make a different mode choice, reducing auto-dependence.

Parking also has economic impacts on developers. Minimum parking requirements turn parking into an impact fee for developers. An impact fee is a fee paid by a developer to the municipality before permits can be given. Many cities require developers to pay impact fees to finance public infrastructure—such as roads and schools. Parking requirements resemble impact fees because developers must provide required infrastructure – parking spaces – to obtain building permits (41). The cost of required parking is buried in the cost of development, and resembles municipal impact fees. The impact fees implicit in parking requirements are far higher than the impact fees for all other public purposes combined. The fact that they are so high
should make it hard for developers to ignore the high cost of minimum parking requirements. Given the high cost of required parking spaces, planners should not assume that the demand for parking automatically justifies minimum parking requirements (41). Planners who require enough spaces to satisfy the existing demand for parking make the mistake of requiring enough spaces to satisfy the demand for free parking, no matter how much it costs (41). If minimum parking requirements were not so high, then the impact fee would not be as high, and it would encourage further development, creating more tax revenue for cities.

4.7 ACHIEVING A BALANCE

Policies need to be implemented to achieve a balance between parking, residential, and commercial land uses that is profitable for the city and accessible for all citizens.

There are two opposing political views in regards to parking policy for the future. Conservatives, especially ultra-conservatives, tend to resist any restriction by government over what they perceive to be inalienable rights: to move freely, to own and use property, to seek personal success (1). The automobile, which represents a prized possession for most Americans, usually being their second most valuable form of property to the house, is the ultimate symbol of mobility. To a conservative mind, parking should be readily available because limiting the ability of citizens to use their automobiles represents the government restricting personal freedom to use property. Many progressives advocate total elimination of autos in certain kinds of urban area, and indeed, over recent decades, experiments with auto-free pedestrian zones has not been inconsequential (1). They welcome restriction, decrying the wastefulness of an automobile dependent society. Progressives castigate not only the wastefulness of energy in
terms of petroleum use, but also in terms of the wasted urban space taken up by roadways and parking structures.

There exists a middle ground between these two polar opposite opinions. A balance in terms of parking policy recognizes both the wastefulness and detrimental impacts of parking and auto-dependence, but also acknowledges that the infrastructure for automobiles has been heavily invested in and the cost to reverse this auto-dependency is infeasible at this time. Parking should be available everywhere in cities and towns but configured imaginatively in limited amounts to meet specific demands (I). In this way, there is much more of a balance, and the optimal mix between parking, residential, and commercial land uses can exist where a city can reap the most profit from taxes and maintain access for citizens.

A possible solution to balance all land uses and reduce parking in a city is a mixed land use. Mixed land use not only involves the same land being used for both residential and commercial, such as an apartment building with stores in the bottom floor, but also mixing commercial uses such as offices, shops, restaurants, and banks. Mixed land use has many benefits. Mixed-use developments (MXD) can improve suburban mobility and reduce local traffic congestion in at least four ways: by reducing motorized travel; by spreading trips out more evenly throughout the day; by encouraging more workers to carpool and vanpool; and by allowing shared-use parking arrangements to be introduced (42). Motorized travel can be reduced because due to the close proximity, more travel is made by foot and bicycle. Trips are more spread out during the day because the diverse activities in the mixed-use development all have different travel peaks. Mixed use developments also encourage ride-sharing. Unless restaurants, shops, and banks are located nearby, most workers will find it necessary to drive their own cars in order to reach lunch-time destinations and run midday and after-work errands.
Parking can also be shared in a mixed-use development because in most instances the parking demand of different land uses peak at different times.

4.8 AREAS FOR FURTHER RESEARCH

Though much data has been collected for the six cities (Arlington, Berkeley, Cambridge, Hartford, Lowell, and New Haven) studied by our research group, the most conclusive data contained herein - namely the property taxation data - has yet to be collected for the other four cities. To corroborate our findings rigorously, these other cities must be examined in a similar fashion as New Haven and Cambridge.

The idea has also been proposed that a lifecycle cost analysis be developed for urban parking facilities. This could potentially take into account the capital construction costs, annual operation costs and revenues, property taxation, amortization fees, and in the case of the Coliseum, demolition costs. This analysis would illustrate the annual cost of parking on a per space basis in an effort to supply community leaders with accurate and holistic parking costs. Most of the necessary data has already been collected for New Haven, but due to time constraints and research difficulties this data has not yet been collected for Cambridge. To do a comparative life cycle cost analysis, these pieces of data would need to be collected in the future.
5 Conclusion

5.1 THE FUTURE OF URBAN PARKING SPACES

Property taxes are levied on land owners to form the primary revenue source for municipalities in order to provide necessary public services. Property taxes also control the development of land uses and it has been theorized that current property taxation policies are partly responsible for urban sprawl and suburbanization (43). The results of this study indicate that property taxation policies are also partially responsible for the degradation of urban environments in American cities like New Haven. By taxing parking lower than other land uses, cities are incentivizing the development of vacant land in urban areas into parking lots as well as the destruction of buildings in city centers in favor of parking facilities. Progressive cities like Cambridge have not only pursued supply driven transportation models, but tax parking more than other land uses in order to dis-incentivize the proliferation of parking facilities in the city’s urban core.

The converging catastrophes of climate change, peak oil, and capital scarcity will put additional strain on the flawed economic system that supports this kind of erosional development pattern in the near future. In order for city centers to be environmentally, economically, and socially sustainable for the future of the country, the emphasis on automobile use and plentiful free (or underpriced) parking provision must be removed as soon as possible. Even in cities where parking revenues can sustain the operation and the amortization of capital costs, the external costs generated in the form of traffic congestion, air pollution, devalued property, urban sprawl, and a host of other deleterious effects, cannot be paid back on the scale that parking facilities have proliferated to.
Cities like New Haven thankfully have a parking problem to be concerned about. There is still enough urban vitality to motivate the use of their extensive parking facilities. When cities push this erosional development pattern beyond a limit, the parking problem has been “solved” because there is no longer any reason to park in the city. This is the case in Detroit, Michigan, where historic buildings have been retrofitted to be parking garages while the city has filed for bankruptcy. The birthplace of the automobile has become the nation’s most poverty stricken city (44). New Haven is a long way from this and has many resources and community benefits to be proud of.

The research suggest that a balance must be approached in cities like New Haven, and much can be learned about how to enact this from cities like Cambridge. In order to prevent further proliferation of detrimental parking facilities, cities must remove parking minimums, and in some cases institute parking maximums. Cities like New Haven also must tax parking as a land use more than other uses in order to prevent the incentivization of parking as opposed to buildings. Provision of too much off-street parking has proved to be a burden in urban areas, and to mitigate this, cities should tax parking more than other land uses.
6 Appendix

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