An Investigation into Rational Pricing for Curbside Parking

What will be the effects of higher curbside parking prices in Manhattan?

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by

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Chapter 1 – Introduction

Conflicting demands for space, both public and private, are a primary feature of urban areas. During the past century, these demands have been exacerbated by the automobile (Gutfreund 1990; Gray 1996), which requires huge swaths of territory when both in motion and stationary. The dominant method of addressing this conflict has been to accommodate the automobile. Streets were widened and limited access highways were constructed in an attempt to promote motion. On the issue of storage, minimum parking requirements were written into zoning codes, off-street parking garages were constructed and the space adjacent to the sidewalk was provided at minimal or no charge for vehicular storage (Shoup 1997; C. de Cerreño 2002). The accommodation to the needs of the automobile have helped to create the auto dominated cites of the 21st century.

Several papers have examined the issue of proper pricing for curbside space. There is general agreement that higher curbside pricing would benefit cities by reducing traffic, increasing public transit usage and provide a significant source of revenue (Roth 1965; Falcocchio, Darsin et al. 1995; Arnott and Rowse 1999). These papers were either written by transportation economists and are theoretical, while others are based upon transportation surveys for a particular city.

This paper seeks to integrate the information from prior studies and apply them to the Midtown section of the Manhattan Central Business District (CBD), which is generally defined as the area bounded by 59th Street to the north, 34th Street to the south, 8th Avenue to the west and 3rd Avenue to the east. In addition, this paper will publish data

from The Commercial Parking Project, a pilot study being conducted by New York City's Department of Transportation (NYC DOT). This thesis also seeks to determine the amount of parking revenue that can be raised by NYC. Finally, this paper will suggest current technologies for collection and enforcement of on-street parking, and how they might be implemented.

This thesis will focus on Midtown Manhattan, a unique location due to its population density and high public transit usage. Models and data analyzed were generally created for other urban areas. In interpreting these models for NYC parking issues, there may be some incorrect conclusions, due to the different environment where the data was collected. This may be due to the NYC's large variation between off-street and on-street parking pricing, or the possibly high demand for parking when compared with other areas.

Congestion pricing for movement is currently being implemented in several cities including London and Singapore. There is some question as why to study an increase in the price of being stationary, rather than of motion. At first glance higher curbside pricing can be seen a second best alternative form of congestion pricing. Placing higher charges on motion should reduce traffic more directly by discouraging movement during busy periods. The reason this paper will focus on parking rather than movement is twofold. The first part is political, as vehicular movement is a states right issue, while parking is a home rule issue. This means that for New York City to enact a congestion

charge for movement may require New York State approval, while there would be no oversight for raising the parking rates.

The second reason for studying pricing for parking rather than movement relates to the fact that it is an understudied topic. In an effort to bring new knowledge and ideas to the field of planning, this topic is being pursued. As congestion pricing for movement is in use in several locations, hard evidence should be forthcoming of its successes and failures. In the field of parking, congestion pricing is still at the theoretical level and there has yet to be a full scale implementation.

This paper seeks to determine the short and medium term ramifications of increased curbside parking fees. Understanding the long-term effects, when the infrastructure has the opportunity to respond, and change in the face of new cost constraints will not be evaluated. Higher parking fees will monetize search times, making urban areas more expensive, though more efficient, due to lower levels of traffic congestion and the relative ease in finding a parking space near the desired destination. In the short run, increased parking fees may not be emulated in the suburban fringe, which may increase traffic in these areas, as drivers alter their travel patterns. In the long run, it is theorized that a new equilibrium will be reached between urban areas and their suburban counterparts, which will benefit urban areas. It is expected that the findings of this study will be transferable to other urban centers as they share many of the same issues.

Although this research will focus on how traffic will be affected, it will be difficult to anticipate all of the various decisions that will be made by drivers facing new choices.

Finally, this study does not plan on researching the specific effect on lower income groups. As the majority of poor in NYC do not own automobiles, most members of this lower income group will not be adversely affected, but this may not be true of the working poor who rely on the automobile. As members of the lower income groups may be willing to exchange searching time for a free parking space, they may suffer larger losses than other income groups. If this group does suffer severe hardship, it should be left to the municipality to offer relief. This could be in the form of improved public transit to areas currently underserved, or income supports. Ideally the working poor can be supported in a way that does not distort the outcomes for others, and for this reason discounted parking permits should be avoided.

Hypothesis

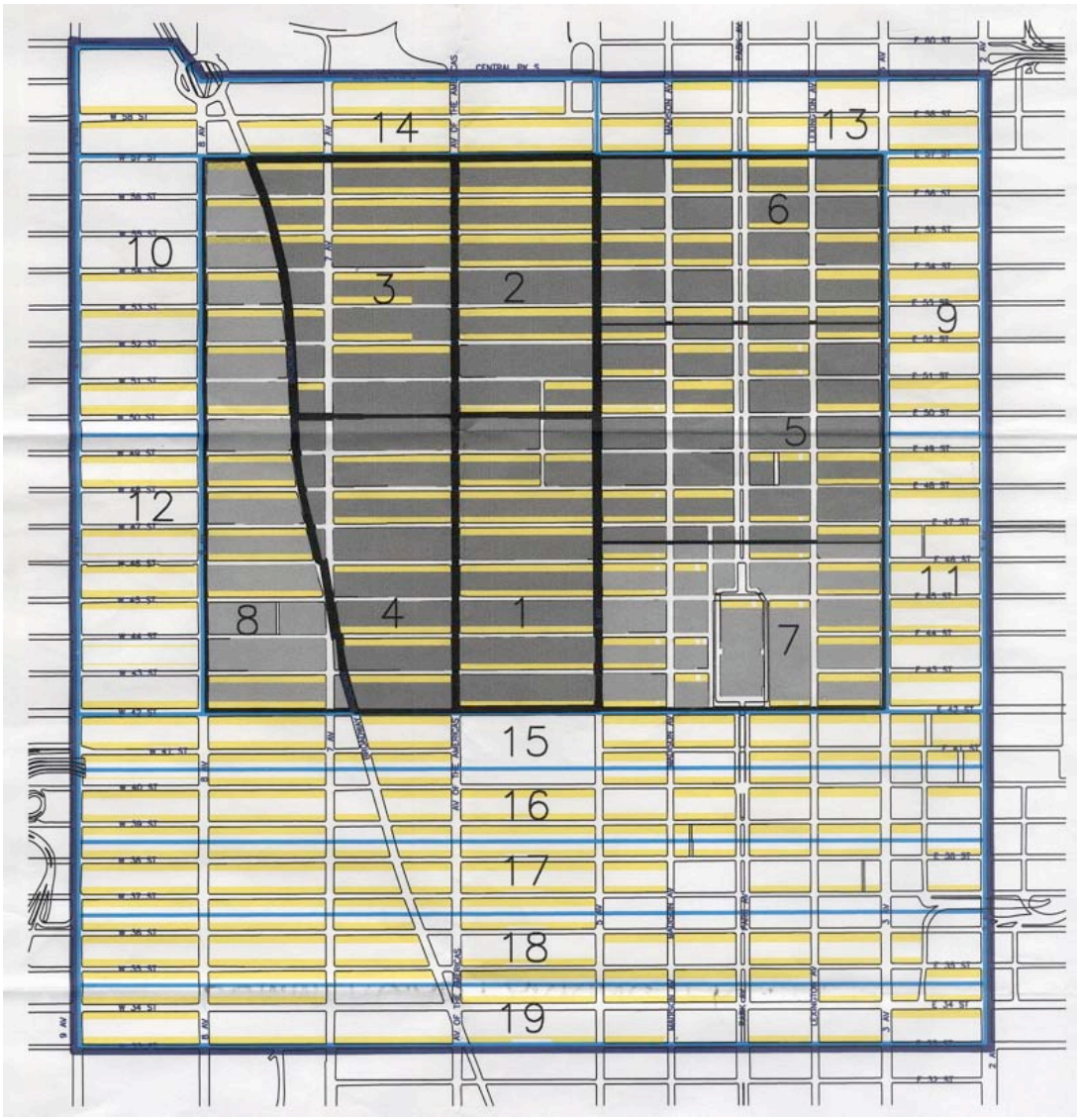
This paper will explore the issues of how city resources are currently allocated. It is felt that higher pricing of curbside parking can provide significant benefits to urban areas, through better use of this scarce resource. As the currently low curbside parking fees subsidize auto travel, higher parking fees should make the transportation system more efficient and reduce pricing distortions. This paper will explore how much revenue higher curbside parking fees can provide for a municipality.

This thesis will follow a mixed methods approach. One source of data is the Commercial Parking Project (CPP), a project currently being conducted by NYC DOT, Bureau of Parking. The CPP area is bounded by the areas 2nd to 9th Avenues and 33rd to 59th Streets in Midtown (figure 2). The project installs Muni-Meters (figure 1) where meters had not previously been present and notes changes in parking patterns. This study targets commercial vehicles during business hours, and converts to non-commercial parking after 6:00 pm.

Figure 1 – Muni-Meter

Figure 2 – Muni-Meter Display

Figure 3 – Map of Commercial Parking Project Area



Commercial / Theater District Regulations

Sectors 1 to 4	43 Street to 56 Street , 5 Ave to Broadway
Sector 5	47 Street to 52 Street , 5 Ave to 3 Ave
Sector 6	53 Street to 57 Street , 5 Ave to 2 Ave
Sector 7	42 Street to 46 Street , 5 Ave to 2 Ave
Sector 8	42 Street to 57 Street , Broadway to 8 Ave

Commercial Only Regulations

Sector 9	50 Street to 57 Street , 3 Ave to 2 Ave
Sector 10	50 Street to 57 Street , 8 Ave to 9 Ave
Sector 11	42 Street to 40 Street , 3 Ave to 2 Ave
Sector 12	42 Street to 49 Street , 8 Ave to 9 Ave
Sector 13	57 Street to 59 Street , 2 Ave to 5 Ave
Sector 14	57 Street to 59 Street , 5 Ave to 9 Ave
Sector 15	41 Street to 42 Street , 2 Ave to 9 Ave
Sector 16	39 Street to 40 Street , 2 Ave to 9 Ave
Sector 17	37 Street to 38 Street , 2 Ave to 9 Ave
Sector 18	35 Street to 36 Street , 2 Ave to 9 Ave
Sector 19	33 Street to 34 Street , 2 Ave to 9 Ave

LEGEND :
LAW BOUNDARY
SECTORS 1 to 6
SECTORS 7 to 8
SECTORS 9 to 19
COMMERCIAL PARKING

June 15, 2002

Research methodologies will also include theorizing about possible ramifications of variable pricing, and how that will affect parking and modal choice decisions. As drivers have various goals, the increase in fees will affect them in different ways. Hensher and King break down the groupings to casual and permanent parkers. Casual parkers are not provided with parking spaces and may be shoppers or salespeople. Permanent parkers are provided with access to a parking space, generally in an off-street parking lot, or are reimbursed for the cost of parking (Hensher and King 2001).

In addition, this thesis will attempt to calculate the total revenue the city can raise, varying the geographic reach of the increased parking fees. Total revenue will be calculated for various pricing schemes. The concept of variable pricing will also be studied in this section, as technology currently allows prices to be raised or lowered easily.

Finally, as variable pricing on curbside space is a form of congestion pricing, material provided by Transport for London (TfL) on their congestion pricing program will be analyzed. It is hoped that this data may yield clues for this study as to the effects of higher pricing on driving habits.

Justification

It is believed that the vast discrepancies in price between public curbside parking and private off-street parking cause inefficiencies to the transportation system. New York City has among the highest off-street parking rates in the country at up to $40/hour, but

on-street parking rates are comparable with that of other cities at $1.50/hour (C. de Cerreño 2002; NYC Department of Transportation-a 2003). This thesis also seeks to explore variable curbside pricing, on which there has been very little written.

In addition, many urban areas have issues regarding their tax base and revenue generation. Cities are continually seeking new revenue streams to maintain and repair their infrastructure. As higher curbside parking fees could both lower the cost of operating a city and bring in additional revenue, it could be a win-win scenario. Negative ramifications of higher curbside rates could "drive" shoppers and businesses away as they find it even cheaper to visit their local "big box" retail location, where parking is nearly always free.

"80 to 90 percent of user costs of driving are fixed… whereas only 10 to 20 percent are direct, out-of-pocket costs that drivers consider when deciding whether to make a trip by car" (Vuchic 1999). This encourages the individual to make use of their cars too much, creating congestion, to the determent of society. In an effort to change this equation, it is necessary to promote policies that require drivers to pay a higher percentage of the cost of their actions. As the American economy is primarily a market based economy, it seems unusual that parking, such a visible and important asset should be distributed on a first come, first serve basis. It is a method that is more akin to the Communist command economy methodology, where if you are lucky or if you have the right connections, you can find a cheap parking space, otherwise you may need to pay an exorbitant price for parking (Vickrey 1992).

One lesson that this study hopes to show is that traffic is optional, not unavoidable. The current transportation system favors the automobile. To the extent that in short to medium length trips, driving is the fastest, cheapest and most convenient way to travel between two points. If America desires to break the dependence on the automobile, it must alter a piece of that equation. Due to the fact that many issues related to transportation are national or statewide issues, cities do not have the power to alter current policies. In contrast, most land use policies are local, meaning higher curbside parking fees are under the purview of urban areas, who may find it as an attractive policy.

Review of the Literature

Parking is a nearly universal planning issue. Every municipality must have a place to store vehicles that enter their jurisdiction. There are few planning issues more visible, as cars are parked virtually everywhere. It is estimated that up to 40% of a typical city's land area is used for parking lots (Childs 1999: xix). In America as a whole, these spaces are provided free of charge 99% of the time (Shoup 1999: 551). Vast resources have been invested into building infrastructure to enable vehicles to travel safe and efficiently. Parking might be considered the poor stepchild of transportation. For all of its importance, parking has been under studied in the field of transportation research (Calthrop 2002: 3). Municipalities mainly address the issue of parking through zoning requirements, pushing the problem onto the owners of private property. It is generally assumed that parking will take care of itself. The subject of parking has not received the same level of study and investment as the movement of vehicles.

Background

The internal combustion engine influenced the course of the 20th century. Installed into automobiles, busses and trucks, it replaced animal power as the main form of transportation. The mass use of vehicles has had a tremendous impact on the layout of cities. One of the benefits of the horseless carriage, is that it does not need to be tended, and therefore can be left just about anywhere. As the auto became more popular, they began to crowd cities with their need for space. Parking became an important issue as vehicles were parked wherever there was space (Vuchic 1999).

The issue of cars crowding city streets was perceived as a problem of not enough parking spaces. The remedy, first mandated in Columbus, OH in 1923 (C. de Cerreño 2002: 6), was to require developers to include off-street parking on their property. Minimum parking requirements are currently employed by nearly all cities in America. These mandatory parking requirements add significantly to the cost of construction and the layout of a city. For example, shopping centers are generally required to provide 5 spaces per 1,000 feet Gross Leasable Area (GLA) which translates to 1,500 sf parking area for every 1,000 sf of GLA. The office rate is about 4.0 spaces per 1,000 sf, or 1,200 sf of parking for every 1,000 sf office space (WSDOT 2003).

Excess demand for parking can also be addressed by harnessing market forces. Instead of increasing the supply of parking, the government could make better use of the space they have. Curbside parking is a scarce resource, but is generally distributed at no

charge. The first mechanism for charging for curbside space was first introduced by Carl C. Magee, who invented the parking meter in Oklahoma City in 1935. The main goal of the meter was to encourage the turnover of spaces, rather than charge market rate for parking (Shoup 2003: 5).

Since then, there has generally been little innovation in the field of parking, aside from improvements in off-street parking garage which have decreased their cost and improved their efficiency, and minor improvements to the parking meter. Mandatory parking requirements have failed to solve congestion problems, and may even have exacerbated them. Although there has been very little change in curbside parking practice, there have been several proposals put forward, advocating for higher parking fees. Columbia University Economics Professor and Nobel Laureate, William Vickrey in his 1954 article, "The Economizing of Curbside Space" first introduced the concept of charging variable rates for curbside parking. He theorized that the price of parking should vary depending upon demand for spaces. "Whenever, in a given neighborhood during a given time slot, fewer than 2% to 5% vacancies are observed over a suitable period, charges should be increased, and whenever vacancies average 10% to 20% charges should be reduced, to zero ultimately" (Vickrey 1991). In addition, Vickrey believed there should not be time limits, as long as nearby spaces are available. In his vision, a system based upon pricing instead of the common policy of rationing, will create a situation where there are always available parking spaces. He wrote charging higher prices for curbside parking will lead to shorter search times for parkers and better flow of traffic.

Other transportation economists have put forth similar arguments. G. Roth in his 1965 booklet "Paying for Parking" wrote: "If the number of parking spaces in an area is fixed, a pattern of prices could be aimed at which would result in a small proportion of spaces in every area being vacant at most times, so that parkers could find places with little difficulty"(Roth 1965: 18). Roth goes forward to propose implementing a "parking tax".

There have been several studies that look at the methods of allocation and use of parking spaces. As drivers rarely pay for parking, the cost of parking is bundled into the cost of goods and services. It is estimated that the construction costs for parking spaces increase the cost of office construction by 27% for above ground parking and 67% for below ground parking (Shoup 1999: 556). This means that everyone pays for parking spaces, but almost nobody pays the cost of their parking spaces directly. This also encourages the use of private automobiles. If parking is pre-paid, why not drive?

In most cities, planning, policy, management and operation of on-street parking is covered by several agencies, which do not always share data. In New York City, these tasks are split between the NYPD Traffic Control Division, NYC Department of Finance Division of Parking Violations Operations, DOT-Parking Control Division, DOT-Parking Bureau and DOT-Traffic Bureau (C. de Cerreño 2002). Many important facts about parking are not even recorded. For example, New York City does not keep a record of the total number of on-street spaces, and only tracks the number of metered spaces (63,000). In Phoenix, AZ and Los Angeles, CA, they do not track the number of on-

street parking spaces at all (C. de Cerreño 2002: B-3). Multiple agency responsibility leads to many items falling through the cracks.

Research indicates that the presence of free parking increases the demand for parking. As the chances of paying for parking increase, there is a decrease in driving, as people shift to transit and carpooling (Transit Cooperative Research Program 1998: 36). Other studies have found that adding additional parking capacity results in inducing more auto related travel (Merriman 1997: 201). Finally a program called "parking cash out" where employees can accept monetary compensation instead of subsidized parking reduced the number of solo drivers to work by 17%, and increased the number of carpoolers, transit riders and walkers/bikers by 64%, 50% & 39% respectively (Shoup 1997: 204).

Parking problems are created when there is a gap between supply and demand for parking space. The traditional solution is the addition of parking spaces, which lead to increased demand, congestion, pollution among other side effects (Salomon 1986: 197). The availability of free parking has also been connected to traffic problems. When too many drivers seek the limited number of car spaces, search times are increased. One study found that in Manhattan during the afternoon, 38% of drivers spent more than 10 minutes searching for a metered space (Falcocchio, Darsin et al. 1995). For cities with severe parking problems, some claim that up to one-half the cars driving downtown during rush hour are cruising for parking (Arnott and Rowse 1999: 98).

One solution to the parking problem is pricing, which can reduce curbside utilization rates, making it easier to find a space. A study was done in Aspen, CO. Prior to the installation of meters, over 95% of all available spaces were normally in use, after installation, occupancy rates declined to about 70%, making it easier to find a space (Shoup 2003: 13).

An alternative to continually providing additional parking spaces is to charge higher prices for the spaces that do exist. A study done in five English cities estimated that doubling the price of parking would decrease vehicle trips to the CBD by 17%, and increase trips by other modes by 10%. In addition, there is estimated to be a 5% reduction in the number of trips to the CBD (Dasgupta 1994). A model created in Portland evaluating parking pricing for people commuting to work predicted that with free parking 62% of commuters will drive alone, 16% will use carpools and 22% will ride transit. If the daily parking charges are $6/day the numbers for SOV, carpool and transit change to 46%, 4% and 50% respectively (Hess 2001: 1). Another study done on the Lloyd District in Portland where parking meters were installed found a drop of 7% in SOV drivers commuting to work (Bianco 2000: 7).

A U.S. Government report stated that "increasing parking prices for employees is more effective in reducing SOV travel than … other pricing strategies" (Transit Cooperative Research Program 1998: 40). Other strategies include improved public transit frequency, improved public transit accessibility, an increase in the gas tax, among others.

Increased parking fees may have some unintended consequences. One study found that higher priced parking induces each person to park for a shorter time, allowing more persons to use parking spaces each day, thereby increasing traffic (Glazer and Niskanen 1992).

Studies have found that there are two main sources of inefficiency in urban transport markets. First, transport prices fail to reflect the external costs of travel, notably accidents and peak-period external congestion costs. Secondly, a large percentage of drivers park for free, particularly at the workplace. It is believed that the removal of market distortions, that efficiency can be restored partially through higher curbside pricing. It is also believed that higher curbside parking fees will work best integrated with a congestion charge (Calthrop, Proost et al. 2000).

To conclude, the presence of low priced parking encourages drivers to demand too many parking spaces. This leads to congestion, as these underpriced spaces are acquired on a first come first serve basis, which forces drivers to invest time to find a low priced space, which may be far from their desired location. Higher pricing for curbside parking will provide several benefits for urban areas, including improved traffic flow, less pollution, fewer parking tickets for commercial vehicles and improved revenue for urban governments.

Chapter 2 – History

> "It is presently recognized that the parking of cars on the public thoroughfares constitutes one of the greatest problems facing the city. In addition to retarding the movement of traffic, parked cars also constitute a fire hazard, interfere with the cleaning of the public thoroughfares by the Department of Sanitation, increase street noises during the night and tend toward larcenies of automobiles or thefts therefrom."
>
> -NYC Police Commissioner Arthur W. Wallander
> New York Times, April 4, 1947

The history of curbside parking rules reveal that the current collection of laws was not the result of an overarching vision into the best use of the miles of roadway, but rather a series of accommodations. By reviewing the history of parking in the United States, with a focus on New York City, we see that cities struggled with the inflow of automobiles, but were reluctant to charge for curbside parking. It appears that cities generally place a low economic value on curbside space, even though this shared area is important to the vitality of a city.

Current parking regulations came into play from a series of decisions made since the popularity of the car began its rapid increase in the 1920s. Initially, there were no parking regulations, the 1930's saw the introduction of the parking meter, the 1940's saw expansion of both off-street parking and meter use and the 1950's brought us alternate side parking. In the field of curbside parking, there have only been incremental changes in the past fifty years.

Initially there were no parking regulations, and drivers parked wherever was most convenient. It was reported in the 1920's that drivers would commute from Brooklyn to Manhattan by driving to their nearest subway station and parking just outside the entrance of the station, a forerunner of "park and ride" (Gutfreund 1990). Regulation of curbside space was started in the late 1920's as the increased usage of automobiles began to impact the flow of traffic. Initially automobiles were seen as a problem, inhibiting mobility of streetcars and horse drawn wagons, leading to the banning of curbside parking on most major crosstown streets of Manhattan: Fulton, Chambers, Grand, 14th, 23rd, 34th, 42nd, 57th and 59th. Other cities were working with similar strategies, as Chicago banned all parking in the Loop district in 1928 (New York Times 1938). During this time, parking violations were required to be delivered in person to the offending driver, making enforcement extremely difficult and towing of cars was the only way to enforce the rules (Gutfreund 1990). Instead of banning parking completely, Paris, France tried banning curbside parking on only one side of the street, with the side alternating by day of the week (McLoud 1929). It is clear at this period, that automobiles were not yet dominant, and parking regulations were being dictated by incumbent modes of transportation.

Parking Meter Invented

On July 16th, 1935 the world's first parking meter was introduced in Oklahoma City. More flexible than parking bans, the parking meter recognizes the value of curbside spaces by placing both a monetary price and time limit on parking. The parking meter was invented and manufactured by Carl C. Magee and was seen as a way to encourage

turnover of curbside spaces. The initial charge was $0.05/hour, which is $0.67/hour adjusted for inflation (Federal Reserve Bank of Minneapolis 2003). As expected, not everyone was pleased with the idea of paying for something that was previously free, and on July 17th, a lawsuit was filed by motorists in Oklahoma City who desired to "jam the mechanism of the city's parking meter ordinance enforcement" (New York Times-a 1935). The following week, a district court ruled that the meters were legal (New York Times 1935), but this was a sign of the future opposition to pricing of curbside spaces. There are two things interesting about the description on the workings of the first parking meter as written by the New York Times:

> This is how the meters work:
> A motorist drives his car into the space blocked off with white lines along the curbing. When he deposits a nickel in the meter, set at the edge of the curbing, a flag flies up, indicating the meter has been "paid."
>
> Then a hand starts moving slowly across a graduated scale. When it indicates the hour is up the flag drops. Policemen may "tag" the car for being in the space without its rent paid. (Associated Press 1935)

On the one hand, it shows how little innovation there has been in the field of parking meters. Mechanical meters in use today function in an identical method to the 1935 version, and computerized meters generally do nothing more than emulate the same functions of the original meter. The other point of interest is the use of the word "rent". Today money placed in a parking meter is referred to as a "parking fee", though "rent" is a more accurate description.

Cars continued to flood into cites as the auto age dawned, but the limited numbers of off-street spaces created severe traffic congestion in all urban areas, but New York City was

singled out as "the greatest public garage in the world" (Yordan 1936). To solve the parking problem, NYC explored ideas such as construction of parking towers or shopping malls with interior roadways in addition to implementation of parking meters. Use of the parking meter spread to about a dozen cities by 1936, early adopters included Miami, Houston and Salt Lake City. Meters were generally accepted as a way for making better use of curbside space where they were adopted (Yordan 1936).

It would take sixteen years of discussion and debate before the first parking meter was installed in New York City, but there were calls for the adoption of meters as early as 1936 by the New York City's Merchants Association (New York Times-b 1936). Three years later, a member of the city government, City Council Member Robert K. Strauss, suggested that NYC experiment installing meters “on one or two streets to ease the traffic congestion" (New York Times 1939).

Installation of meters was strongly opposed by The American Automobile Association (AAA) for the following stated reasons: 1) drivers pay enough in taxes, 2) meters do not relieve traffic congestion, as the curbside is still used as a parking zone 3) the meters are "easily tampered with" and 4) they require people to carry nickels (Yordan 1936). The Automobile Club of New York stated that meters were unconstitutional, undesirable and would not reduce traffic congestion. In addition, the Club was strongly opposed to the "possibility of paid parking" and they felt that the State of New York, "has no power to charge the owners of automobiles for parking in the streets, for any purpose whatsoever, whether it be to raise revenue or to regulate traffic" (New York Times-b 1936). The

concept of paying for parking was not yet ingrained in society and in 1937, the Alabama Supreme Court held parking meters to be "an unauthorized exercise of taxing power" (New York Times 1937).

As the pricing tool was restricted for political reasons, parking problems were permitted to fester and by the late 1930 parking was described as a nationwide problem, where "space-taking" machines were invading cities built before the "motor age". In Washington D.C., the parking problem was described as "out of control", while in Philadelphia and San Francisco it was reported that lack of cooperation by the public stymied all attempts to improve the parking situation. Chicago continued its policy of banning parking in the loop district and was reported to begin studying parking meters, as well building off-street parking for over 28,000 vehicles, including a 25 story parking garage. Miami reported early success with parking meters, but was still overwhelmed during the winter tourist season and considered banning curbside parking in parts of the city (New York Times 1938).

Detroit, as might be expected quickly adopted off-street parking, and by 1938 developed over 900 parking lots with nearly 50,000 spaces. For comparison NYC with fewer than 300 lots, was second in the U.S. The city of Detroit was reportedly being demolished to make way for parking lots, and streets were described as "subsidized parking lots, both day and night" (New York Times 1938).

As the parking meter offered a revenue positive method of dealing with automobile congestion its use spread, and by 1939 meters had been installed in 29 cities and towns in Pennsylvania alone. The Keystone Automobile Club surveyed its members who reported a high satisfaction with parking meters, by a ratio of four to one (Davies 1939). Drivers in other communities such as Wilmington DE, and Washington DC also expressed support for parking meters. Even as members of the club praised the effect of paying for parking, there was still the desire to have something for nothing. While parking rates were one cent for twelve minutes or one hour parking for a nickel, a spokesman for the Keystone Automobile Club stated:

> "It seems to us that there is too great a profit margin in the sale of meters. They could, we believe, be installed at far less cost, which obviously would be reflected in lessened charges against the motorists for their use." (Davies 1939)

This statement brings to light one of the problems with motorist's attitudes toward parking meters. It is in the driver's own best interest to have higher prices to help avoid curbside congestion, but most drivers do not want to pay for a "free good". Higher prices should lead to a higher level of service, as each parker is encouraged to park for a shorter time period.

By 1938 NYC extended the ban on curbside parking to ten east-west streets between 17th and 54th Streets and 3rd and 9th Avenues. At the same time, it doubled the fine for a parking violation from $1 to $2 (New York Times 1938). By 1939, it was suggested that the elimination of curbside parking in all of Midtown Manhattan was the only solution to the congestion the city was facing (New York Times 1939). The shortage of off-street

parking was also being addressed as legislation was passed permitting parking garages in the basement of apartment buildings for use of the tenants (Cooper 1939).

Parking in Manhattan continued to be at crisis level during the war years, and in 1942 the Regional Plan Association (RPA) declared, "For years the city has been greatly facilitating access to its central areas by new bridges and tunnels, parkways and express highways, without giving sufficient thought to disposition of the vehicles after they arrive" (New York Times 1942). Their five-point plan proposed use of parking meters, construction of parking garages, creation of a Parking Authority, changes in zoning to require increased off-street truck-loading spaces and other new techniques. The following year The ENO Foundation for Highway Traffic Control released a proposal which dismissed parking meters as "mere palliatives" and recommended that free parking should be provided, "but only for a reasonable length of time" (New York Times 1943).

Never one to stay out of an auto related issue, in 1944 Robert Moses declared the parking problem "has been exaggerated". His solution to the parking problem was the building of new express east-west arteries to relieve congestion, which was supported by the RPA. Moses also supported a study of parking meters. He stated that public parking garages were not feasible and private enterprise must build the necessary parking facilities (New York Times 1944).

Mayor La Guardia attempted to solve the parking problem in 1945 announcing "to end traffic in one week". His proposal called for the creation of tow pounds, increasing the

fine for parking, requiring that parking summonses be answered in person and establishing parking places at subway terminals with parking charges that are "low and reasonable". Two days later, the front page of the New York Times read, "Motorist Ignore Ban on Parking; Few Places Vacant Despite Fines" (New York Times-a 1945).

To people in the trucking industry the solution was clear-cut, simply ban private cars from parking at the curb. Truckers felt parking meters would only add to the congestion, as car owners would feed the meter. "Those people have three methods of transportation at hand, the bus, the subway and taxi, while the mass movement of merchandise has but one, the truck" (New York Times-b 1945). To salesmen, parking meters with a 15 to 30 minute limit seemed an ideal solution (Williams 1949).

New York City made incremental progress toward installing meters in 1946 when it received permission from Albany to install parking meters with the passage of the Conrad-Crisona bill. The bill permitted the New York City Council to "order the use of parking meters and charge a fee for parking" (New York Times 1946). Even with the permission of the state, the city was not ready to tackle this delicate issue as NYC's Mayor O'Dwyer stated, "installation of parking meters is not part of the city's tax or police program" (Egan 1946).

By 1949, Mayor O'Dwyer's administration realized the police were unable to deal with the growing traffic problem and created a Traffic Commission. Appointed to the commission were two traffic engineers from Detroit. The goal of the commission was

both to explore to "feasibility of installing parking meters" and the "feasibility of a Parking Authority for off-street parking" (New York Times 1949). This appeared to be an attempt to push the decision of installation out of politics and into the hand of traffic experts.

Resistance, and lack of understanding into the workings of the parking meters was still prevalent in 1949 as the 5th Avenue Association stated that, "it needed every square foot of sidewalk space… it would be a grave mistake to encroach upon the limited space with meters (New York Times 1949). Meanwhile, Port Authority economist Nathan Cherniack was in favor of installing meters, but did not feel they would provide any relief for traffic congestion. Mr. Cherniack proposed cross subsidization, possibly as a way to make charging for curbside space more palatable, "If the profits [from meters] are devoted to off-street parking facilities, far reaching good is in the making… the money collected from meters, after the upkeep expenses and deducted be utilized for off-street parking requirements and no other purpose" (Pierce 1949).

Parking Meter Introduced in New York City

Finally, on September 19th, 1951 over fifteen years after their invention, the first meters were installed in Harlem on 125th Street. The initial price was fixed by law at $0.10/hour (Ingraham 1951), which is about $0.71/hour when adjusted for inflation (Federal Reserve Bank of Minneapolis 2003). Meters were regarded as a success almost immediately and several days after installation, a local patrolman reported, "I've never seen so many empty spaces on 125th Street before" (New York Times 1951).

As there was still an imbalance between the number of cars in the city and the number of off-street spaces, in 1951 the City Planning Commission recommended that all apartment buildings include off-street parking, and in 1953 it was proposed to require all commercial buildings to include off-street parking (Stern, Mellins et al. 1995). These spaces would provide a location for cars to park off-street, but the executive director of NYC's Traffic Commission T. T. Wiley, still did not understand the economic value of the automobile when he stated in 1954, "We've no intention of encouraging short-term parkers to bring their cars into the very heart of town" (Stern, Mellins et al. 1995). He stated this belief as he oversaw the installation of 26,000 parking meters in New York's business districts, which when properly enforced should encourage short-term parking. The goal at the time was to build off-street lots on the periphery, and not to encourage driving through the center of the city.

Another piece of the New York City's parking regulations, alternate side parking, was also developed in the early 1950s. Alternate side parking is a regulation enacted by the Department of Sanitation, to keep the streets clean. As storage of vehicles curbside became standard practice, filth began to pile up along the curbside (New York Times 1950). In 1954, the rules were still attempting to tame the auto, as there existed a one-hour parking rule, which limited parking on unposted streets to one hour. Due to the shortage of off-street parking it was estimated in 1954 by the NYPD that there were 750,000 illegally parked cars every night in New York City (Ingraham 1954).

In the 1960s the point of view shifted, and NYC stopped trying to fight against the automobile and started to accommodate. Overnight parking was permitted, and the city built a series of Municipal parking lots. These changes provided greater opportunities for both for residents and for commuters to use a car in the city. Today thousands of people take pride in knowing how to get around parking policy. Countless hours are invested into performing the "alternate side shuffle", or cruising for a low cost curbside space.

With an understanding of the history of parking policy, it seems apparent that modernization of this system is needed. Parking is permitted on-street simply because the immense flow of cars had nowhere else to go. Parking fees are generally not charged because drivers did not want to pay them. What is needed is a new system to take into account a broader understanding of urban transportation issues. The car should be embraced, and the value that others are willing to place on its use should be noted. Using concepts of value pricing and an understanding of the importance of urban space, we can streamline the arcane parking regulations and improve the transportation network in untold ways.

Chapter 3 – Economic Rationale for Higher Curbside Parking Prices

> One of the biggest problems facing contemporary society is how to allocate limited resources when the demand for them is virtually unlimited. In theory two methods are available:
>
> a) to put the goods and services up for sale or hire, and allocate them to buyers or hirers prepared to pay the most;
>
> b) to allocate resource to people who are considered to be in greatest need of them by a public authority (Roth 1965: 10)

From the view of an economist, the outlook is fairly clear, the current method that New York City uses to distribute curbside space is inefficient. In many places, the curbside is provided free of charge, which promotes the needs of the long-term parker over the needs of the short-term parker. In many places, the curbside has strict time limits, which promote the needs of the sort term parker over the long-term parker. The curb is generally priced below the rate at which the market will bear, which encourages overuse and overcrowding. The following chapter will explain the economic rationale for raising the price of curbside parking.

To begin, curbside parking is a scarce commodity in the dense urban fabric of cities, what makes it scarce is that it would be expensive to increase the supply (Roth 1965: 16). It is also a private good, meaning that only one person can use it at a certain point in time, and the benefit of parking is not affected by the number of others who wish to park there (Glazer and Niskanen 1992). In certain districts there is excess demand over supply for this limited resource. If we view the space at the side of the curb as a valuable resource, rather than a perk provided to car owners we can begin to improve the current inadequate situation.

There are three general methods for the allocation of goods: a) 'first come, first served'; b) 'time limitation'; c) 'pricing' (Roth 1965: 18). 'First come, first served', as the name implies is the free distribution of the commodity. This is the most commonly used method for the allocation of most curbside spaces in the United States. Free parking favors people who arrive early, and leads to a pattern of outward parking, in which the most desirable spaces, located in the center are filled first and later arrivers park further from their desired destination (Arnott and Rowse 1999). 'First come, first served' also encourages the practice in New York City known as the 'alternate side shuffle', where drivers store their cars on street, moving it only upon the requirements of the Sanitation Department's Alternate Side Parking Rules. Recent revisions to the Alternate Side Parking Rules shortening the time frame in which parking is restricted have further encouraged exploitation of the "alternate side shuffle". This method discriminates against short-term parkers such as shoppers and delivery vehicles. Parking permits for residents are sometimes added to 'first come, first served', further inconveniencing short-term parkers.

The second method known as 'time limitation' encourages turnover. This method places strict time limits, typically one or two hours, on the time that a vehicle can be parked in any one location. Although from an urban planner perspective, the creation of turnover seems a positive outcome, economists disagree. They ask why is it better to have eight cars in one spot per day, than one car for eight hours? "Do we say that it is more in the

general interest for seven people to be able to stay at a hotel for one night each then for one to stay for a whole week"? (Roth 1965: 18)

The third method, 'pricing' can achieve the outcomes of turnover in a better fashion, through the use of economic incentives, rather than strict limits. Drivers will move from their high priced spot once their task is complete, freeing the space for the next driver. Proper pricing for the curbside might be analogous to the way taxicabs are priced in New York City. Most taxicab users try to minimize the amount of time they spend in a taxi due to the fact the meter is running. In emergencies, some users ask the driver to wait for them while they perform a task, but most allow the taxi to continue on its path, with the understanding that another taxi will come along when they need it. Care must be taken not to set the pricing too high, but Vickrey recommends the price should be based on the "marginal social cost of space occupancy in terms of impairing the ease with which other can find a convenient space" (Vickrey 1995).

Besides 'first come, first served', the most common practice of rationing curbside spacing is by using a parking meter. The parking meter uses a combination of time limitation and pricing, but as the fee is normally far below the market clearing rate, the meter is primarily a way to enforce 'time limitation'. Carl C. Magee developed his 'timing device' with the goal to encourage turnover of curbside spaces, which would allow many persons to visit the nearby retail locations. Although the meter has been wildly successful and can be found in the four corners of the globe, from the economist eye, "such regulations

are, almost necessarily, highly inefficient, in the rationing of parking space" (Vickrey 1954).

The failure of curbside allocation through the use of the parking meter is apparent in the low level of service that is currently being provided to the motorist. As this is primarily 'time limitation' along with a low fee for the use of the curb, drivers pay a high price in the cost of time. Current low pricing for curbside spacing promotes the act of searching for a parking space know as 'cruising'. Many people would prefer to pay to park quickly than spend time searching for a free space (Roth 1965: 12). Aside from the motorist, the residents of the city pay a high cost in the congestion and pollution caused by these excess miles driven.

In most U.S. cities, parking is both underpriced and oversupplied, and represents one of the largest subsidies in urban transportation (Vuchic 1999). As parking is underpriced or free in most locations, when analyzing on-street parking, Donald Shoup points out that "What makes sense for each individual driver is bad for the community as a whole"(Shoup 2003). He believes that curbside parking is suffering from a problem of the "asphalt commons". As drivers compete for the scarce resource of space, "overgrazing" occurs. People are encouraged to overuse parking, and become protective of their space. Anecdotal evidence points out that drivers with a free curbside space may either put off their trip or take car service to hold onto their space. This causes congestion on the curbside, as there is no incentive to leave your space quickly. As with the traditional New England commons, overgrazing forced a change, as there were too

many animals in the herd to be sustained. Over-parking is forcing change in the way the curbside space is managed.

Economist Henry George was in favor of land taxes, as they are the most appropriate form of local taxes. Parking spaces are simply short-term rentals of land. George was in favor of land taxes since, "it falls only upon those who receive from society a peculiar and valuable benefit" (Shoup Quoting George). In addition, he predicted that taxing land might lead the owner to use their land for the "highest and best use". Roth suggests that charging "at least the economic rent for the use of the land" (Roth 1965: 10), or the rent the property would generate if leased on the open market. This will adversely affect parkers who rely on the free parking, but will in the long run provide significant benefit for the city.

Economist William Vickrey, pointed out that parking "charges should be based on the added difficulty that occupancy of a space imposes on others seeking to park" (Vickrey 1991). He felt that the price of parking should vary depending on demand. Vickrey theorized that there where there was a very low vacancy rate (2% to 5%) consistently in a certain area, parking charges should be raised. If there is an excess of spaces (10% to 20%), then the rate for parking should be decreased, even to the point where parking is free, if that is the demand at the time (Vickrey 1991).

The parking meter, as we know it, was not favored by Vickrey due to the fact that variable pricing would lead to a better outcome. "Price rigidity leads alternately to underutilization of the more convenient spots and to preemption in peak periods by those with fortunate time patterns of use, making it difficult or impossible for late-comers to find space"(Vickrey Undated).

Vickrey felt the entire structure of on-street parking should be altered:

> "Instead of being entirely free or else partly rationed by time limits and charged for at flat rates by mechanical parking meters, should be charged for without arbitrary time limits at rates varied according to time and place in such in such a way as to assure that a small number of vacant spaces are nearly always available for those with a sufficiently urgent need to warrant their paying the going rate. In principle the charge should represent the short-run marginal social cost of occupying the space, consisting of the probable inconvenience imposed on others in terms of having to spend more time searching for a space or having to park further from one's destination, or to give up entirely on the use of a car for the trip" (Vickrey 1992).

Higher charges for curbside parking may have little impact on road congestion levels (Calthrop 2002), or by allowing more people to use a given amount of curbside space may actually increase congestion (Glazer and Niskanen 1992). Many people prefer paying to queuing, and it is therefore wrong to suppose that the interests of car users as a whole would be best met by forcing them to queue for free or cheap (subsidized) parking places (Roth: 13).

"Underpriced curb parking creates the wrong kind of crowding-too many cars and not enough customers" (Shoup 2003: 2). The high usage rate of the curbside space is a factor

of both the convenience of curbside parking and the price advantage. In New York City the first 1/2 hour of off-street parking typically cost between $6.00 and $10.00, when compared with less than $1.00 for on street parking. This leads to drivers cruising for a space, which can be envisioned as a mobile queue of cars searching for a space. A 1996 study found 44% of people in Manhattan south of 96th street spent more than 15 minutes searching for an on-street space. Of those 13% reported spending more than 30 minutes searching for a space (New York City Department of City Planning 1996). A 1993 study found that cruising times in Manhattan range from approximately 8 to 14 minutes per vehicle (Falcocchio, Darsin et al. 1995). This cruising not only leads to additional congestion, it also creates significant amount of pollution. The numbers can get quite large, when you multiply the cruising time by the typical turnover of 3 to 7 times per day (Edwards and ITE. 1999) or 8 minutes times 3 cars/space/day or 24 minutes per space. As a typical block contains about 60 spaces, this comes to 1,440 cruising minutes (24 hours).

"If on-street parking is cheaper than off-street parking, cruising is individually rational. Collectively, however, it congests traffic, wastes fuel, causes accidents and pollutes the air" (Shoup 2003). Increased parking fees will have two effects, it will reduce the length of time each person parks, and reduces expected waiting time (Glazer and Niskanen 1992; Calthrop 2002). The underpricing of curbside spaces creates disincentives to the individual to do what is good for society. The simple act of changing the economic incentives for the driver will alter his attitudes toward curbside parking and improve the transportation network. There is the potential that higher pricing will deter casual parkers

from entering the city. This may hurt the city economically, as these parkers may prefer to visit a strip mall, where the price of parking is generally bundled into the price of the goods. Alternately, higher pricing for on-street parking may reduce overall demand for parking, and lead to a lower prices for off-street parking. These lower prices may improve the cities economy by lowering the total cost of driving in the city. It is also possible that the absence of free parking will encourage higher value uses of curbside space, improving the business climate in the city.

Chapter 4 – NYC Data Analyzed

This chapter will analyze data collected in the Midtown Manhattan section of New York City, America's premier Central Business Districts (CBD). It contains Times Square, the Garment District, Grand Central Station and the nation's largest concentration of commercial development. The physical structure contains a concentration of high-rise buildings, including some of the worlds tallest (Empire State, Chrysler and Citigroup). Commercial enterprises abound, the streets are lined with stores and restaurants, on both the avenues and streets. Some of the city's most valuable real estate can be found in this area, with rental prices ranging from $30 to $65/sf (Crain's New York Business 2003). Off-street parking can cost upwards of $40/day, the curbside is continuously congested, and double parked cars are not uncommon.

In 2000 The New York City Department of Transportation, Bureau of Parking (NYC DOT, BOP) began a study in the area to improve the situation for curbside parking called the "Commercial Parking Project." Prior to the study, parking was generally permitted on one side of cross-town (east-west) streets for commercial parking only. Areas were posted with signs reading, "No Standing Except Trucks Loading and Unloading". This signage allows commercial vehicles to park, "expeditiously making pickups, deliveries or service calls…between the hours of 7 AM and 7 PM" (NYC Department of Transportation 2003). As there is no parking time limit, ticketing of vehicles is difficult.

Figure 4 – Sign in Commercial Parking Project

In an effort to improve the parking situation, the Commercial Parking Project (CPP) was instituted in October 2000, between Broadway, 42nd Street, 5th Avenue and 57th Street.

Pay-and-display Muni-Meters were installed, which permitted parking at the rate of $1 for 1 hour, $3 for two hours and $6 for three hours (NYC Department of Transportation-a 2004). Rates were then increased on April 7, 2003, and now read, "commercial vehicles will be charged $2 for one hour, $5 for two hours and $9 for three hours of parking for loading and unloading. In most of the

commercial areas the hours in effect are 7 AM to 6 PM Monday through Friday" (NYC Department of Transportation 2003).

What follows is a preliminary analysis of some of the data collected by NYC DOT, BOP. Data was collected before and after the installation of the meters. The addition of the meters both increases the ease of enforcement and adds a monetary value to the parking space. The fees being charged are below the off-street parking rates, but price is irrelevant for most delivery and service vehicles, as they must park on the curbside to perform their job properly. One area of concern is that enforcement was increased in 1999 with the start of the CPP. The recent increase in ticket prices took place November 12, 2003 (NYC Department of Transportation 2003) and do not have any bearings on the findings.

NYC DOT conducted parking surveys, where teams would monitor vehicles parking along the curbside at half hour intervals. They collected type of car and license plate information. With this data it is possible to determine how many vehicles are parked over the time period, as well as duration of stay. A random survey of blocks in the CPP was amalgamated in an attempt to determine what changes, if any, occurred in parking patterns. One area of concern relates to the fact that different blocks were studied, at different times of the year. Parking density has seasonal variation and is generally greater in the spring and fall months. There are also different patterns based on days of the week, as Monday and Friday experience different patterns than midweek (Tuesday,

Wednesday, Thursday), and differences based on weather conditions. All the listed blocks are within the study area, and will provide a broad overview of changes.

The following chart displays the results of 1,437 vehicles in the "before" study and 2,520 vehicles in the "after" study. The "before" study surveyed thirteen blocks, while the after study observed twelve blocks. The wide variation in the number of vehicles is due partially to block length. There is no correlation between the number of cars who used the blocks, as the different blocks have different capacities, which is determined by length minus locations where parking is not permitted due to hydrants or curb cuts. In addition, illegally parked cars were not included in these numbers; only parking that occurred in legal spaces was counted in this portion of the study.

Table 1 – Amount of Time Vehicles Reside at Curbside

Time in Hours residing at curb	Prior to the Installation of Meters	After the Installation of Meters
0.5	54.00%	59.48%
1.0	73.83%	76.27%
1.5	81.28%	84.01%
2.0	86.36%	88.53%
2.5	89.56%	91.90%
3.0	91.65%	93.97%
3.5	93.18%	95.91%
4.0	94.71%	96.98%
4.5	95.55%	98.02%
5.0	96.66%	98.53%
5.5	97.22%	98.85%
6.0	97.98%	99.21%
6.5	98.68%	99.52%
7.0	100.00%	100.00%

The results appear to validate the conclusions that the installation of meters will result in shorter parking durations. The results showed an increase of approximately 10% in the number of vehicles that parked for 1/2 hour or less, as the percentage increased from 54% to 59.5%. The initial 10% increase shrinks as the day progresses.

One block was selected for in-depth study. West 45th Street, between 5th and 6th Avenue (figure 3) was selected at simply due to the fact that data was available both before and after the installation of meters. The first date of observation was May 8, 2001, with the second observation taking place on April 4th, 2003. There are several areas of concern

for this portion of the study. First of all this block contains a consulate, in which diplomats are permitted to park for an unlimited amount of time, which was consistent in both readings, but will serve to raise the average parking time compared with non-consulate blocks. In addition, the curb conditions are unknown, as construction may have altered the number of spaces available.

Figure 5 –

Consulate Sign West 45th Street

Figure 6 – West 45th Street, between 5th and 6th Avenues

The numbers for this block do not hold up to our expectations. The total number of vehicles that parked decreased from 224 to 182 after the installation of meters. Duration of vehicles parked less than 1/2 hour decreased significantly from 125 (55.8%) to 84 (46.2%). This may have been affected by four tractor trailers trucks parked on April 24, 2003, as none were reported to have parked on May 8, 2001. The tractor trailers were parked for a total of 11.5 hours (7 hrs, 3 hrs, 1 hr, 0.5 hr respectively). As the length of a tractor trailer ranges from 40 to 60 feet, one tractor trailer equals two to three cars, this appears to have significantly altered our results.

One positive change is curbside occupancy, which was over 100% for eight readings before meters and only four readings after meters. In 2001, 100% capacity was reached at 10:00AM and remained at that level until 1:30PM, a period of 3.5 hours. In 2003, the longest period of 100% capacity was one hour.

Table 2 – Analysis of Parking Patterns

	May 8, 2001				April 24, 2003				
Time	# of cars	Occup. Rate	Total Illegally Parked		# of cars	Occup. Rate	Total Illegally Parked	North Side	Double Parked
8:00 AM	11	34.38%	2		20	62.50%			
8:30 AM	16	50.00%	3		27	84.38%	2	1	1
9:00 AM	19	59.38%	1		31	96.88%	2	2	0
9:30 AM	27	84.38%	5		32	100.00%	3	1	2
10:00 AM	35	109.38%	6		29	90.63%	2	2	0
10:30 AM	32	100.00%	7		32	100.00%	0	0	0
11:00 AM	37	115.63%	12		28	87.50%	2	1	1
11:30 AM	35	109.38%	8		29	90.63%	1	1	0
12:00 PM	36	112.50%	10		29	90.63%	1	1	0
12:30 PM	35	109.38%	15		29	90.63%	4	3	1
1:00 PM	33	103.13%	12		28	87.50%	2	2	0
1:30 PM	31	96.88%	7		30	93.75%	2	0	2
2:00 PM	30	93.75%	16		33	103.13%	3	1	2
2:30 PM	28	87.50%	12		34	106.25%	10	2	8
3:00 PM	28	87.50%	12		30	93.75%	4	3	1
3:30 PM	33	103.13%	15		27	84.38%	6	5	1
4:00 PM	26	81.25%	10		20	62.50%	2	1	1
4:30 PM	26	81.25%	14		24	75.00%	0	0	0
5:00 PM	24	75.00%	12		22	68.75%	1	0	1
5:30 PM	28	87.50%	17		23	71.88%	0		
Totals	**570**	**89.06%**	**196**		**557**	**87.03%**	**47**		

On a positive note, the number of illegally parked vehicles decreased by 75% after the installation of meters. This is partially due to the increase of enforcement of the parking rules, and partially due to the availability of legal spaces. Overall there were 196 illegally parked vehicles before the start of the CPP, but only 47 afterwards.

What can explain the failure of the numbers to add up the way we expected? Why was the drop in illegal parking so dramatic? How can it be that fewer cars used the curbside after meters were installed? As the sampling size was one, due to the limitations of the data, we can suggest that this is an area for future research. Given the sample size, the

presence of tractor trailers may have had a larger effect on the outcome that might have been the case otherwise.

However, in a review of the aggregate data, our expectations were met. It was found that by applying a charge to an area that did not previously have time limits the amount of time parked did decrease by approximately 10%. As the consolidated data has a much larger sample size, it should be more reliable. Further research attempting to control for more variables should be performed to further validate this hypothesis.

Chapter 5 – What are the Expected Costs and Benefits

This paper seeks to answer the question, what will be the overall effect of higher curbside parking charges for the City of New York? One figure that can be estimated is the amount of revenue that can be generated by implementing higher curbside parking prices. The input needed is the total number of curbside spaces available. Unfortunately, the City does not keep track of curbside spaces, but only metered curbside spaces (approximately 62,500) (Bloomberg 2004). Neither the total number of curbside spaces in the City nor in the survey area could be located. One figure that was found is the distribution of on-street parking spaces by Community District. An agglomeration of Community Districts Four, Five and Six covers the area from 14th Street to 59th Street, ranging from the Hudson River to the East River. Within this area there are a total of 13,590 potential spaces. As of 2002, only 2,890 of these spaces were metered (Rose 2002).

There are many different ways to raise parking fees, all of which provide certain benefits and drawbacks. The simplest method, very similar to the program currently employed by Transport for London (TfL), is a flat fee per car per day. For example, if all current laws and regulations were kept in place, but a new $5 fee added for the privilege of parking on-street, the resulting revenue would be fairly easy to calculate. As there are 13,590 spaces in our expanded area, taking a baseline of no turnover, or one car per space per day, would raise $24,801,750/year. A conservative estimate would liken curbside space to "customer parking", meaning turnover of three to seven times per day (Edwards and ITE. 1999). This would then bring estimated revenue figures from $74,405,250 to

$173,612,250/year. Just for the sake of discussion, we will expand the area to include all of Manhattan south of 96th Street on the East Side and south of 110th Street on the West Side, where there are a total of 50,084 available spaces (Rose 2002). Based on the same calculations estimated revenue is $274,209,900 to $639,823,100/year. These fees will act as a congestion charge in a similar fashion to the TfL model, but is not a total, but rather an addition to the current fees raised through parking. As some drivers always park off-street, they will not be affected, but most automobiles entering the zone will be affected.

When trying to determine the effect of this increased charge, we can first extrapolate some of the results from TfL, where they compared the years 1999 and 2004 and found that the introduction of their congestion charge of £5/day ($9.15 on 3/4/04) lead to a 4% decrease in auto use, coupled with a 4% increase in public transit usage. In addition, there was an increase in the total number trips into the city from 24.8 million to 26 million (Transport for London 2004). The statistics show a clear shift from auto to public transit. Raising the rates for parking may have similar implications for NYC. A further study found congestion charges work best when coupled with higher parking charges (Calthrop, Proost et al. 2000).

In addition, as higher parking rates will affect driver's decisions, it is important to look at who is the most price sensitive to changes, and how they will respond to increased prices. It is expected that persons who pay for their parking costs directly are the most sensitive to price and will most likely leave their car at the fringe or beyond the CBD. People with higher incomes and individuals attending business meetings or on an expense account are

more likely to park in the CBD. Shoppers are believed to park in the CBD, but are somewhat sensitive to price, and are willing to do some walking (Hensher and King 2001). One other aspect to be considered is that people are willing to walk or drive to save money, meaning that higher parking rates will not necessarily cause people not to visit the area, but will probably alter their parking patterns (Lambe 1996).

Drivers have a choice when driving into a city, they can stop at the edge of the CBD and look for a free spot and then walk or take transit the remainder of the trip, or they can drive closer to their destination and pay the appropriate fee. A driver may also choose an intermediate location. Drivers choose the location that provides the highest value for themselves. Research in the Sydney CBD showed that a 10% increase in the price of parking will result in a 5.4% decrease in demand for central CBD parking, and 10% decrease in demand for spaces elsewhere in the CBD spots and 4.8% decrease for spaces for spaces at the fringe (Hensher and King 2001). The high curbside utilization in Midtown Manhattan shows that there is excess demand. If the results from Sydney are transferable, we estimate that every 2% fee increase will reduce demand by 1%. As most parking charges are $1.50/hour an increase to $1.65/hour will hypothetically result in a 5% reduction in demand. Due to the fact that there is a huge price discrepancy between off-street and on-street parking, and free parking also exists, the reduction in demand may not be as great as expected.

As New York City has an extensive public transit network, nearly all commuters traveling to the NYC have other options besides driving via automobile, up to the

systems capacity. The cost of parking has been shown to have an effect on their modal choice. In Portland OR, it was discovered that a parking charge of $6/day would result in a 21% decrease in the number of cars driving into the CBD. Most of this decreased demand for parking is shifted to public transit – providing a very desirable outcome for the City. Increased transit ridership leads to increased revenue, increased parking fees provide additional revenue at the same time, this will be accompanied by a reduction in traffic, as there are fewer cars entering the CBD (Hess 2001). These figures are more conservative than the numbers determined in the Sydney study, and may well be more applicable to New York City.

NYC Traffic Volumes

As of 2000, 825,000 vehicles entered the CBD Hub, defined by NYMTC as Manhattan south of 59th Street (New York Metropolitan Transportation Council 2003). This number is up from 761,000 in 1990 and 648,000 in 1980. If the estimates previously mentioned result in a 5% to 20% reduction in vehicles per day, that translates to a reduction of 33,000 to 165,000 vehicles per day. One of the greatest concerns of increasing fees is the affect it will have on the economic vitality of an area. Data provided by TfL showed both a decrease in auto trips and an overall increase in trips. Comparing 1999 to an estimate for 2003 showed a 5% increase in the total number of trips accompanied the 4% decrease in automobile use (Transport for London-b 2004).

Up to this point, calculations have been based on static fees. Static fees are more easily calculated, but do not provide the benefits of true congestion pricing. Static pricing will

result in fewer vehicles being stored for long periods of time and will eliminate the incentive for most drivers to work the "alternate side shuffle", as in many neighborhoods it will be more cost effective to pay for an off-street space. Residents who park on street who currently receive a tremendous benefit from free curbside space stand the most to loose. There has been some talk of implementing resident parking permits to enable residents a better chance of getting their free space. A suggestion it to enact curbside pricing, and to make the concept more politically palatable offer a discount to residents, enabling them to only pay 90% of the non-resident rate.

True congestion pricing alters the cost of spaces based on demand. As the goal is to maximize the benefit for the drivers, by always providing a space convenient to the parking location, estimated revenue figures are much more complicated and complex. Prices will be set with the goal that there will always be at least one empty space per block. These open spaces will not only provide the necessary flexibility of the system, but should help to eliminate double parking. As prices will be variable, there are numerous issues such as how to inform drivers what the parking rates are before they arrive, how often to alter the fees, and how should parkers be treated during a price increase.

Information dispersal is relatively easy due to the presence of the internet. Parkers can collect the rate information prior to leaving their house via internet or phone. Managing pricing will be more difficult, but as with many issues, patterns develop which should assist pricing decisions. If pricing is related the current vacancy rate, there should be

automatic increases in parking rates as the curbside fills up. The thorniest question is if the parking fees are variable, how do you determine the rates paid by a current parker. In the scenario where a driver parks at a vacant curbside at 6:00AM, with the rate at $1.00/hour – over the course of the day, the curb fills up and the rate is increased to $5.00/hour with the goal of promoting turnover, should the early-bird parker be permitted to keep his cheap rate all day long, or should there be some mechanism to increase a parkers rates as the variable rate increases. My guess is that this will be self correcting, as if a parker is "locked in" to the rates found when they arrive, there will be significant incentive for drivers to arrive early to get the cheap spot. As other commuters learn this arbitrage, they too will arrive early in an attempt to lock in a low daily rate. As this maneuver becomes more popular, it will result in pushing up the price, and eliminating any benefit they might have accrued to the early-bird.

The initial results from the Commercial Parking Project may shed some insight. These rates are not variable, but instead fixed at $2 for one hour, $5 for two hours and $9 for three hours during business hours. As mentioned previously, there were no meters prior to the start of the project, meaning parking revenue was zero. For the nine month period from October 2000 to June 2001, the area bounded by 42nd Street to the south, 5th Avenue to the East, Broadway to the west and 57th Street to the north, raised was $1,838,712. An estimate for the full year (multiplying by 1.33) is $2,451,616. During the year long period of July 2001 to June 2002, $2,851,734 was raised in parking revenue, which represents a 16.3% increase in revenue over the first period (NYC Department of Transportation-b 2004). As this revenue figure is based on approximately 960 parking

spaces (32 blocks times 30 spaces per block – parking is permitted on only one side of the street), it is estimated that each space produced approximately $2,550 during the 1st year or $10.75/space and $2,970 per space during the 2nd year or $12.50/space.

On thing to note is the $12.50/space per day revenue figure was when rates were $1/$3/$6, as they have since raised $2/$5/$9, the revenue figures should rise significantly. If we estimate that during the eleven hour period per day that these rates are in effect, revenue raised per space may rise to $20/space per day. If these increases do come into effect, it is estimated that this four block area will raise about $4.5 million in parking fees per year. Further, if we estimate that each space in Manhattan south of 96th street (50,084 spaces) is capable of raising $4,760/year, we arrive at the figure of $238,399,840. What is most interesting about these figures is that this revenue should actually improve the urban transportation network – a far cry from the $284 billion in spending proposed from the current highway bill (Hulse 2004).

Chapter 6 – Where Do We Go From Here – Steps for Implementing the Program

The system of curbside parking in major metropolitan areas must be improved. The curbside fails to provide adequate levels of service to drivers. Cities do raise substantial revenues from parking fees and fines, Chicago raises $129.4 M ($17.4 M parking fees, $112 M parking fines), Los Angeles raises $113.2 M ($20.5 M parking fees, $92.7 M parking fines) and NYC raises $354 M ($75 M parking fees, $279 M parking fines) (Hevesi 1999; C. de Cerreño 2002). Increased parking fees could provide significant additional revenue, though it may be coupled with a reduction in the amount of fines. The concepts underlying parking procedures need to be re-evaluated, and one model that may be more applicable is the "airport model". Airports understand that there are multiple types of parkers, and normally break down their parking structures to long-term, short-term and very short-term parking. They generate significant revenues from these spaces, and make significant investments in technology to provide a high level of service.

Before looking at what can be learned from airport parking policies, we will first explore parking in urban areas, where there has been little curbside innovation since the introduction of the parking meter in 1935. There have been some improvements, such as the multi-headed meters, pay-and-display and parking cards, but most areas have done nothing. In some cities the only innovation has been to replace the mechanical meter with a digital parking meter. As of 2003 25% of all meters in New York City were still mechanical (Bloomberg 2004). The basic concepts that are used to manage spaces has undergone few changes. Society has changed, with the growth of the suburbs, off-street

parking policies have changed, but curbside parking has not. What can be done, what should be done and how should these goals be accomplished?

One change is the decline in inexpensive short-term parking. Forty years ago, off-street lots priced one hour of parking at about 25% the price of all day pricing, by 1970 the hourly rate was 40% of the daily rate (Falcocchio, Darsin et al. 1995). Over time, the cost of one hour compared with all day parking has continued to increase. At the current time one hour parking is priced at generally the same rate, and sometimes higher than "Early Bird" parking. The Early Bird Special varies by garage, but it generally permits

Figure 7 – Off-Street Early Bird Parking Sign

arriving before 10:00AM (sometimes as late as 11:00AM) and departing before 7:00PM (sometimes as late as midnight). From the point of view of the businesses that run off-street lots, this pricing scheme may maximize profit by minimizing churn and labor costs. For the off-street lot, commuters provide a steady stream of revenue. They are predictable, park for long periods of time and provide a high price per transaction.

Unfortunately, what is good for the off-street parking garage is not necessarily good for the city, as the wrong type of car traffic is encouraged. The commuter, who drives during peak times periods, should be discouraged since they incur negative externalities due to their congestion and resulting pollution. The short-term parker is the one who potentially can provide significant benefit to the city. The drivers who rely on the automobile for it's incredible mobility and flexibility should be encouraged. For individuals that need to deliver items to multiple locations within the city on a given day, a private vehicle's speed, price and convenience cannot be matched. The current pricing schemes penalizes these high value trips. If the short-term parker wishes to find an on-street space, they must be willing to invest time. Alternatively, if the short-term parker is willing to park off-street, they are punished by the prohibitively high parking charges. The typical commuter, traveling point to point, can generally be served quite well by public transit. Multiple destination trips, when deliveries or packages are involved are not served as well by public transit.

There are several methods that can be used to help mitigate this pricing discrepancy. One would be alter the current taxing schemes that the City uses to tax users of off-street lots, which is currently a flat 18% rate. To discourage commuters and encourage short-term parkers, the parking tax should be lowered for short duration – say shorter than three hours – and raised or maintained for longer duration parkers. This would serve to reduce the discrepancy between short-term on-street and off-street parking.

The next method would be to increase the number of spaces available for short-term parking. Under current parking rules, only about 62,500 spaces in the city are metered (Bloomberg 2004). Parkers who perform the "Alternate Side Shuffle" invest hours of time to benefit from this price discrepancy. If there were a minimum daily charge for on-street parking, this would free up more spaces for short-term parkers. A fee as low as $2-$3 per day may be effective, while rates in the $4-$5 range will certainly have the desired effect of encouraging drivers to parking their cars in an off-street parking lot.

A third method would be to change the way that drivers are charged for on-street parking. The current methods normally have strict time limits, and minimal charges. In addition, drivers are forced to estimate the length of their stay upon arrival at their parking space. Finally, most drivers are required to carry a large number of quarters to enable them to pay the necessary parking fees.

One of the problems with the parking meter is its inherent inflexibility for both the municipality and the parker. The municipality has very little flexibility in changing parking rates, while the parker must determine the amount of parking time immediately after parking. The parker is threatened with severe fines, which currently $65 in Manhattan south of 96th Street for parking overtime parking (NYC Department of Transportation 2003). One promising methods to alter the way on-street parking is managed and parking fees are paid is the "in-car meter" parking device (figure 8). "An in-car meter" is a small computer that contains a digital clock, a slot for pre-paid parking

cards and buttons to enter the proper code. The parker types in the code of the current rate, and leaves the meter running while parked.

Figure 8 – Ganis In-Car Meter Parking Device

There are many benefits to the in-car meter, one of which is that no street furniture is required, all necessary hardware is stored within the vehicle. This has many positive ramifications, the first of which is the beautification of the city, as many people consider parking meters an eyesore, which occupy valuable sidewalk space. This also brings the benefit of lower maintenance costs, linked with higher revenue. In New York City, about 10% of all meters are normally broken (Bloomberg 2004). In-car meter also brings a tremendous amount of flexibility – as rates can be altered simply, and can be varied as often as necessary.

Enforcement is currently an issue, as meters must be read inside of vehicles. This significantly impacts the speed at which parking attendants can locate scofflaws. At some point, electronic transponders can be incorporated into the in-car meter, which would permit the meters to be read by wirelessly. This would permit parking attendants to read the status of the in-car device easily, and could lead to off-site data recording. Off-site enforcement of curbside parking would entail a large upfront cost to install the necessary equipment on every street, but this would lower the cost of enforcement significantly. The situation would be analogous to the red light camera, where enforcement could be almost totally automated.

Another idea to assist with the goal of raising parking rates, in an attempt to get backing from property owners is to privatize the curbside space. Privatization can be done through an auction, or gift to the owner of the adjacent property. As the new owners would immediately recognize the profit potential of leasing their space, it should open up curbside spaces for short-term parkers. After the initial privatization of the space, it is likely that the market will be fragmented, with many different operators managing a few spaces each. As there will be economies of scale in overseeing spaces, it is likely there will be consolidation.

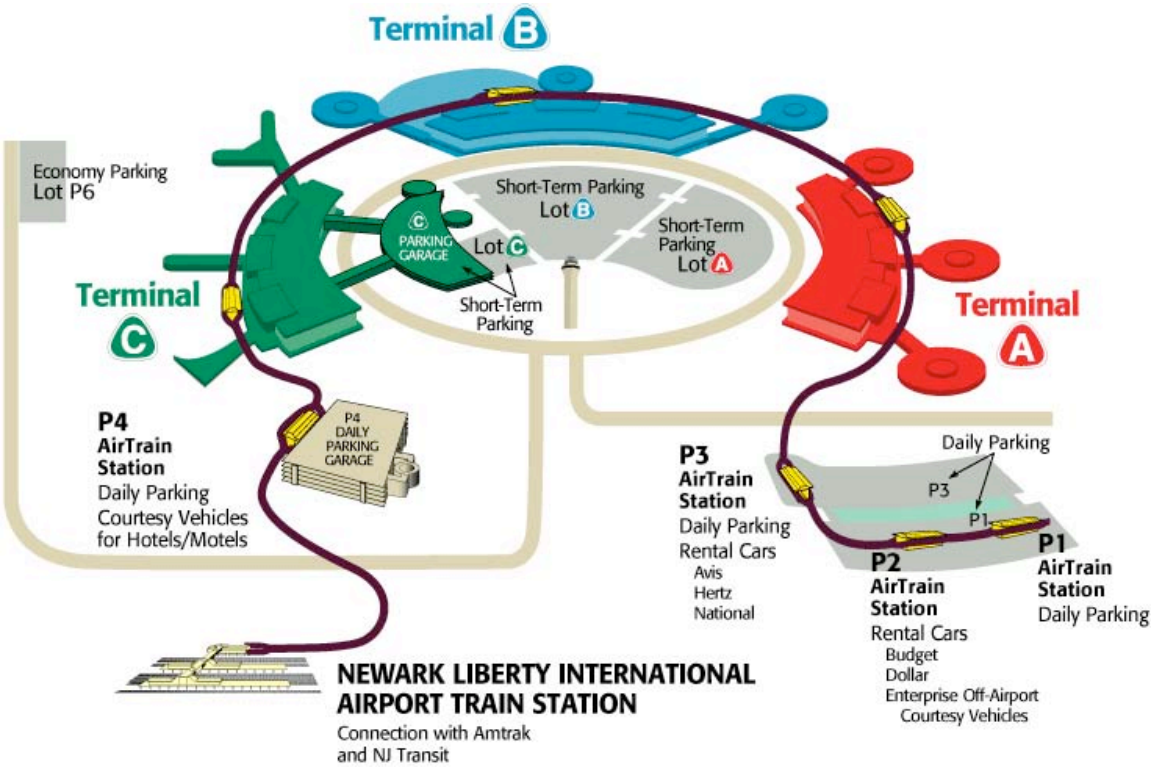
Another idea would be to keep all parking fees raised local, to be used for civic improvements. This can be managed by the local Business Improvement District. This may become a virtuous cycle, as the parking fees are used to improve a section of the city, the area may attract more people, further pushing up parking rates. There should

also be a trickle down effect, as increased rates will encourage parkers to seek a space further from their destination. Old Pasadena is successfully working with this model, and raised $1.2 million in 2001 from parking meter revenue to support public improvements (Shoup 2003).

We turn to airport parking, where there is a complete change in attitude and fee structure. At the airport, drivers accept the fact that if they wish to park close to their final destination, they will be charged a premium. Airport parking is one of the largest sources of revenue at airports, they raise about $2 billion in parking revenues on an annual basis (Stringer and Harris 2003). The Port Authority of NY and NJ alone raised nearly $235 million dollars in parking fees, much of it at Kennedy Airport, La Guardia Airport and Newark Airport (Port Authority of New York and New Jersey 2003). The Port Authority has also introduced innovative policies, such as the introduction of EZ-Pass Plus, which uses transponders to collect parking fees (Port Authority of New York and New Jersey-b 2004). In addition, airports recognize that close in parking has a greater value. Newark Airport currently offers four levels of parking based both on their proximity to the destination. The most expensive parking is "Short Term Parking" which is a surface lot and charges $3 for the first half hour or part, $6 for up to 1 hour, $3 for each hour or part thereafter and $30 maximum each 24-hour period. Drivers willing to be inside a parking garage are charged at the "Daily Parking" rate that has the same rates as the "Short Term Parking", but the daily maximum is lowered to $20/day. Their cheapest parking is called, "Economy Long-Term Parking" which has the simple rate structure of $10 for the first 24-hour period or part and $5 for each 12-hour period or part thereafter. Finally "Valet

Parking" is offered for those requesting a higher level of service at $28 for the first 24-hour period or part and $14 for each 12-hour period or part thereafter (Port Authority of New York and New Jersey 2004).

Figure 9 – Newark Airport Parking Map



To conclude, the parking situation in New York City must be improved. NYC should emulate the success of the Port Authority, and recognize the value of short-term parking, compared with long-term parking. The in-car meter parking device should be adopted in New York City and when linked with the Symbol Mobile Computers and Printers which will shortly be rolled out in NYC, should make the collection of tickets much more efficient (Symbol Technologies 2003). Variable pricing should be implemented which would improve the service for the city, assist the valuable short term parker and improve the economic development of New York City.

Chapter 7 – Conclusion

Cites as a whole will benefit in many ways from the introduction of higher curbside parking prices. As with any change, there will be winners and losers, and politically, implementing higher curbside pricing will be difficult. Americans, and especially New Yorkers dislike paying for something that they believe should be free. As parking is free today, drivers will be unwilling to voluntarily pay rational prices for parking. The transportation system must shift more of the costs back to the users to improve the efficiency of the system.

Commercial vehicles and businesses will be among the biggest winners when higher curbside pricing is implemented. As delivery trucks are required to use on-street parking due to the nature of their work, it is common to see multiple parking tickets on the windshield of a truck. These costs are passed along to the consumer, and are seen as a cost of doing business in the city. Less congested curbsides will lead to a lower cost for the delivery of goods within the City. To my understanding FedEx pays approximately $1,000,000/year in parking tickets in NYC and there is a judge solely assigned to processing parking violations committed by the delivery services. Raising curbside parking rates may negatively affect the United States Postal Service, as they will lose some competitive advantage, as they are immune from parking violations.

As it will be difficult politically to implement higher curbside parking charges, support from the delivery services is needed to help sell the idea to the general public. With the strength of their support and the business community, it may be possible to convince the

politicians of the value of improved curbside access. In addition, as it should reduce the number of parking tickets written, it should make the cost of doing business in the city more predictable. As many retailers are under the false assumption that free curbside parking is vital to their business, it is important to get other business to support increased curbside parking rates.

Another winner is expected to be the car-sharing services, such as ZipCar and FlexCar, which manage a fleet of cars that members can rent on very short notice. The cars are parked in off-street lots, and are available by the hour for about $10 hour plus $0.40/mile or by the day for about $100/day (ZipCar.com 2004). Rates vary by location, type of car, day of the week (weekends cost more) and season. According to ZipCar founder Robin Chase, "We have found that about 12% of members sell their car on joining, and another 35% avoid purchasing a car, meaning that each ZipCar replaces 7-10 vehicles" (Chase 2004). Ms. Chase sites these figures from their non-Manhattan locations, and does not believe she will replace as many cars in Manhattan, but the numbers are astounding nonetheless. With higher curbside parking prices, the casual car owner in Manhattan may find ZipCar style automobile access an alluring alternative to paying higher parking rates.

Retail stores are expected to prosper under higher parking fees, as it will improve the accessibility to their locations for both deliveries and shoppers. It is unknown how many purchases are deferred for want of a short term parking space. As mentioned previously,

the cost of goods delivery should be reduced due to reduction in parking violations incurred by delivery trucks, which should now be able to find legal curbside parking.

Retail locations will be a difficult segment to convince of the benefits of higher curbside parking rates, as they rightly fear that some drivers will be deterred by the lack of free parking within the city. It is certainly true that the shoppers wishing to visit at a chain store, may opt for a location outside of Manhattan where parking is plentiful and cheap. Alternatively, original and unique shopping destinations will find their attractiveness enhanced, as they should be more easily accessible. This should augment the value of the City and promote it as being a destination location.

The NYC DOT is expected to gain with higher curbside parking fees. Currently a ratio of approximately 1:4 exists between parking fees, which are collected by NYC DOT and parking violations which are collected by NYPD, currently $75 M parking fees, $279 M parking fines (Hevesi 1999; C. de Cerreño 2002). As curbside parking fees are hypothesized to raise upwards of $600 million per year, there could be infighting as to which department gets to handle this revenue stream.

It is expected that off-street parking lots will be overall gainers with the implementation of higher on-street parking fees. The business model for off-street parking will change dramatically. It is expected that they will experience a much higher percentage of long term parkers. It is likely that many residents that take advantage of free curbside parking will move their cars off-street. This will increase demand for long-term parking. At the

same time short-term parkers will have a reduced incentive to cruise, as there will be less differential between on-street and off-street rates. Many of these drivers should be able to find parking on-street, which will reduce the lucrative short-term parker. Off-street lots currently take advantage of the parking shortage in NYC, regularly charging $10 to $20 for one hour, these rates may need to be lowered as off-street lots are forced to compete with more convenient and available on-street spaces.

The group that stands to lose the most by the implementation of higher parking fees are car owners who depend on free curbside parking to store their vehicles for long periods of time. The "curbside shuffle" where parkers take advantage of free parking will become a thing of the past. Car owners will be encouraged to park in off-street lots, or sell their car in the face of the new pricing scheme.

Higher curbside parking fees have the potential of raising over $500 million in additional revenues. These dollars will benefit they city by improving the transportation network through reduced inefficiencies that raise the cost of doing business in the City. Higher curbside parking fees will shift the burden of supporting the transportation network from general tax dollars to direct user fees. Increasing the price of parking in New York City will not solve all of the City's problems, but it will be a start.

Footnotes

Arnott, R. and J. Rowse (1999). "Modeling Parking." Journal of Urban Economics **45**(1): 97-124.

Associated Press (1935). Oklahoma City Autoists Plan to Fight Nickel-in-Slot Curbstone Parking Meters. New York Times**:** pg. 21.

Bianco, M. J. (2000). Effective Transportation Demand Management: The Results of Combing Parking Pricing, Transit Incentives - Portland, Oregon. Portland Oregon, Portland State University.

Bloomberg, M. R. (2004). Preliminary Fiscal 2004 Mayor's Management Report. M. s. O. o. Operations. New York, New York City**:** 162.

C. de Cerreño, A. L., Ph.D. (2002). The Dynamics of on-Street Parking in Large Central Cities. R. C. f. T. P. Management. New York, New York University**:** 29.

Calthrop, E. (2002). "Evaluating on-Street Parking Policy." Center for Economic Studies; Energy, Transport & Environment **Working Paper Series**(n°2002-03): 31.

Calthrop, E., S. Proost, et al. (2000). "Parking Policies and Road Pricing." Urban Studies **37**(1): 63-76.

Chase, R. (2004). Re: Columbia Urban Planning Student. G. Roth. New York.

Childs, M. C. (1999). Parking Spaces : A Design, Implementation, and Use Manual for Architects, Planners, and Engineers. New York, McGraw-Hill.

Cooper, L. E. (1939). Garages Legalized in Apartment Buildings; Space May Be Used Only for Tenants'. New York Times. New York**:** pg. 45.

Crain's New York Business (2003). West 35th Street Tees Off. http://www.crainsny.com/page.cms?pageId=926. New York. **2004**.

Dasgupta, M., Oldtield, R., Sharman, K. and Webster, V. (1994). Impact of Transport Policies in Five Cities. T. R. Laboratory. Crowthome, Berkshire.

Davies, L. E. (1939). Cities Like New Meters. New York Times. New York**:** pg. 101.

Edwards, J. D. and ITE. (1999). Transportation Planning Handbook. Washington, DC, Institute of Transportation Engineers.

Egan, L. (1946). 4 City Tax Bills Signed by Dewey. New York Times. New York**:** pg. 1.

Falcocchio, J., J. Darsin, et al. (1995). An Inquiry on Traffic Congestion Impacts of Parking and Pricing Policies in the Manhattan Central Business District. T. T. a. R. C. Polytechnic University. Brooklyn, NY.

Federal Reserve Bank of Minneapolis (2003). What Is a Dollar Worth? http://minneapolisfed.org/research/data/us/calc/.

Glazer, A. and E. Niskanen (1992). "Parking Fees and Congestion." Regional Science and Urban Economics **22**(1): 123-132.

Gray, C. (1996). When Streets Were Vehicles for Traffic, Not Parking. New York Times. New York**:** RCW7.

Gutfreund, O. D. (1990). Strangled! Seaport**:** 17-23.

Hensher, D. A. and J. King (2001). "Parking Demand and Responsiveness to Supply, Pricing and Location in the Sydney Central Business District." Transportation Research Part A: Policy and Practice **35**(3): 177-196.

Hess, D. B. (2001). "The Effects of Free Parking on Commuter Mode Choice: Evidence from Travel Diary Data." The Ralph & Goldy Lewis Center for Regional Policy Studies **Working Paper #34 in the series**: 26.

Hevesi, A. G. (1999). Budget Notes. http://www.comptroller.nyc.gov/bureaus/bud/April1999-budgetnotes.shtm. New York.
Hulse, C. (2004). Veto Threatened on Highway Bill.
Ingraham, J. C. (1951). Parking by Meter in Operation Here. New York Times. New York: pg. 33.
Ingraham, J. C. (1954). Cure Still Sought for Parking Evils. New York Times. New York: pg. 14.
Lambe, T. A. (1996). "Driver Choice of Parking in the City." Socio-Economic Planning Sciences **30**(1): 207-220.
McLoud, N. C. (1929). Paris Rules Traffic to Accommodate All. New York Times. New York: pg. XX17.
Merriman, D. (1997). "Subsidized Parking and Neighborhood Nuisances." Journal of Urban Economics **41**(2): 198-201.
New York City Department of City Planning (1996). Parking Facilities Users' Survey and Parking Need Survey in Community Boards 1-8 in Manhattan. New York, New York City Department of City Planning,.
New York Metropolitan Transportation Council (2003). Hub Bound Travel Report - Transportation to the Manhattan Central Business District.
New York Times (1935). Parking Meters Held Legal. New York Times: pg. 12.
New York Times (1937). Ousts Parking Meters. New York Times. New York: pg. 9.
New York Times (1938). Cities Try out Traffic 'Cures'. New York Times: pg. 135.
New York Times (1939). Ban on All Parking in Midtown Area Is Urged Us Only Solution to Problem. New York Times: pg. 11.
New York Times (1942). Parking Garages in Midtown Urged to Relieve Congestion after War. New York Times. New York: pg. 17.
New York Times (1943). Parking Rules. New York Times. New York: pg. 14.
New York Times (1944). Moses' Parking Problem Solution Calls for Boulevards, Parkways. New York Times. New York: pg. 17.
New York Times (1946). Parking Meters Approved. New York Times. New York: pg. 46.
New York Times (1949). 5th Ave. Opposes Parking Meters. New York Times. New York: pg. 16.
New York Times (1949). New Traffic Board to Weigh Use Here of Parking Meters by Kenneth Campbell. New York Times. New York Times: pg. 1.
New York Times (1950). Parking Hampers Street Cleaners. New York Times. New York: pg. 33.
New York Times (1951). Meters Speed up 125th St. Traffic. New York Times. New York Times: pg. 34.
New York Times-a (1935). Parking Meters Halted. New York Times. New York: pg. 21.
New York Times-a (1945). Motorists Ignore Ban on Parking; Few Places Vacant Despite Fines. New York Times. New York: pg. 1.
New York Times-b (1936). Auto Club Opposes Parking Meter Plan. New York Times: pg. 2.
New York Times-b (1945). Parking Meters Held Impractical. New York Times. New York: pg. 16.

NYC Department of Transportation (2003). New Rates to Go into Effect for Midtown Parking. http://www.nyc.gov/html/dot/html/about/pr2003/pr03_27.html.
NYC Department of Transportation (2003). Parking in New York City - Parking, Standing & Stopping Rules. http://www.ci.nyc.ny.us/html/dof/html/prknyc3a.html. New York. **2004**.
NYC Department of Transportation (2003). Schedule of Nyc Parking Violations Fine Amounts. http://www.nyc.gov/html/dof/pdf/01pdf/pvofines.pdf.
NYC Department of Transportation-a (2003). New Parking Meter Rates Start to Take Effect. http://www.nyc.gov/html/dot/html/about/pr2003/pr03_61.html**:** Press Release# 03-61.
NYC Department of Transportation-a (2004). A Few More Questions. G. Roth. New York, NY.
NYC Department of Transportation-b (2004). Dates and Revenue. G. Roth. New York.
Pierce, B. (1949). Parking Meters Hit as Congestion Spur. New York Times. New York Times**:** pg. 29.
Port Authority of New York and New Jersey (2003). The Port Authority of New York and New Jersey Annual Financial Report.
Port Authority of New York and New Jersey (2004). Ewr Parking Information. http://www.panynj.gov/aviation/egrpfram.htm.
Port Authority of New York and New Jersey-b (2004). E-Zpass Plus Information. http://www.panynj.gov/ezpass.html.
Rose, J. B. (2002). An Evaluation and Update of Off-Street Parking Regulations in Community Districts 1-8 in Manhattan. New York, New York City Department of City Planning.
Roth, G. (1965). Paying for Parking. London, Institute of Economic Affairs.
Salomon, I. (1986). "Towards a Behavioral Approach to City Center Parking - the Case of Jerusalem's Cbd." Cities **Vol 3**(# 3): pg. 200-208.
Shoup, D. C. (1997). "Evaluating the Effects of Cashing out Employer-Paid Parking: Eight Case Studies." Transport Policy **4**(4): 201-216.
Shoup, D. C. (1997). "The High Cost of Free Parking." Journal of Planning Education and Research **17**(1): 3-20.
Shoup, D. C. (1999). "The Trouble with Minimum Parking Requirements." Transportation Research Part A **33**: 549±574.
Shoup, D. C. (2003). Buying Time at the Curb. The Half-Life of Policy Rationales: How New Technology Affects Old Policy Issues. F. F. a. D. Klein. New York, New York University Press**:** 60-85.
Shoup, D. C. (2003). The Ideal Source of Local Public Revenue. Los Angeles, UCLA**:** 41.
Shoup, D. C. (2003). Turning Small Change into Big Changes. Access**:** pg 2-7.
Stern, R. A. M., T. Mellins, et al. (1995). New York 1960 : Architecture and Urbanism between the Second World War and the Bicentennial. New York N.Y., Monacelli Press.
Stringer, K. and N. Harris (2003). Paved Paradise: The New Airport Parking Lots. Wall Street Journal. New York**:** D1.

Symbol Technologies, I. (2003). New York City Police to Deploy Symbol Mobile Computers and Printers to Issue Traffic Ticket. www.symbol.com/news/pressreleases/nypd_gets__mobile__computers.html.

Transit Cooperative Research Program (1998). Strategies to Attract Auto Users to Public Transportation. T. F. T. Administration. Washington, D.C., NATIONAL ACADEMY PRESS.

Transport for London (2004). Londoners Swap Cars for Public Transit. www.transportforlondon.gov.uk/tfl/press-releases/2004/march/press-948.shtml.

Transport for London-b (2004). Statistical Evidence. www.transportforlondon.gov.uk/tfl/downloads/pdf/press-releases/pn948a-statistical-evidence-modal-shift.pdf.

Vickrey, W. (1954). "The Economizing of Curb Parking Space." Traffic Engineering: 62-67.

Vickrey, W. (1991). Land, Traffic and Markets. Henry George Breakfast University Club, Columbia University Rare Books.

Vickrey, W. (1991). Making New York Work.

Vickrey, W. (1992). Making New York City Work. Unknown- Columbia University Rare Books.

Vickrey, W. (1995). Promoting Efficient Use of on-Street Parking, Columbia University.

Vickrey, W. (Undated). Notes Re Marginal Cost Pricing. C. R. B. Department.

Vuchic, V. R. (1999). Transportation for Livable Cities. New Brunswick, N.J., Center for Urban Policy Research.

Williams, J. A. (1949). Parking Ban Held Menace to Trade. New York Times. New York Times**:** pg. F1.

WSDOT, W. S. D. o. T. (2003). Local Parking Policy: Kent, Wa. http://www.wsdot.wa.gov/tdm/tripreduction/matrices/Kent.cfm.

Yordan, E. L. (1936). City Parker Studied. New York Times. New York**:** pg. XX1.

ZipCar.com (2004). Check Rates: New York City. www.zipcar.com/nyc/check-rates. **2004**.

Bibliography

Anderson, S. P. and A. d. Palma (2002). The Economics of Parking: Road Congestion and Search for Parking.

Arnott, Richard. "Alleviating Traffic Congestion: Alternatives to Road Pricing." Paper presented at the Alternative Strategies for Managing Externalities, Cambridge, Massachusetts, September 30/October 1, 1994.

Arnott, Richard, and John Rowse. "Modeling Parking." *Journal of Urban Economics* 45, no. 1 (1999): 97-124.

Associated Press. "Oklahoma City Autoists Plan to Fight Nickel-in-Slot Curbstone Parking Meters." *New York Times*, July 17 1935, pg. 21.

Bianco, Martha J. "Effective Transportation Demand Management: The Results of Combing Parking Pricing, Transit Incentives - Portland, Oregon." Portland Oregon: Portland State University, 2000.

Bloomberg, Michael R. "Preliminary Fiscal 2004 Mayor's Management Report." edited by Mayor's Office of Operations, 162. New York: New York City, 2004.

C. de Cerreño, Allison L., Ph.D. "The Dynamics of on-Street Parking in Large Central Cities." edited by Rudin Center for Transportation Policy & Management, 29. New York: New York University, 2002.

Calthrop, Edward. "Evaluating on-Street Parking Policy." *Center for Economic Studies; Energy, Transport & Environment* Working Paper Series, no. n°2002-03 (2002): 31.

Calthrop, Edward, Stef Proost, and Kurt van Dender. "Parking Policies and Road Pricing." *Urban Studies* 37, no. 1 (2000): 63-76.

Campbell, Kenneth. "New Traffic Board to Weigh Use Here of Parking Meters." *New York Times*, February 2 1949, pg. 1.

Chase, Robin. April 5 2004.

Childs, Mark C. *Parking Spaces : A Design, Implementation, and Use Manual for Architects, Planners, and Engineers*. New York: McGraw-Hill, 1999.

Cooper, Lee E. "Garages Legalized in Apartment Buildings; Space May Be Used Only for Tenants'." *New York Times*, June 9 1939, pg. 45.

Crain's New York Business. *West 35th Street Tees Off* 2003 www.crainsny.com/page.cms?pageId=926.

Crummy, Karen E. "Cherry Creek Parking Fee Ok'd New Street Kiosks to Accept Credit

Card." *Denver Post*, Aug 5 2003, B.03.

Daniel, Mac. "City Cracks Down on Work Crews Who Hog Meters." *Boston Globe*, Jun 22 2003, B.2.

Dasgupta, M., Oldtield, R., Sharman, K. and Webster, V. "Impact of Transport Policies in Five Cities." edited by Transport Research Laboratory. Crowthome, Berkshire., 1994.

Davies, Laurence E. "Cities Like New Meters." *New York Times*, Dec 31 1939, pg. 101.

Edwards, John D., and ITE. *Transportation Planning Handbook*. 2nd ed. Washington, DC: Institute of Transportation Engineers, 1999.

Egan, Leo. "4 City Tax Bills Signed by Dewey." *New York Times*, Apr 3 1946, pg. 1.

El-Fadel, M., and H. Sbayti. "Parking Facilities in Urban Areas: Air and Noise Impacts." *Journal of Urban Planning and Development* 127, no. 1 (2001): 16-33.

Engdahl, Todd. "Parking Meters: Bane or Boon?" *Denver Post*, Jun 22 2003, E1.

Falcocchio, John, Jose Darsin, and Elena Prassas. "An Inquiry on Traffic Congestion Impacts of Parking and Pricing Policies in the Manhattan Central Business District." edited by Transportation Training and Research Center Polytechnic University. Brooklyn, NY, 1995.

Federal Reserve Bank of Minneapolis. *What Is a Dollar Worth?* 2003 minneapolisfed.org/research/data/us/calc/.

Fishman, Margie. "City's Parking Will Go Private." *The News & Observer*, January 22 2003, A1.

Gelb, Arthur. "City Parking Plan Will Be Expanded." *New York Times*, Jan 5 1952, pg. 13.

Gilbey, Julian D., and Louis H. Kalikow. "Parking Functions, Valet Functions and Priority Queues." *Discrete Mathematics* 197-198 (1999): 351-73.

Glazer, Amihai, and Esko Niskanen. "Parking Fees and Congestion." *Regional Science and Urban Economics* 22, no. 1 (1992): 123-32.

Gordon, Rachel. "Parking Meter Plan Put on Hold for Week / Public Miffed About Golden Gate Park Money-Making Idea." *San Francisco Chronicle*, Jul 23 2003, A.17.

———. "Golden Gate Park to Get Meters / $1 Per Hour to Park at East End Will Bring in $1.4 Million Yearly." *San Francisco Chronicle*, Jul 16 2003, A.15.

Gray, Christopher. "When Streets Were Vehicles for Traffic, Not Parking." *New York*

Times, March 17 1996, RCW7.

Gutfreund, Owen D. "Strangled!" *Seaport*, Fall 1990, 17-23.

Hendricks, Gary. "Dot Plan for Square Is Roundly Criticized." *The Atlanta Journal - Constitution*, Jul 20 2003, D.1.

Hensher, David A., and Jenny King. "Parking Demand and Responsiveness to Supply, Pricing and Location in the Sydney Central Business District." *Transportation Research Part A: Policy and Practice* 35, no. 3 (2001): 177-96.

Hess, Daniel Baldwin. "The Effects of Free Parking on Commuter Mode Choice: Evidence from Travel Diary Data." *The Ralph & Goldy Lewis Center for Regional Policy Studies* Working Paper #34 in the series (2001): 26.

Hester, Amy E., Donald L. Fisher, and John Collura. "Drivers Parking Decisions: Advanced Parking Management Systems." *Journal of Transportation Engineering* 128, no. 1 (2002): 49-57.

Hevesi, Alan G. *Budget Notes* 1999 www.comptroller.nyc.gov/bureaus/bud/April1999-budgetnotes.shtm.

Hinze, Dirk. "Italians Drive for Smart Card Parking in Major Cities." *Card Technology Today* 12, no. 3 (2000): 6-7.

Hulse, Carl. "Veto Threatened on Highway Bill." 2004.

Ingraham, Joseph C. "Parking by Meter in Operation Here." *New York Times*, Sep 20 1951, pg. 33.

Ingraham, Joseph C. "Hour Parking Limit in City to End Soon." *New York Times*, Apr 29 1953, pg. 31.

———. "Cure Still Sought for Parking Evils." *New York Times*, Feb 2 1954, pg. 14.

———. "City Urged to Tax Street Parkers." *New York Times*, Feb 24 1959, pg. 20.

Ison, Stephen, and Stuart Wall. "Attitudes to Traffic-Related Issues in Urban Areas of the UK and the Role of Workplace Parking Charges." *Journal of Transport Geography* 10, no. 1 (2002): 21-28.

Kaheny, John. "NYC Parking Policy Is Backwards and Dangerous." *Transportation Alternatives Magazine*, June 2003, 9.

Komanoff, Charles. "Demand and Supply." *New York* 29, no. 49 (1996): 20.

Kulash, Damian J., Urban Institute., and National Science Foundation (U.S.). Research Applied to National Needs Program. *Parking Taxes for Congestion Relief : A Survey of Related Experience*, *Urban Institute Paper ; 1212-1*. Washington, D.C.:

Urban Institute, 1974.

Lambe, T. A. "Driver Choice of Parking in the City." *Socio-Economic Planning Sciences* 30, no. 1 (1996): 207-20.

Layton, Lyndsey. "Metro Parking Shows Steepest Rate Increase." *The Washington Post*, Jun 20 2003, B.05.

Marszalek, Diana. "In Scarsdale, Disputed Garage Proposal Sent Back for Study." *New York Times*, Jun 15 2003, 14WC.5.

Martin, Antoinette. "Can 'Smart Growth' Cut Parking Needs?" *New York Times*, Aug 3 2003, 11.7.

McLoud, N.C. "Paris Rules Traffic to Accommodate All." *New York Times*, Apr 7 1929, pg. XX17.

McShane, Clay. *Down the Asphalt Path : The Automobile and the American City*, *Columbia History of Urban Life*. New York, NY: Columbia University Press, 1994.

Merriman, David. "Subsidized Parking and Neighborhood Nuisances." *Journal of Urban Economics* 41, no. 2 (1997): 198-201.

———. "How Many Parking Spaces Does It Take to Create One Additional Transit Passenger?" *Regional Science and Urban Economics* 28, no. 5 (1998): 565-84.

Moore, Melody Deniece. "Parking Woes: Tickets, Space and Availability Major Issues for Downtown Businesses and Visitors." *Michigan Chronicle*, Jun 4 2003, A1.

Mullan, Elaine. "Do You Think That Your Local Area Is a Good Place for Young People to Grow Up? The Effects of Traffic and Car Parking on Young People's Views." *Health & Place* 9, no. 4 (2003): 351-60.

Nakamura, David. "To Park, Perchance, near Dream; Snagging Spots by City Clubs Costly, Confusing and Often Illegal." *The Washington Post*, May 25 2003, C.01.

New York City Department of City Planning. "Parking Facilities Users' Survey and Parking Need Survey in Community Boards 1-8 in Manhattan." New York: New York City Department of City Planning,, 1996.

New York Metropolitan Transportation Council. "Hub Bound Travel Report - Transportation to the Manhattan Central Business District." 2003.

New York Times. "Ousts Parking Meters." *New York Times*, Jan 15 1937, pg. 9.

———. "Cities Try out Traffic 'Cures'." *New York Times*, Jan 2 1938, pg. 135.

———. "Ban on All Parking in Midtown Area Is Urged Us Only Solution to Problem."

New York Times, May 13 1939, pg. 11.

———. "Valentine Points Way to Ease Parking." *New York Times*, Feb 14 1941, Pg. 38.

———. "Parking Garages in Midtown Urged to Relieve Congestion after War." *New York Times*, Mar 14 1942, pg. 17.

———. "Parking Rules." *New York Times*, Feb 1 1943, pg. 14.

———. "Moses' Parking Problem Solution Calls for Boulevards, Parkways." *New York Times*, Jul 10 1944, pg. 17.

———. "End of Traffic Jam within One Week Pledged by Mayor." *New York Times*, Oct 15 1945, pg. 1.

———. "Parking Meters Approved." *New York Times*, Mar 12 1946, pg. 46.

———. "Police Lift Ban on Night Parking." *New York Times*, April 4 1947, 25.

New York Times. "5th Ave. Opposes Parking Meters." *New York Times*, Feb 18 1949, pg. 16.

———. "Parking Hampers Street Cleaners." *New York Times*, Nov 14 1950, pg. 33.

———. "Meters Speed up 125th St. Traffic." *New York Times*, Sep 21 1951, pg. 34.

New York Times-a. "Parking Meters Halted." *New York Times*, Jul 18 1935, pg. 21.

———. "Motorists Ignore Ban on Parking; Few Places Vacant Despite Fines." *New York Times*, Oct 17 1945, pg. 1.

New York Times-b. "Parking Meters Held Legal." *New York Times*, Jul 25 1935, pg. 12.

———. "Auto Club Opposes Parking Meter Plan." *New York Times*, Jun 28 1936, pg. 2.

———. "Parking Meters Held Impractical." *New York Times*, Oct 13 1945, pg. 16.

Nozzi, Dom. *Road to Ruin : An Introduction to Sprawl and How to Cure It*. Westport, Conn.: Praeger, 2003.

NYC Department of Transportation-a. *New Parking Meter Rates Start to Take Effect* June 17, 2003 www.nyc.gov/html/dot/html/about/pr2003/pr03_61.html.

NYC Department of Transportation-a. March 30 2004.

NYC Department of Transportation-b. *Schedule of NYC Parking Violations Fine Amounts* 2003 www.nyc.gov/html/dof/pdf/01pdf/pvofines.pdf.

———. March 5 2004.

NYC Department of Transportation-c. *New Rates to Go into Effect for Midtown Parking* March 21, 2003 www.nyc.gov/html/dot/html/about/pr2003/pr03_27.html.

NYC Department of Transportation-d. *Parking in New York City - Parking, Standing & Stopping Rules* 2003 www.ci.nyc.ny.us/html/dof/html/prknyc3a.html.

NYC Dept City Planning. "Parking Guide to New York City: Off- Street Parking Facilities in Area South of 72nd Street Manhattan, New York City." New York: NYC Dept City Planning / NYC Dept Consumer Affairs, 1999.

Owen, Wilfred. "Shortage in Curbs." *New York Times*, Mar 9 1952, pg. XX14.

Pierce, Bert. "Parking Meters Hit as Congestion Spur." *New York Times*, Sep 28 1949, pg. 29.

Port Authority of New York and New Jersey. "The Port Authority of New York and New Jersey Annual Financial Report." 2003.

Port Authority of New York and New Jersey-a. *EWR Parking Information* 2004 www.panynj.gov/aviation/egrpfram.htm.

Port Authority of New York and New Jersey-b. *E-ZPass Plus Information* 2004 www.panynj.gov/ezpass.html.

Rose, Joseph B. "An Evaluation and Update of Off-Street Parking Regulations in Community Districts 1-8 in Manhattan." New York: New York City Department of City Planning, 2002.

Roth, G. *Paying for Parking*, *Hobart Papers*. London: Institute of Economic Affairs, 1965.

Salomon, Iian. "Towards a Behavioral Approach to City Center Parking - the Case of Jerusalem's CBD." *Cities* Vol 3, no. # 3 (1986): pg. 200-08.

Saltzman, R. M. "Three Proposals for Improving Short-Term on-Street Parking." *Socio-Economic Planning Sciences* 28, no. 2 (1994): 85.

Santana, Arthur. "Free Parking Gives Way to Meters in D.C." *The Washington Post*, Jul 27 2003, C.01.

Shafer, Ronald G. "'Sorry--Lot Filled'." *Wall Street Journal*, Apr 24 1967, pg. 1.

Shoup, Donald C. "Evaluating the Effects of Cashing out Employer-Paid Parking: Eight Case Studies." *Transport Policy* 4, no. 4 (1997): 201-16.

Shoup, Donald C. "The High Cost of Free Parking." *Journal of Planning Education and Research* 17, no. 1 (1997): 3-20.

———. "In Lieu of Required Parking." *Journal of Planning Literature* 14, no. 2 (1999).

Shoup, Donald C. "The Trouble with Minimum Parking Requirements." *Transportation Research Part A* 33 (1999): 549±74.

———. "Buying Time at the Curb." In *The Half-Life of Policy Rationales: How New Technology Affects Old Policy Issues*, edited by Fred Foldvary and Daniel Klein, 60-85. New York: New York University Press, 2003.

———. "The Ideal Source of Local Public Revenue." 41. Los Angeles: UCLA, 2003.

———. "Turning Small Change into Big Changes." Access, Fall 2003, pg 2-7.

Sinopoli, Joseph. "Trustees Look at Parking Options for Thriving Downtown Lagrange." *Chicago Tribune*, Jul 16 2003, 5.

Small Kenneth A. "Charging for Road Use Worldwide: An Appraisal of Road Pricing, Tolls and Parking." *Transportation Research Part A: Policy and Practice* 28, no. 5 (1994): 447-48.

Spencer, Jim. "Drivers Fed up with Feeding City's Meters." *Denver Post*, Jun 24 2003, B.01.

Staff. "Retailers Square Off on Parking Issue." *The Washington Post*, Aug 18 2003, E.03.

———. "A Nickel-and-Dime Idea." *San Francisco Chronicle*, Jul 17 2003, A.22.

———. "Night Parking Fees: A Real Dumb Idea." *Call & Post*, Jun 5 2003, A4.

Stern, Robert A. M., Thomas Mellins, and David Fishman. *New York 1960 : Architecture and Urbanism between the Second World War and the Bicentennial*. New York N.Y.: Monacelli Press, 1995.

Sternberg, Robert J. "How Much Money Should One Put into the Cognitive Parking Meter?" *Trends in Cognitive Sciences* 5, no. 5 (2001): 190.

Stringer, Kortney, and Nicole Harris. "Paved Paradise: The New Airport Parking Lots." *Wall Street Journal*, November 12 2003, D1.

Stubbs, Michael. "Car Parking and Residential Development: Sustainability, Design and Planning Policy, and Public Perceptions of Parking Provision." *Journal of Urban Design* 7, no. 2 (2002): 213-37.

Symbol Technologies, Inc. *New York City Police to Deploy Symbol Mobile Computers and Printers to Issue Traffic Ticket* 2003 www.symbol.com/news/pressreleases/nypd_gets__mobile__computers.html.

Tam, M. L., and William H. K. Lam. "Maximum Car Ownership under Constraints of Road Capacity and Parking Space." *Transportation Research Part A: Policy and Practice* 34, no. 3 (2000): 145-70.

Transit Cooperative Research Program. "Strategies to Attract Auto Users to Public Transportation." edited by The Federal Transit Administration. Washington, D.C.: NATIONAL ACADEMY PRESS, 1998.

Transport for London. *Londoners Swap Cars for Public Transit* 2004 www.transportforlondon.gov.uk/tfl/press-releases/2004/march/press-948.shtml.

Transport for London-b. *Statistical Evidence* 2004 www.transportforlondon.gov.uk/tfl/downloads/pdf/press-releases/pn948a-statistical-evidence-modal-shift.pdf.

Triborough Bridge Authority. *Parking*. New York City, 1944.

Tsamboulas, Dimitrios A. "Parking Fare Thresholds: A Policy Tool." *Journal of Planning Literature* 16, no. 2 (2001): 236-319.

Urban Land Institute, and National Parking Association. *The Dimensions of Parking*. 4th ed. Washington, DC: Urban Land Institute : National Parking Association, 2000.

Van Dender, Kurt. "Pricing Transport Networks with Fixed Residential Location." *Regional Science and Urban Economics* In Press, Corrected Proof (2002).

Verhoef, Erik T. "Second-Best Congestion Pricing in General Networks. Heuristic Algorithms for Finding Second-Best Optimal Toll Levels and Toll Points." *Transportation Research Part B: Methodological* 36, no. 8 (2002): 707-29.

Vickrey, William. "The Economizing of Curb Parking Space." *Traffic Engineering* (1954): 62-67.

———. "Making New York Work." 1991.

———. "Land, Traffic and Markets." Paper presented at the Henry George Breakfast University Club, October 15, 1991

———. "Making New York City Work." *Unknown- Columbia University Rare Books*, May 5 1992.

———. "Promoting Efficient Use of on-Street Parking." Columbia University, 1995.

———. Undated.

Voith, Richard. "Parking, Transit, and Employment in a Central Business District." *Journal of Urban Economics* 44, no. 1 (1998): 43-58.

Vuchic, Vukan R. *Transportation for Livable Cities*. New Brunswick, N.J.: Center for Urban Policy Research, 1999.

Walker Parking Consultants., Urban Land Institute., and International Council of Shopping Centers. *Parking Requirements for Shopping Centers : Summary*

Recommendations and Research Study Report. 2nd ed. Washington, DC: ULI, 1999.

Wall, Lucas. "Parking Proposal at Impasse / Rate Hike Just One Way to Go, Some Say." *Houston Chronicle*, Jul 20 2003, 35.

Williams, Clarence. "Demands for More Parking Answered; Georgetown Begins Paid Valet Service." *The Washington Post*, Jun 22 2003, C.01.

Williams, James A. "Parking Ban Held Menace to Trade." *New York Times*, Jan 23 1949, pg. F1.

Wilson, Richard W. "Estimating the Travel and Parking Demand Effects of Employer-Paid Parking." *Regional Science and Urban Economics* 22, no. 1 (1992): 133-45.

Wong, S. C., C. O. Tong, Wilkie C. H. Lam, and Rayson Y. C. Fung. "Development of Parking Demand Models in Hong Kong." *Journal of Urban Planning and Development* 126, no. 2 (2000): 55-74.

WSDOT, Washington State Department of Transportation. *Local Parking Policy: Kent, WA* 2003 www.wsdot.wa.gov/tdm/tripreduction/matrices/Kent.cfm.

Yordan, E.L. "City Parker Studied." *New York Times*, Nov 29 1936, pg. XX1.

ZipCar.com. *Check Rates: New York City* 2004 www.zipcar.com/nyc/check-rates.