Parking policy as a mechanism to reduce car ownership and use

By

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ABSTRACT

The vast majority of Americans own a car, despite its high cost and low utilization rate. Through a stated preference survey in Washington D.C., Chicago, Dallas, and Seattle metro areas, I find that people value their car at $11,197, and the majority of that value comes from owning the car, rather than from using it. The ownership value comes in part from the "option value," that the car is sitting in a parking spot, waiting to be used whenever and however the owner wishes. Parking enables this value. In the next set of results, I find that parking-related variables, like the built environment and employer-provided parking benefits, also impact car use. Though these findings point to the potential for policymakers to use parking policy to reduce car ownership and use, American cities are notorious for having an oversupply of underpriced parking. To investigate why parking policies may be underutilized, I interview and survey parking officials. I find that officials are not trying to use parking policy to reduce car ownership or to disincentivize cars. Officials face strong resistance to such policies by businesses and residents that live near to where they will be implemented. I conclude with several policy recommendations aimed at enabling policymakers to better utilize parking policy to reduce car ownership and use, including policies relating to reframed goals and metrics and shifting power to balance localized stakeholder needs better with recipients of larger scale benefits. Lastly, in order for parking policy to be truly effective in reducing car use and ownership, I recognize that land use policy and mobility system improvements must be deployed to provide truly viable non-private car alternatives that replicate the option value of car ownership.

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1. Introduction

The privately-owned automobile has remained the dominant form of transportation in the United States for decades (History.com Editors, 2018). This large-scale dominance is at least in part due to the fact that in most parts of this country, there are few or no alternatives to the car that provide the same level of mobility and access. For many U.S. households, access to a car unlocks economic opportunities (Curl et al. 2018; Blumenberg and Pierce 2014; Baum 2009; Gurley and Bruce 2005). Several studies have found that far more jobs are accessible within a reasonable commute for people who use a car as compared to those who use transit in U.S. cities (Kawabata 2017; Wang and Chen 2015). In addition to the value of the car that comes from the mobility it provides through its use, researchers have also found that consumers frequently attribute social status and pride to car ownership and use (Moody & Zhao, 2020a; Moody & Zhao, 2019; Steg, 2005; Gurin, 1976). At this large scale, the dominance of the private car is understandable.

1.1 The paradox of car ownership at the individual level

When the view shifts from the nation-wide scale to the scale of individual consumer behavior, however, the dominance of the private car presents a puzzling paradox: car ownership is very expensive (Edmonds, 2019), and our cars sit idle 90+% of the time, taking up vast amounts of space in our cities (Shoup, 1997; Manville & Shoup, 2005; Shaheen, 2018), and yet the vast majority of people in the United States still choose to own cars (Bureau of Transportation Statistics, 2017). Why do individuals not choose to use shared vehicles and public transit, as many mobility advocates promote, allowing us to avoid the upfront cost of purchasing a vehicle, only pay for what we use, and require many fewer vehicles (and parking spaces) in our cities?

The dominant explanation for the car ownership paradox is that consumers systematically underestimate the true cost of car ownership, with the implication being that more people would choose to forego car ownership if this bias in mental accounting was corrected (Thaler, 1999; Shafir and Thaler, 2006). This argument is exemplified and evidenced in Andor et al. (2020). They find that people underestimate the total cost of vehicle ownership by 52%, with most of that coming from underestimating depreciation, repairs, taxes, and insurance. They concluded that if consumers did take those costs into account, there would be up to 37% fewer cars in Germany. Much of the literature on car sharing also relies on this explanation (Meijkamp, 1998; Katzev, 2003; Millard-Ball et al, 2005; Duncan, 2011; Wilhelms et al 2017), as well as marketing materials for car-sharing companies (Car2Go 2020; Zipcar, 2020).

Another possibility that has received less attention is that the value of car ownership exceeds the cost, and that private vehicle ownership is rational for the vast majority of US consumers despite the perceived resource inefficiency. Owning one's own vehicle provides the option value of driving at any time, described by Prettenthaler and Steininger (1999) as "waiting obedience". If the value of car ownership significantly exceeds the cost, consumers may continue to want privately-owned vehicles even if the cost is high, and cheaper, high quality non-private car transportation options are available. This option value that comes from owning a car is directly enabled by each car having a parking space to sit in, obediently waiting to be used.

1.2 The negative impacts of private car ownership and use

There are well-known and significant consequences of this mobility regime. At the societal level, car ownership is highly correlated with car use and vehicle miles travelled (VMT) (Dissanayake & Morikawa, 2010). Car use, or vehicle miles travelled (VMT), especially in gasoline-fueled cars, generates carbon dioxide and other emissions that worsen climate change and air pollution. In the United States, the transportation sector has continued to increase its total emissions in recent years, and is now the leading

contributor to national emissions (EPA, 2019). Car ownership and use are also correlated with high levels of traffic congestion and road deaths (Parry et al 2007; Axsen et al 2020).

Private car ownership also takes up a lot of space that could otherwise be used for more housing, services or commercial activity, green space, or space for non-car transportation modes. Though it is difficult to get exact numbers for urban space dedicated to the private car in the U.S., estimates have ranged from 30% to 65% for different cities (Manville & Shoup, 2005; Gardner, 2011). Car owners have also become a powerful political bloc, halting many non-car transportation projects and car-optional reforms in their tracks (Henderson, 2009).

At the individual level, car ownership is also expensive and thus can be an undue burden on people of low income. Transportation is generally the second largest expenditure for households after housing, and for low income households, the share of income spent on transportation averages around 30% (Vaidyanathan, 2016). The average yearly cost of car ownership in 2019 was $9,282 (Edmonds, 2019). And yet, car ownership is often linked to upward mobility because of the car-dependent infrastructure and urban form in most American cities, leaving low income people tied to spending a significant portion of their income on a car in order to access opportunities (Blumenberg & Pierce, 2014).

Reducing car use and reducing car ownership both could positively impact a wide-ranging set of negative consequences of the private automobile regime. Americans tend to be highly concerned with individual freedoms particularly related to private property (Alexander 2009; Nadler & Diamond 2008; Cohen 1954), which may contribute to the tendency for policy to focus on people's driving behavior, rather than their ownership of cars as personal property. However, many of the same policies aimed at reducing car use can also result in reduced car ownership, and vice versa. The impact of focusing on car use or on car ownership in terms of policy design, implementation, and eventual outcomes, remains to be seen. This thesis explores policy goals to reduce car ownership, to reduce car use, and to reduce car dependence, which can be thought of as implementing policies that enable people to make more trips without a car, and to not own one.

1.3 The paradox of parking policy in the US

As outlined in the previous section, there are huge negative societal consequences for the private car mobility regime, as well as individual consequences. Importantly, for the 90% of the time a car is not in use, it must be sitting in a parking space. The value of car ownership that comes from "waiting obedience" is therefore directly enabled by parking. Parking policy could be a key mechanism for reducing car ownership and use, and the value people place on owning cars.

Consumers consider both cost and value when determining whether to purchase an item, indicating that policies can either increase the cost or reduce the value of an item if they want to discourage it. Parking policies can affect both of those aspects of using and owning a car. Policies that increase the price of parking can increase the cost of owning and using a car. Policies that reduce the parking supply can decrease the value of owning or using a car by making it less convenient. The consumer decision also includes comparing the item to alternatives that would accomplish the same purpose, sometimes deemed the "outside option." In this case, consumers will compare owning and using a car to using a non-car alternative like biking, walking, taking transit, taking ride-hailing, or using urban goods delivery. Parking policy is powerful in that it can simultaneously reduce the value of a car and increase the value of the alternative options. For example, parking policy can include removing parking and replacing it with bus lanes, bike lanes, widened sidewalks, or loading zones. Zoning policies can also prevent parking from being built, enabling developers to use that space for more development, increasing the density of destinations in an area. Increased density tends to make non-car alternatives more convenient.

A second paradox thus emerges: despite the direct connection between parking and the "waiting obedience" value of car ownership, and the many ways parking could be used to reduce car ownership and use, parking policy seems to be underutilized in the United States. Instead, the US is known for having an oversupply of underpriced parking (Manville & Shoup, 2005; Gardner, 2011). Why do policymakers not implement more and better parking policies in order to reduce car use and ownership and the negative effects that accompany the private car mobility regime?

1.5 Research questions

To investigate the first paradox, I ask the question: How do people value car ownership separate from car use, and what factors increase or decrease that valuation? I explore this question in the second section of this thesis, using a statistical analysis of stated preference survey responses asking people whether they would be willing to give up their private car under different scenarios.

To clarify the connection between the two paradoxes I have identified, I ask: How do parking-related policies impact car ownership and use? For the third section of my thesis, I conduct an additional statistical analysis investigating the factors that impact car use in particular.

Lastly, I explore the second paradox. I ask: How are parking professionals using parking policy? I use interviews and surveys of public officials whose work impacts parking policy in Chicago, Dallas, Seattle, and Washington D.C metro areas. I explore the goals, strategies, processes, and barriers in the parking policy process on the ground.

I end with policy recommendations that address my overarching question for this thesis: How can parking policies be used to reduce car ownership and use?

Preface to section 2

This section is slightly adapted from a paper I wrote with Dr. Joanna Moody, Dr. David Keith, and Marisa Papagelis as part of the Massachusetts Institute of Technology Energy Initiative (MITEI) Mobility Systems Center (MSC). This paper is currently under consideration for publication.

2. The value of car ownership and use

In this section, we estimate the value of private car ownership and use in four U.S. cities—Chicago, IL, Dallas, TX, Seattle, WA, and Washington D.C. We conduct two stated choice experiments in which we estimate respondents' willingness to accept compensation to give up access to their primary vehicle for one year. Understanding how much value consumers derive from car ownership is a critical input into mobility strategy- and policy-making and sharpens the focus on the attributes that emerging sustainable transportation modes will need if they are to disrupt the dominance of private car ownership. These results also indicate that exploring factors that influence car use (section 3), and understanding parking policies that directly enable car ownership (section 4), are key to upending private car ownership.

2.1 The persistence of car ownership in the United States

The rate of car ownership among U.S. households has remained over 90% for the last decade (American Community Survey, 2010-2020 5-year estimates), remarkably stable given economic fluctuations and rising costs of car ownership (Edmonds, 2019; AAA Automotive, 2016). Despite hopes that the introduction of new on-demand and shared mobility services might disrupt the current paradigm of car ownership, and that changing demographics might lead to lower car consumption among newer generations, car ownership remains dominant even in cities with multiple travel alternatives.

Many factors contribute to this high level of motorization in the U.S., including socioeconomic trends, built environment characteristics, and road and parking supply. Considering characteristics of individuals and households, common factors that influence car ownership include income, age, and the number of working adults and children in the household (Clark et al 2016; Oakil et al 2016; Anowar et al 2014; Bhat and Guo 2007; Hanley and Dargay 2000). In particular, households with higher income, more working adults, and more children tend to own more cars. Car ownership also increases with age up to a point around 50 years, after which it decreases. The built environment also plays a key role. Households that live in lower density places, like rural and suburban areas, tend to own more cars compared to households in higher density, urban areas (Axsen et al 2020, p. 813; Stevens 2017; Oakil et al 2016; Clark et al 2016; Anowar et al 2014; Bhat and Guo 2007; Hanley and Dargay 2000). Finally, parking supply and cost have been found to have a large influence on car ownership as well (Guo 2013; Buehler 2010; Shoup 2004).

Despite the consistently high rate of car ownership in the U.S. over the past decade, some studies have predicted the demise of privately-owned vehicles based on low driver's license and car ownership rates among young people (Ho et al 2018; Hjorthol, 2016; McDonald 2015; Delbosc & Currie, 2014; Delbosc & Currie, 2013; Kuhnimhof, Buehler, & Dargay, 2011). However, Etezady et al (2020) and Knittel and Murphy (2019) find little difference in preferences for car ownership between Millennials and prior generations after accounting for their different socioeconomic circumstances. This finding is supported by Kurz et al (2018) and Klein and Smart (2017), who identify lower income and wealth as the primary driver for lower car ownership in Millennials rather than different consumption preferences. In fact, economically independent Millennials own slightly more cars than previous generations. Knittel and Murphy (2019) find that Millennials' life choice like living in more urban areas and marrying and having children later in life are not likely to have a large effect on U.S. car ownership either—estimating as little as a 1% reduction. Etezady et al (2020) and Klein and Smart (2017) also caution that if the economic status of Millennials changes, we could see a reversal in the trend toward lower car ownership. The reluctance of people in the United States to take up car-sharing in place of private car ownership over the past couple decades is also indicative of the challenges in transitioning away from car ownership (Hahn et al 2020; Marshall, 2019; Matyas and Kamargianni 2018).

New on-demand travel options have also garnered attention as potential mechanisms by which to reduce the privately-owned car as the dominant transportation mode in U.S. cities (Lyons et al 2019; Rodriguez, 2018; Mulley, 2017; Jittrapirom et al 2017; Eckhardt et al 2017; EPOMM, 2017). Ride-hailing services have proliferated in U.S. cities over the past decade. Cross-sectional studies have found that ride-hailing users own fewer vehicles than non-users nationally and in select cities (Schaller, 2018; Gehrke et al., 2018; Rayle et al., 2016) and as many as 10% of ride-hailing users report postponing the purchase of a new car on surveys (Bansal et al., 2020; Hampshire et al., 2018). Yet recent longitudinal studies have found that the introduction of ride-hailing services has had an insignificant effect on vehicle ownership in cities across the country, with the potential exception of those cities with the most robust transit systems (Diao et al., in press). When it comes to vehicle use, studies have found that ride-hailing replaces public transit, walking, and bicycling more than personal car use on a trip-by-trip basis (Moody & Zhao, 2020); over the past decade, ride-hailing has reduced transit ridership and increased VMT in major U.S. cities (Diao et al., in press). A travel option more comprehensive than ride-hailing is Mobility as a Service (MaaS): a single digital platform that allows people to seamlessly plan their journey, book rides, and pay for multiple mobility services including on-demand vehicle trips (ride-hailing), public transportation, bike and scooter sharing, etc. (Kamargianni et al 2016). However, very few MaaS schemes have been implemented worldwide, and those that exist have not yet succeeded in reducing car ownership (Jittrapirom et al 2017; Socher et al 2015). Even hypothetical stated preference surveys agree that MaaS is unlikely to decrease car ownership significantly (Lyons 2019; Webb et al 2019; Mulley 2017). Ho et al (2018) found that people were more sensitive to the cost of MaaS packages than to the long-term cost of owning their car, indicating the difficulty in using pricing to attract people to give up their car. These new mobility services do not appear to be attracting people away from their cars, suggesting that a better understanding of the value of car ownership and use is needed.

2.2 Methods

We undertook an online survey with two types of discrete choice experiments: single binary discrete choice (SBDC) (Loomis et al., 1998) and best-worst scaling (BWS) (Louviere et al., 2013). Here we introduce our respondent recruitment and our two choice experiments. For additional details on sample representativeness, survey design, and estimation methods, please see the Appendix A.1.

2.2.1 Sample

We implemented our study in four metropolitan areas of the U.S.—Washington D.C., Chicago, Seattle, and Dallas—chosen to provide variation in terms of factors such as geography, car ownership, and transit availability. We recruited participants to take our online survey between June 10 to July 2, 2020, using Qualtrics, a professional panel company. Quota sampling was used to ensure statistical representativeness of each metropolitan area sample by age, household income, and household car ownership. A total of 4,937 responses were collected from which 915 individuals were screened out by quota questions or failed to complete all sections of the survey. This left us with a final sample size of 4,022 responses, with 1,017 from Washington, D.C., 1,006 from Chicago, 1,001 from Seattle, and 998 from Dallas.

2.2.2 Single binary discrete choice

The single binary discrete choice (SBDC) experiment asked respondents to make a single choice from two options: keep access to a transportation option or forego access in return for receiving a specific amount of compensation. Different scenarios were created to measure the value of private car ownership and use compared to ride-hailing:

1. Value of ride-hailing: Given all your travel needs and options, choose whether to give up access to **ride-hailing** for one year and receive a compensation amount, or keep access to ride-hailing and receive no compensation.
2. Value of car ownership and use: Given all your travel needs and options, choose whether to give up access to your **primary car** for one year and receive a compensation amount, or keep access to your car and receive no compensation.
3. Value of car ownership: You are given access to a **new, free, ubiquitously available ride-hailing service** that can serve all of the trips that you currently make by your primary vehicle without any additional inconvenience. Choose whether to give up access to your **primary car** for one year and receive this free service and a compensation amount, or keep access to your car and receive no compensation nor free ride-hailing.

Then from the difference between scenarios 2 and 3, we can isolate the value of car use. Each respondent was randomly presented with four compensation amounts for each scenario. For one set of scenarios, respondents were asked to recall their typical travel behavior in a year pre-COVID-19 (for example, 2019). For a second set of scenarios, respondents were asked to answer for a month during COVID-19, with the monetary amounts adjusted to be approximately 1/12 those provided for the typical year.

For each SBDC scenario, we estimate a binary logistic regression model that included a random intercept and the log of the compensation amount, C, displayed in each choice experiment. Setting the probability of giving up the car (or ride-hailing) equal to 0.5, we can solve for the median willingness to accept compensation (WTAC). This provides a point estimate of the compensation amount associated with indifference between giving up and keeping access to the car (or ride-hailing) for the entire sample. We also estimate this model with additional covariates, including the individual's typical travel behavior, household and individual demographic characteristics, the built environment of their residence, and the employee benefits that they receive. Based on the estimated coefficients and the observed values of the covariates, we can then calculate individual-specific indifference compensation amounts (Ci).

2.2.3 Best-worst scaling

While the main results of this study come from these SBDC experiments, we also employed best-worst scaling (BWS) as a benchmarking method following Brynjolfsson, Collis, and Eggers (2019). Employing a case 1 or object-case BWS design, we asked respondents to select the best (most important) and worst (least important) options from a set of three options: a mobility good, a non-mobility good, and a monetary amount (Louviere, Flynn, and Marley, 2015). Respondents answered 10 randomly allocated BWS choice questions and were randomly assigned to either pre- or during-COVID-19 framings for the questions. Utility parameters for the BWS experiment were estimated using a random intercept multinomial logit using the maxdiff model (Louviere, Flynn, and Marley, 2015).

2.3 Results

Finding 1: On average, private cars are valued more than they cost, and the majority of that value comes from ownership rather than use.

We find that people value owning and using their car annually at $11,197 on average (Table 1), meaning that people value owning and using their car more than its cost, based on the AAA average annual cost of owning and using a car of $9,282 (Edmonds, 2019). This finding runs counter to the narrative that people are behaving irrationally by owning a car because they underestimate the true cost. Instead, we find that

people value owning the car high enough to make the cost worthwhile. Additionally, we find that around 58% of that value is in owning the car, compared to 42% in using it. The majority of the cost of a car also comes from owning it, rather than using it (Edmonds, 2019; Chia et al 2001).

Table 1. Base model estimation results (with standard errors) and calculated median willingness to accept compensation (WTAC) to lose access to a transportation option for a typical year

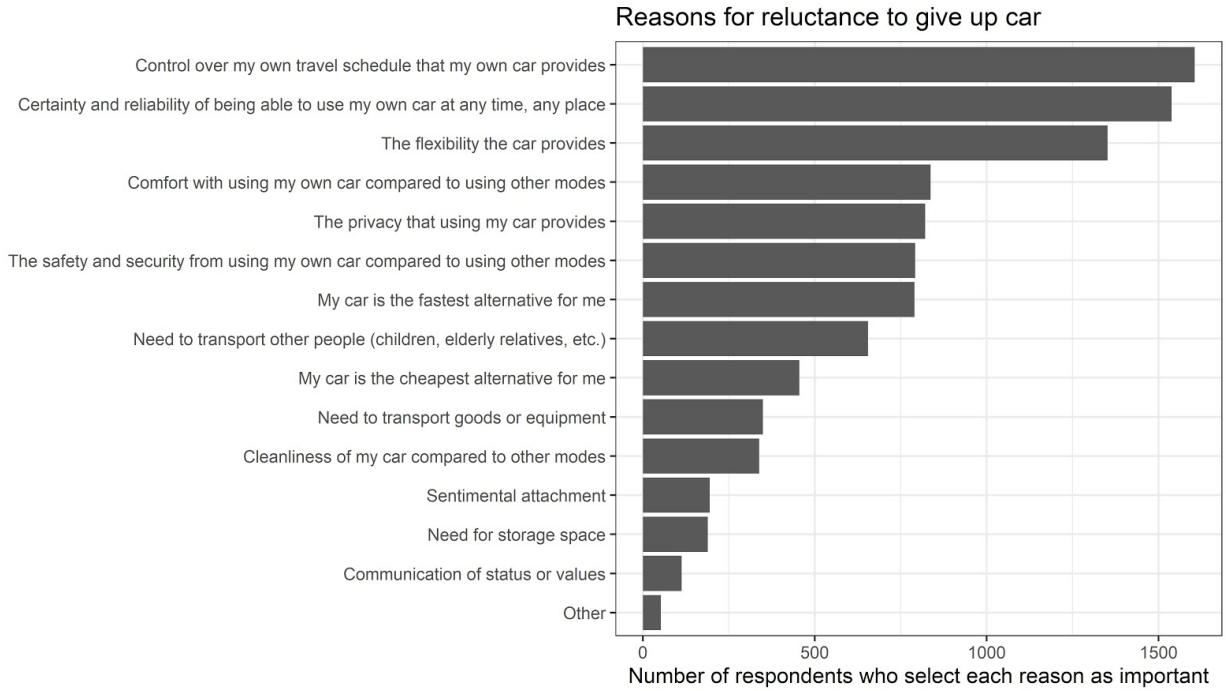
Scenario	Random intercept	Coefficient of log(C)	Median WTAC best estimate	95% CI for median WTAC
1. Ride-hailing*	-3.659 (0.135)	0.760 (0.021)	$123	[$98, $149]
2. Car ownership and use**	-10.432 (0.238)	1.119 (0.025)	$11,197	[$9,908, $12,648]
3. Car ownership only**	-10.385 (0.250)	1.183 (0.028)	$6,496	[$5,706, 7,377]
Car use only (calculated)	--	--	$4,701	--

Table notes: All estimated coefficients were statistically different from zero at a 0.01 level. 95% confidence interval (CI) calculated using 1,000 bootstrapping iterations, with each iteration randomly selecting 1,500 individuals in the sample with replacement. * = only calculated for individuals who have used ride-hailing (n = 2,821); ** = only calculated for individuals whose household owns at least one car (n = 3,787).

These valuations suggest that the value of the car goes well beyond the trips that it provides. To understand the components of car ownership value better, we asked our respondents to select the most important reasons that they might be reluctant to give up their car (see Figure 1). The most commonly cited reasons—control over travel schedule, certainty and reliability, and flexibility—all make up some aspect of "option value," or the value placed on having the car available to use whenever it is needed. This option value is directly enabled by parking, indicating that parking could be a lever with which to impact the value of car ownership. This will be explored in sections 3 and 4 of this thesis.

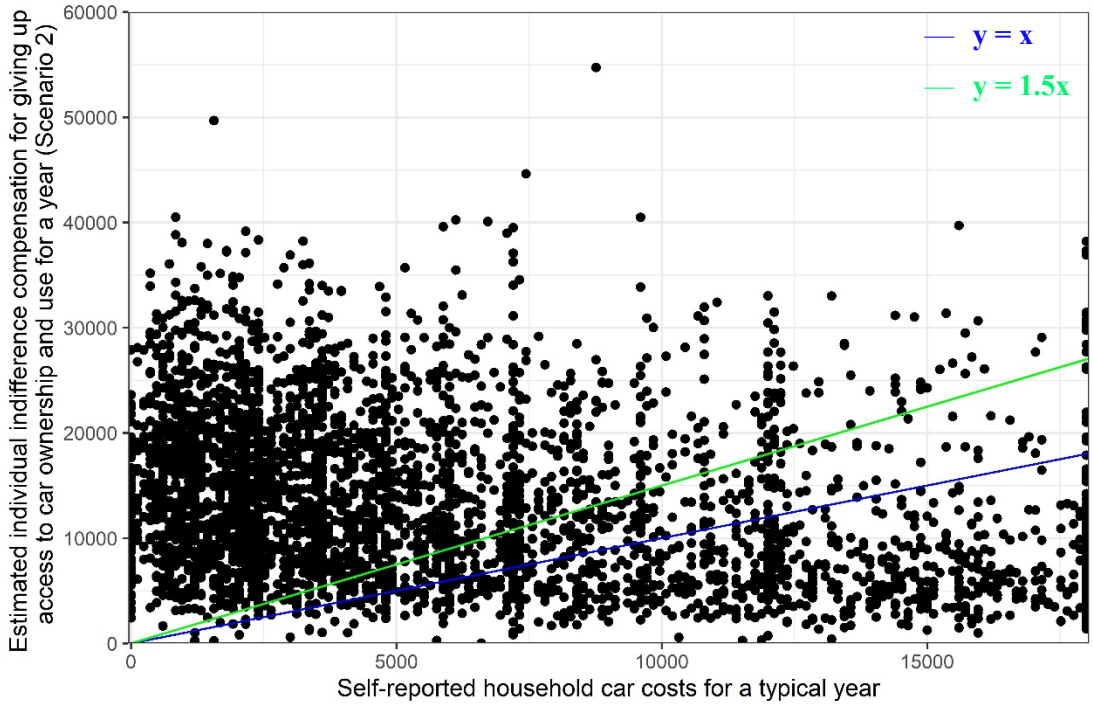
Other reasons were also common, indicating that the value placed on car ownership includes not only option value, but also the value of comfort, privacy, security, and other features.

Figure 1. Distribution of responses to the question "What are the three most important reasons why you would be reluctant to give up your primary vehicle?"



Further evidence that people value owning a car more than its cost comes from visualizing each individual's indifference compensation, Ci, estimated from SBDC Scenario 2 compared to their self-reported estimation of how much their household spends on car ownership and use in a typical month (divided by the number of cars in the household) (see Figure 2). In fact, 80% of respondents in the sample were estimated to value car ownership and use more than they reported it costs them (above the line $y = x$). Even if the individuals underestimate the costs of their household vehicles by as much as 50% (Andor et al. 2020), 75% of individuals still value their car more than it costs (above the line $y = 1.5x$).

Figure 2. Scatterplot of estimated car ownership and use value versus self-reported car costs



Finding 2: Individuals who travel less by car and more by other modes are more willing to give up private car ownership and use.

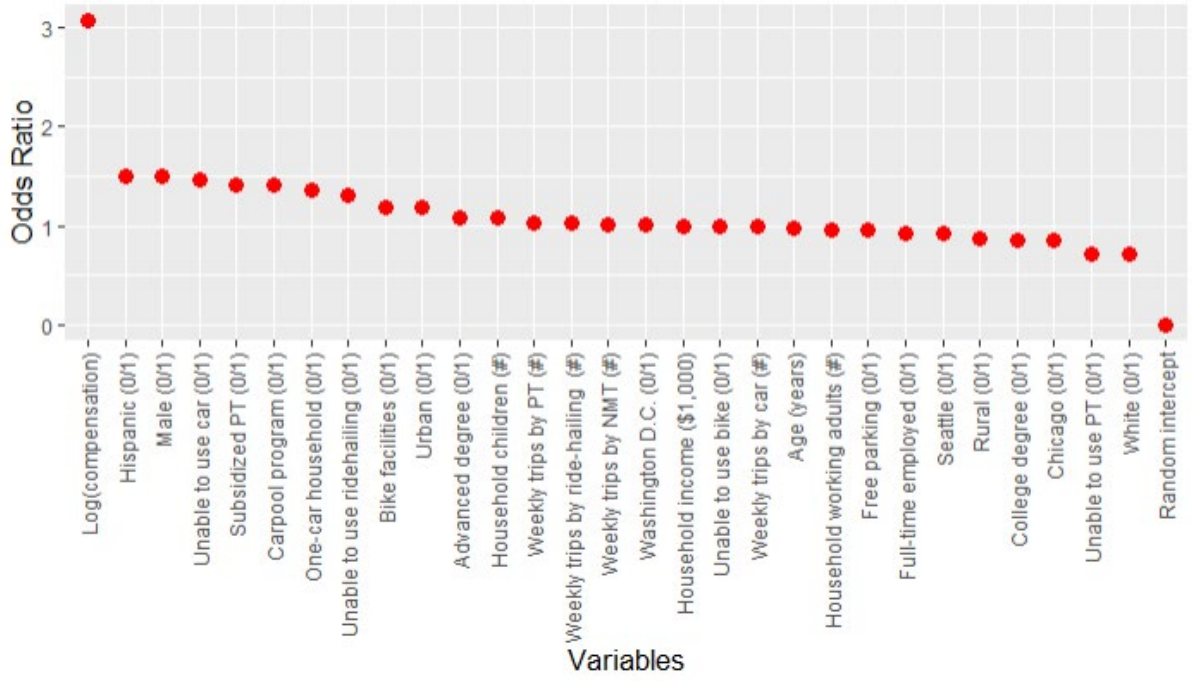
In this and the following finding, we consider how differences in the willingness to give up one's car at a given compensation level is explained by factors such as a person's typical travel behavior, the built environment where they live, and the employee benefits that they receive (Table 2).

Table 2. Estimation results (with standard errors) for the binary logistic regression model of probability of giving up access to transportation option for a year with all predictors

Predictor	Scenario 1 (ride-hailing)	Scenario 2 (vehicle ownership and use)	Scenario 3 (vehicle ownership)
Random intercept	-3.178 (0.340)***	-9.696 (0.240)***	-9.274 (0.379)***
Log(compensation)	0.760 (0.021)***	1.121 (0.025)***	1.186 (0.028)***
Rural (0/1)	0.116 (0.254)	-0.127 (0.171)	-0.187 (0.201)
Urban (0/1)	-0.449 (0.130)***	0.167 (0.101)*	0.134 (0.119)
Washington D.C. (0/1)	-0.053 (0.164)	0.010 (0.130)	0.353 (0.154)**
Chicago (0/1)	0.109 (0.164)	-0.151 (0.127)	0.089 (0.150)
Seattle (0/1)	-0.012 (0.165)	-0.080 (0.128)	0.226 (0.151)
Male (0/1)	-0.087 (0.124)	0.405 (0.099)***	0.122 (0.116)
Age (years)	0.013 (0.004)***	-0.018 (0.004)***	-0.030 (0.004)***
White (0/1)	0.394 (0.137)***	-0.343 (0.114)***	-0.335 (0.134)**
Hispanic (0/1)	-0.167 (0.195)	0.407 (0.167)**	0.246 (0.197)
College degree (0/1)	-0.597 (0.145)***	-0.148 (0.111)	-0.032 (0.131)
Advanced degree (0/1)	-0.301 (0.173)*	0.085 (0.136)	0.069 (0.160)
Full-time employed (0/1)	-0.075 (0.136)	-0.069 (0.108)	0.019 (0.127)
Household income ($1,000)	-0.003 (0.001)***	-0.001 (0.001)	-0.001 (0.001)
Household children (#)	-0.095 (0.062)	0.075 (0.049)	-0.013 (0.058)
Household working adults (#)	0.020 (0.068)	-0.037 (0.053)	-0.017 (0.063)
Zero-car household (0/1)	-1.222 (0.259)***	--	--
One-car household (0/1)	-0.423 (0.139)***	0.306 (0.106)***	0.344 (0.126)***
Weekly trips by car (#)	0.002 (0.003)	-0.007 (0.002)***	-0.003 (0.002)
Weekly trips by ride-hailing (#)	-0.039 (0.010)***	0.024 (0.011)**	0.005 (0.011)
Weekly trips by PT (#)	0.023 (0.009)**	0.024 (0.011)**	0.009 (0.012)
Weekly trips by NMT (#)	-0.005 (0.005)	0.019 (0.005)***	0.019 (0.006)***
Unable to use car (0/1)	-0.121 (0.176)	0.377 (0.147)**	-0.003 (0.175)
Unable to use ride-hailing (0/1)	-0.245 (0.278)	0.270 (0.240)	0.061 (0.285)
Unable to use PT (0/1)	0.085 (0.280)	-0.336 (0.237)	-0.174 (0.281)
Unable to use bike (0/1)	0.042 (0.201)	-0.004 (0.157)	0.242 (0.185)
Free parking (0/1)	-0.119 (0.130)	-0.042 (0.106)	-0.065 (0.126)
Carpool program (0/1)	-0.002 (0.207)	0.341 (0.180)*	0.297 (0.215)
Subsidized PT (0/1)	-0.064 (0.165)	0.342 (0.146)**	0.378 (0.173)**
Bike facilities (0/1)	0.166 (0.215)	0.173 (0.187)	0.636 (0.222)***

Table notes: PT = public transport; NMT = non-motorized transport; -- = not applicable

Figure 3. Odds ratio for variables in the binary logistic regression model of probability of giving up access to vehicle ownership and use (Scenario 2) for a year



We find that an individual's typical travel behavior helps explain their choice to give up access to their private car at a given compensation level. Individuals who take more trips by car in a typical week are less willing to give up their private car under current conditions by a factor of 0.99 (Scenario 2 in Table 2, Figure 3). However, if individuals can replace use of their car with unlimited ride-hailing trips, then their current number of car trips is no longer significantly predictive of willingness to give up car ownership (Scenario 3 in Table 2). We also find that individuals who make more trips by modes other than the private car— including public transit, walking or biking, or ride-hailing—are more likely to give up access to their car under current conditions. For each additional trip taken on public transit, the odds of being willing to give up one's private vehicle increase by about 1.1 (Figure 3). This result demonstrates that the extent to which people use their car (rather than other modes) may still be a significant factor in how people value it.

We also find that people that receive a free or subsidized transit pass or car pool benefit from their employer are more willing to give up their car. The impact of employer-provided free or subsidized parking, in contrast, was not found to be significant. This suggests that incentivizing people to use alternatives modes of travel to work could be impactful in reducing car ownership.

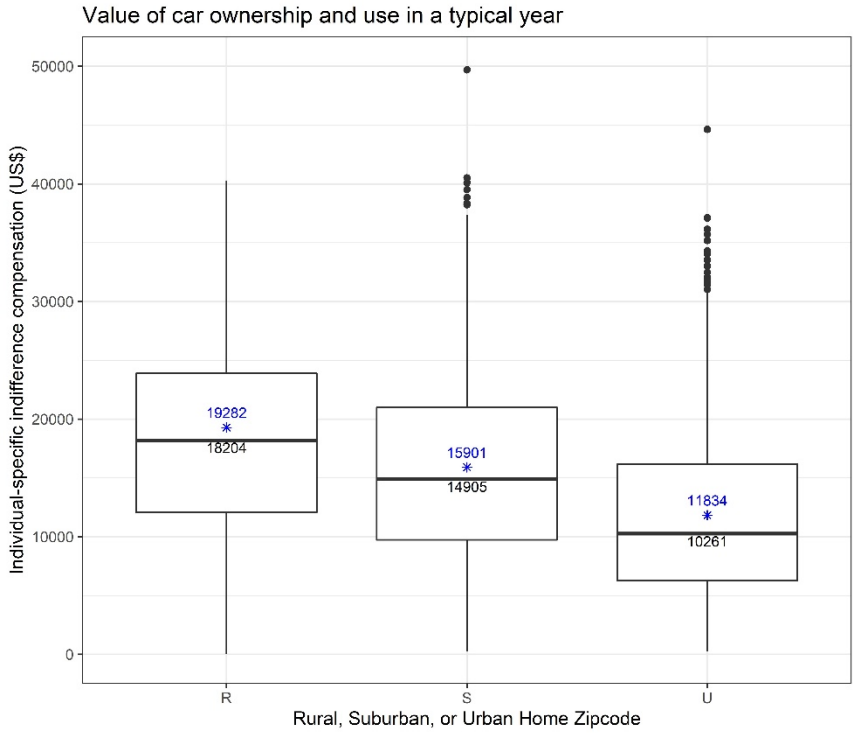
Finding 3: The value of private car ownership and use is lower for urban residents, independent of the metropolitan area they live in.

We find that the built environment where a person lives significantly impacts their valuation of owning and using a car. Existing literature has found that density and mix of street networks influences the rate of car ownership and use, but has not previously considered how consumers perceive the value of car ownership. Living in an urban zip code is positively correlated with being more willing to give up one's car as compared to living in a rural or suburban zip code. The magnitude of the built environment's impact on valuation is

shown further in Figure 4: each increase in the built environment category (level of density) reduced the median value of owning and using a car by nearly $4,000. Importantly, once this built environment variable was added to the model, the impact of each of the city dummy variables became insignificant. This suggests that the built environment has a bigger impact than region-specific geographic, cultural, or governance differences.

The built environment variable we used aggregates many different elements of the built environment that may have varying significance individually, such as density, mix of uses, supply of parking, density of street network, biking infrastructure, and public transit infrastructure. While we do not disaggregate the impact of specific built environment variables here, we do see that people who take more weekly trips by non-motorized transit, public transit, and ride-hailing were more willing to give up their vehicle. This indicates that changing the built environment to be more urban, and providing more and better transit alternatives, biking and walking infrastructure, and ride-hailing services, could help to reduce car ownership.

Figure 4. Boxplots of distribution of individual-specific indifference compensation for SBDC Scenario 2 for individuals from rural, suburban, and urban zip codes. Median values in black, mean values in blue.



Finding 4: During the COVID-19 pandemic, the value of car ownership increased dramatically, but the value of car use did not.

In addition to asking respondents their preferences during a pre-COVID-19 year, such as 2019, we also asked respondents their preferences during one month of COVID-19. We find that people's valuation of owning and using a car increased by 260% during a month of COVID-19 (to $3,361) compared to a month pre-COVID-19 (approximate $933). The vast majority of this increase in valuation came from the increase in the value of owning a car, rather than using it, with the car use component very similar ($401/month during COVID-19 versus $392/month pre- COVID-19). This result likely reflects the perception of control and flexibility that car ownership provides, such as providing households the ability to travel out of COVID-

19 hotspots, or to visit supermarkets or medical facilities without using shared modes at a time when substantial fear and uncertainty about COVID-19 existed.

While interesting and consistent with our observations, we caution about extrapolating from these results. Our responses were collected during the first wave of the COVID-19 pandemic when disruptions to everyday life (including travel) were particularly salient, and uncertainties surrounding the nature and impact of the virus remained high. Nevertheless, the stark finding that car ownership value increased during the pandemic highlights the importance of option value as a key incentive for car ownership. In times of greater uncertainty when consumers are more likely to be risk averse, car ownership is a security blanket and its option value is an especially salient feature in consumer decision-making.

Table 3. Base model estimation results (with standard errors) and calculated median willingness to accept compensation (WTAC) to lose access to a transportation option for a month during COVID-19

Scenario	Intercept	Coefficient of log(C)	Median WTAC best estimate for a month of COVID	Median WTAC for a typical month (year best estimate / 12)
1. Ridehailing*	-1.486 (0.106)	0.635 (0.021)	$10 [$7, $14]	$10
2. Car ownership and use**	-8.128 (0.223)	1.001 (0.029)	$3,361 [$2,736, $4,173]	$933
3. Car ownership only**	-7.462 (0.207)	0.934 (0.027)	$2,960 [$2,376, $3,726]	$541
Car use only (calculated)	--	--	$401	$392

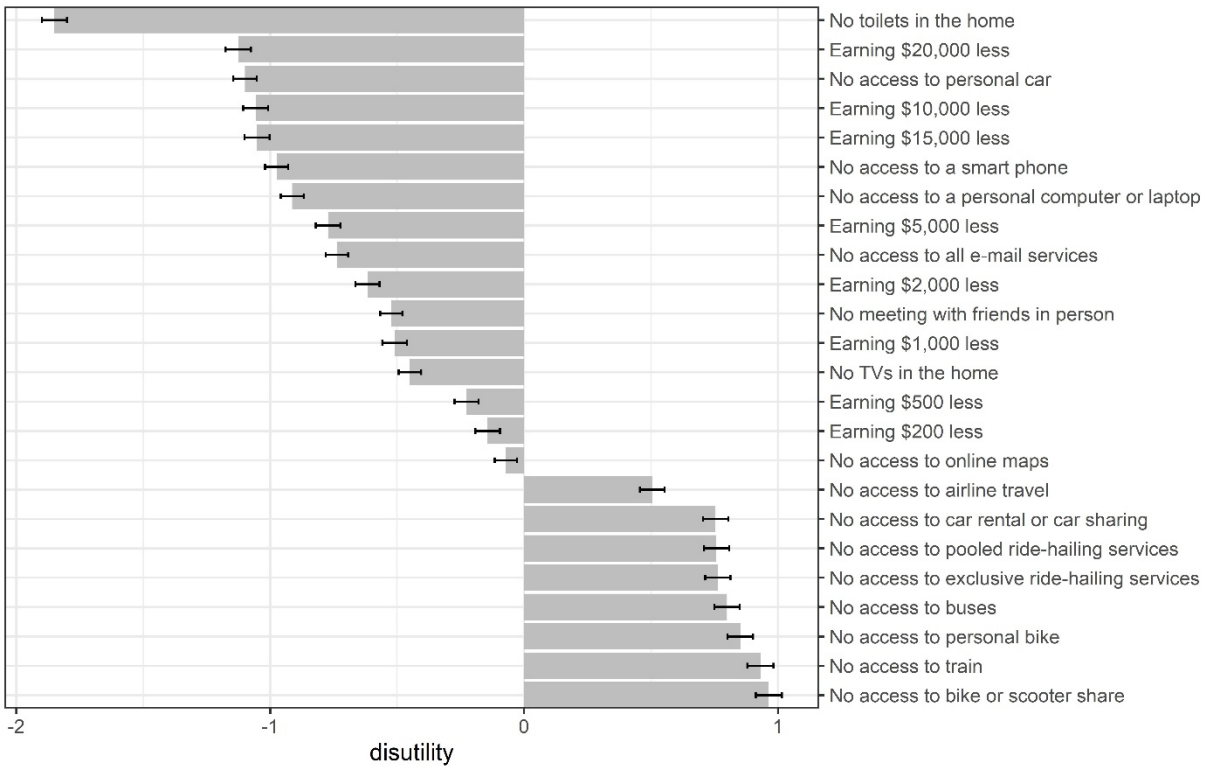
Table notes: All estimated coefficients were statistically different from zero at a 0.01 level. 95% confidence interval (CI) calculated using 1,000 bootstrapping iterations, with each iteration randomly selecting 1,500 individuals in the sample with replacement. * = only calculated for individuals who have used ride-hailing (n = 2,821); ** only calculated for individuals whose household owns at least one car (n = 3,787).

Finding 5: The value of car ownership and use is orders of magnitude higher than the value of other urban transportation options.

Our best-worst scaling results are broadly consistent with the results of our single binary discrete choice responses, ranking the disutility of not having access to a personal car for a year between earning $10,000 and $20,000 less for a year (Figure 1). In contrast, access to other mobility options, including airline travel, car rental, ride-hailing, public transit, and bikes/scooters are all valued at less than $100 for a year.

Using the estimated dis-utilities of the monetary loses, we can estimate monetary values for the mobility and non-mobility options (see Appendix A.1 for details). We find that the value of one year of access to a personal car is estimated to be $16,890. On the other hand, access to all other forms of transportation included among the mobility options—car rental or car sharing, exclusive or pooled ride-hailing services, bus, train, and personal bike or bike/scooter share—were each valued under $5. These extremely low valuations of individual non-car mobility goods are notable considering the energy behind MaaS, or a package of non-car mobility goods, replacing car ownership. The sum of valuations of these goods remains below $50, which is unlikely to compete with the value of a personal car. If MaaS is to compete with private car ownership, the packaging of these mobility goods must result in a value much greater than the sum of its parts.

Figure 4. Disutility of losing an option for a year based on BWS maxdiff model estimation; all results are relative to earning $100 less per year set to disutility = 0.



2.4 Discussion

Our results indicate that people value owning and using their car significantly more than the full cost of ownership on average. Even if people are underestimating the true cost of car ownership and use, our study suggests that people are not "irrationally" buying cars; instead, consumers own and use vehicles because the realized value more than accounts for the incurred cost. We find that the highest contributor to car value is ownership (not use) and that prominent among the many reasons for ownership value is "option value"—the fact that owning a car gives people control, certainty, reliability, and flexibility. These elements were also likely large contributors to the significant increase in the value of car ownership that our results showed during the COVID-19 pandemic. The value of car use, notably, did not increase during the pandemic. As the pandemic produced a great deal of uncertainty and risk, this finding indicates that car ownership is seen as a kind of security blanket. Those ownership elements of control, certainty, reliability, and flexibility likely became more important in that uncertain and risky context.

While our results highlight just how resilient patterns of car ownership and use are in the U.S., they also provide hints for what interventions could reduce the value of car ownership, and thus the state of car dependency in the U.S. We find that individuals who live in the urban core are much more willing to give up their car than those who live on the periphery, regardless of the metro area. This implies that long-term land use planning that encourages dense, mixed use, and potentially transit-oriented neighborhoods could be a viable and powerful intervention to reduce car ownership. We also find that individuals who travel less by car and more by alternative modes are more willing to give up private car ownership and use. In other words, people value owning a car less when they have good-quality non-private car alternatives that have enough value to rival using a car. In addition, service and infrastructure improvements as well as employer-

benefits programs that support public transit, walking, and biking could reduce car ownership. More analysis to identify what factors impact car use directly is also warranted. This is explored in the next section of this thesis.

More broadly, our results highlight that improving the value of alternatives enough to compete with the private car is an incredibly steep challenge. We find that the average value of car ownership and use is at least an order of magnitude higher than the value of other urban transportation options, including ride-hailing, public transportation, and non-motorized transport. In cities, these urban transportation options are quite effective substitutes for each other. Therefore, losing access to one urban transportation option does not restrict a person's mobility significantly, likely contributing to their low value in our best-worst scaling experiment. However, losing access to a private car significantly restricts a person's mobility, particularly in suburban and rural area, contributing to its high value. This indicates that for the majority of U.S. residents, there are few legitimate substitutes for the private car. The challenge for policymakers, researchers, and mobility companies, therefore, is to identify a package of transportation alternatives that can together provide value that rivals that of the private car, even when each non-car component of such a multimodal offering is not valued highly. The even more difficult challenge will be to provide that valuable package even in areas that are currently low density.

While employer parking benefits were not found to be significant in this study, several of these results indicate that parking policy may still be a key mechanism to increase the value of non-car alternatives. Land use planning toward increased density and transit orientation often necessitates dedicating proportionally more space to people as compared to their cars, particularly to parking them. Improving non-car alternatives is also found to be key in reducing the value of car ownership. Bus and bike lanes are one way that non-car alternatives can be improved. Building bus and bike lanes often requires removing on-street parking.

Another intervention that could enable the value of alternatives to compete with the value of the private car is to reduce the value of the private car, rather than only focusing on increasing the value of alternatives. As we'll see in section 3.1 of this thesis, several studies have indeed found that disincentivizing cars is a key element of reducing their use and ownership, suggesting that only incentivizing non-car alternatives may not be sufficient to shift the balance of value between car and non-car options (Piatkowski et al 2019; Buehler 2010; Eliasson et al 2009; Pucher and Buehler 2008; Small et al 2005; Olszewski and Xie 2005; Lerman and Ben-Akiva 1975). That section outlines a framework for organizing policies aimed at reducing car ownership and use based on their impact on value and cost for cars and non-car alternatives. Using that framework, it becomes clear that parking policy is a particularly robust area for intervention because it impacts multiple angles of a person's calculus in owning or using a car. In addition to using parking policy to increase the value of non-car alternatives by dedicating more space to their infrastructure and to denser development, parking can also be a mechanism for reducing the value of car ownership by making it less convenient and more costly. The potential for city officials to use parking policy to disincentive cars, as well as incentivize alternatives, is explored in section 4 of this thesis.

These results provide important information on the high value of car ownership and some categories of interventions that could be used to impact that value, potentially including parking policy. However, these results do not provide conclusive evidence supporting or negating that parking policy may have an impact on car use directly. To explore this question, I conduct an additional analysis using this data. In the next section of this thesis, I investigate the impact of parking-related policies on car use, rather than on the value of car ownership. In section 4, I explore the literature on parking policy and its impact on car ownership and use. Then, I analyze results from interviews with and survey responses from local government officials who work on parking policy.

3. Parking policies and car use

Section 2 of this thesis found that people value owning and using their car highly, with a large portion of that value coming from owning it. Those results also indicated that how much a person uses a car is a significant predictor of how much they value it. Additionally, as stated in the introduction, car ownership negatively impacts the urban environment and sustainability in part because of the space vehicles take up when parked, and in part because those vehicles are used. There is clearly a tight connection between ownership and use, indicating that policies impacting both should be considered comprehensively.

There is consistent evidence that owning a car is strongly positively linked with using a car, and negatively correlated with use of other modes (Kitamura 1989; Prettenthaler and Steininger 1999). The reason for this may stem in part from the "sunk cost" psychological phenomenon, where people often want to use their car more once they've paid to own in, in order to make the cost feel worth it (Gardner and Abraham, 2007). This allows people to minimize the per trip cost of owning the car, or the cars purchase cost split by the number of trips made in the car. Interestingly, section 2 of this thesis also found that this goes both ways - that using a car more might also increase how much value they get from owning it.

Many studies have found that many of the same sociodemographic, land use, and public transit variables impact car use similarly to car ownership (Stevens 2017; McMullen and Eckstein 2013; Holtzclaw et al 2002; Kain 2001). Additionally, several studies have found that cultural and social norms, and individual attitudes influence car use (Flamm 2009; Gaerling, Gillholm, and Gaerling 1998). Lastly, Buehler (2010) presented the theory that spatial development patterns shape time, cost, and convenience of different modes of transportation. Higher population density and a mix of uses brings more people to one area at any given point in time, which makes less space-efficient modes like the car harder to use compared to more space-efficient modes like transit, walking, and biking (p. 77). These findings indicate that interventions that impact the built environment and alternative transportation infrastructure could be impactful in making cars less convenient and alternatives more convenient.

This section will explore factors that impact car use, with a focus on employer benefits and parking-related policies, using the same survey response data collected for section 2. First, I will review policies that impact car use using a carrots and sticks framework. Then, I will describe my data analysis methods. Finally, I will present the results of the data analysis identifying factors that impact the number of average weekly trips taken by car, and the proportion of average weekly trips taken by car. I find that employer-provided parking, as well as transit benefits, are positively related to the number of trips taken by car, as well as the metro area the respondent lives in and the walkability of their home. These results indicate that parking policy could be a viable mechanism by which to reduce car use, as well as ownership as found in section 2. Section 4 will dive further into how parking policy can be used to reduce car ownership and use, considering the results of sections 2 and 3.

3.1 Interventions impacting car ownership and use

Cost, the built environment, and transportation infrastructure all impact a household's decision to own and use a car. Transportation policies can shape those factors in order to influence car ownership and use levels for a city or region. Transportation policies have been shown to be impactful in reality as well. Buehler (2010) compared the US and Germany on a number of factors and found that transport policies were key in explaining the difference in car dependence between the two regions.

3.1.1 Disincentivizing driving versus incentivizing alternate modes

Policies are often thought of as falling into the categories of carrots and sticks, or incentives and disincentives. Transportation policies can also be grouped in this way. There are those that incentivize using non-car modes or more sustainable ways of driving. There are also those that disincentivize driving, by making it more costly or inconvenient. Governments, particularly those outside the U.S., often implement policies in packages that include both incentives and disincentives.

Much of the literature has found that implementing policies that disincentivize driving alongside increasing the attractiveness of non-car alternatives may be key in reducing car ownership and use (Buehler 2010; Lerman and Ben-Akiva 1975; Small et al 2005; Olszewski and Xie 2005; Eliasson et al 2009). Pucher and Buehler (2008) analyzed the Netherlands, Denmark, and Germany and found that those countries' success in reducing private car use was due to implementing a coordinated, multi-faceted approach that involved both incentives to use other modes and disincentives to using a private car. Piatkowski et al (2019) similarly found that combining interventions that enable active transportation with interventions that deter driving are more effective than either intervention in isolation. Many studies note that incentivizing non-car modes tends to be more popular with the public, but also more expensive and inefficient. However, policies disincentivizing driving are so politically infeasible that attempting to implement them could even reduce willingness to accept incentivizing measures (Pucher and Buehler, 2008; Piatkowski et al 2019).

3.1.2 Framework

Rather than a simple carrot/stick framework, it is helpful to use a quadrant when thinking about how to reduce car ownership and use. A decision to purchase a product (or to use it) is often framed in economics as a function of the person's perceived value of the product, its cost, the value of the "outside option," or the thing they might buy in place of this product to accomplish the same goal, and the cost of that outside option (as well as the person's income, which is set aside for this framework, as it is not a viable area for transportation policy intervention). For car ownership and use, that economic framework can be used to understand how different transportation policies will affect a person's calculus for purchasing and using a car.

Sticks	Carrots
Increase cost of owning and using a car	Decrease cost of alternatives
Decrease value of owning and using a car	Increase value of alternatives

Increase the cost of owning and using a car

Pricing policies – e.g. parking pricing, congestion pricing, gas tax

Theoretical frameworks have proposed using pricing mechanisms to shift travel behavior for decades (Vickrey 1963). Pricing mechanisms that have been implemented in the transportation sector include fuel taxes, car ownership taxes, road pricing, and parking pricing. Fuel taxes have been shown to be impactful at reducing new car purchases, and at reducing VMT (Bento et al 2005, Bento et al 2009). Cities often utilize the registration or purchase tax for vehicles to disincentivize car ownership, but also to incentivize lower emission vehicles in place of more polluting vehicles. Yan and Eskeland (2018) found that Norway's CO2-differentiated vehicle registration tax did reduce vehicle sales, and shifted consumers to lower emission vehicles. As with many transportation policies, packages with multiple pricing mechanisms may be the most effective. Fu and Kelly (2012) found that the most effective package of taxes for carbon

emissions reduction from cars was a combination of a fuel tax, a vehicle registration tax, and a motor tax (an annual circulation tax for vehicles in use on public roads).

Road pricing is a particularly well-studied form of pricing that has recently gained traction in the U.S. There are many examples of successful road pricing implemented in other cities, including London, Singapore, Stockholm, and Milan. Studies of those cities tend to find that road pricing decreases traffic congestion, decreases total VMT, and increases use of public transportation and alternatives (Santos, 2005; Croci 2016). New York City is set to implement congestion pricing at some point, and several other American cities are currently studying it. This remains a very unpopular policy in the U.S., in part because of concerns of social equity, unfairly burdening lower income people who may be forced to live in places further from activity centers in order to find affordable housing, who do not have great access to alternatives to driving.

A final key mechanism to increase the cost of owning and using a car is to increase the cost of parking. Donald Shoup is the most prominent scholar on this subject, first authoring the book "The High Cost of Free Parking" in 2005, arguing that cities have vastly oversupplied and underpriced parking in the US, the result being the car dependence we're experiencing today. Buehler (2010), along with others, have found that parking cost, as well as supply, can have a large influence on car ownership as well (Guo 2013; Shoup 2004). More literature on parking pricing is described in Section 4.1.

A major concern of pricing policies is that they may end up negatively impacting lower income people who have less money to spare on a necessity like transportation. Ecola and Light (2009) argue that whether pricing policies are equitable depends entirely on how we measure equity and define groups, specific locations under consideration, and what we compare the pricing policy to. Schweitzer and Taylor (2008) push back on the idea that road pricing is regressive with an economic analysis of a local transportation sales tax and a toll system in Orange County, finding that low-income drivers do have to pay more with tolls but low-income residents on average pay more with the sales tax.

Decrease the value of owning and using a car

Reducing parking availability

One key method in decreasing a car's value is to make it harder to find parking. Many studies have found this to be the single most impactful intervention in changing behavior so that people use and own cars less (Guo, 2013; Shoup, 2004). The impact of reducing parking availability is described further in Section 4.1.

Land use & the built environment

Land use mechanisms have been shown to be useful in making car ownership and use less convenient and thus leading households to purchase fewer, or no, cars, as well as reduce their usage of the cars they have. Higher density can lead to congestion on roads and for parking, making it less convenient to use a car. Several studies have found that residential location impacts car ownership, and that higher population and residential density are negatively related to ownership and use (Dargay 2002; Schimek 1996; Bento et al 2005; Li et al 2010; Hess and Ong 2002; Anowar et al 2014). Some studies have found that a mix of land uses is also correlated with lower car ownership and use (Chu 2002; Potoglou and Susilo 2008).

While land use and the built environment are essential factors in reducing car ownership and use, they are some of the most challenging to change. The built environment changes very gradually in most places, with most buildings, streets, and highways lasting for around a hundred years. Additionally, the built environment contributes to many quality of life factors beyond those directly related to transportation behavior and access, such as access to green space, public health, education systems, economic development, and housing. Any decision to change to the built environment must consider not only its

impact on car use and car ownership, but also this multitude of other factors, which can make it challenging to deploy efficiently as a transportation policy.

Decrease the cost of alternatives

Much of the conversation around decreasing the cost of alternatives has focused on the cost of public transit. Decreasing or removing the cost of public transit has gained increasing attention recently in the United States and abroad. Much of the literature finds that while the cost of transit fare does positively influence transit ridership, and may even increase transit usage among habitual drivers, reducing or removing fare on its own may not produce a significant change in modal split (Chen et al 2011, Cools et al 2016; Fuji and Kitamura, 2003). Additionally, Chen et al (2011) found that service levels are consistently more impactful than fares on transit ridership and driving behavior. The argument in public discourse for reducing or removing fares is often motivated by improving social equity and access for low income people, rather than by reducing driving (Wu, 2019).

Increase the value of alternatives

Transportation infrastructure

Providing transportation infrastructure for non-car modes is one of the most popular and publicly acceptable way to shift drivers out of their cars and into public transportation, in particular. The impact of building out new transit infrastructure on reducing car ownership has mixed evidence. Lerman and Ben-Akiva (1975) found that introducing transit where previously there was none can affect car ownership, but improvements to existing transit only had a marginal effect. Kitamura (1989) used a causal analysis, and found that increases in car use and ownership may not be suppressed by improving public transit. However, other studies have found positive effects of public transit service and access on reducing automobile ownership and use (Holtzclaw et all 2002; Kim & Kim 2004; Shindler and Ferreri 1967; Fairhurst 1975; Cullinane 2002).

"New Mobility" solutions

New mobility solutions, such as e-scooter share, bike share, Transportation Network Companies (TNCs) like Uber and Lyft, and autonomous vehicles, are increasingly becoming a part of the urban transportation landscape. Companies and scholars alike are interested in using these new mobility options as alternatives to the private car, hoping they will lure car owners to give up their car in place of these new services.

The term "new mobility" is not yet clearly defined, but generally includes shared modes like car share, ride-hailing, ride-share, bike-share, and scooter-share, as well as a suite of potential future modes like autonomous vehicles and even autonomous helicopters (Lyons, 2016; McKenzie, 2020). Much of the literature on new mobility focuses on Mobility as a Service (MaaS), which is a concept of providing multiple mobility options in one platform to offer convenient transportation without needing to own a car (Kamargianni et al 2016). Thus far, MaaS has not been implemented at a comprehensive and large scale, so its impacts are unknown. However, there are many different predictions for what impact MaaS could have on car ownership and use, ranging from reducing both, to increasing use, to having minimal impact (Becker et al 2020; Kamragianni et al 2016; Hensher 2018; Mulley 2017).

The impact of Transportation Network Companies (TNCs) like Uber and Lyft on American cities is foreboding for the potential impact of MaaS and other new mobility solutions. Clewlew and Mishra (2017) found that ride-hailing users tend to have higher personal vehicle ownership rates than those who only use transit, and the majority of ride-hailing users have not adjusted their vehicle ownership since starting to use

ride-hailing. Additionally, ride-hailing has reduced transit use and is likely increasing VMT in major American cities (Diao et al, in press).

The future with autonomous vehicles is even more uncertain, with some predicting a significant reduction in greenhouse gas emissions with a shared, autonomous, electric fleet (Greenblatt and Saxena, 2015), and some finding even this shared version of autonomous mobility is likely to increase VMT in the U.S. (Hensher, 2018).

Based on these uncertain results and predictions, policymakers aiming to reduce car ownership and use should be cautious about incentivizing new mobility options as replacements for the private car. However, the impact of these options should continue to be monitored to determine if there are ways these modes can be leveraged to make private car ownership and use less valuable as compared to the suite of alternatives.

Employer-based parking policies

Employee parking is another key mechanism that can be used to impact car ownership and use. Programs and laws aimed at employer-provided commuter benefits can cover many elements of parking and transportation policy generally – they can incentivize car use and ownership through providing a large supply of low-cost parking, disincentivize car use and ownership through increasing the cost of parking and reducing the supply of parking, and they can provide transit, bike, carpool, and other benefits that incentivize the use of non-car modes. Many employers provide commuter benefits voluntarily, and the most common to provide is free or subsidized parking (Society for Human Resource Management, 2017). Some cities and states mandate that employers provide certain commuter benefits, though often allowing some flexibility in the program design, including the State of Washington and Washington D.C. (Hamre & Buehler 2014; Su and Zhou 2012).

The literature has consistently found that employer-provided benefits have a significant impact on commute behavior. Driving disincentives like charging market-rate parking prices and refraining from mileage and toll payment reimbursements negatively impact driving to work rates (Bueno et al 2017; Hamre and Buehler, 2014; Su and Zhou 2012). Incentives to take alternative modes of transportation tend to be successful at reducing driving behavior and increasing use of those alternatives (Wu et al 2019; Bueno et al 2017; Dong et al 2016; Yang et al 2015; Hamre and Buehler 2014; Buehler 2012; Su and Zhou 2012; Herzog et al 2006). However, Hamre and Buehler (2014) and Buehler (2012) found that the reduction in driving found when alternatives benefits are provided can be largely offset if the employer also provides free parking. Additionally, Shin et al (2020) found that commuter benefits both increase the likelihood that workers will use the incentivized non-car mode for commuting, and increase the likelihood that their non-commute trips and household members' travel behavior will utilize those incentivized non-car modes. Lastly, there may be equity concerns with commuter benefit policies. Hamre (2019) found that low income workers are less likely to receive employer-based transit subsidies than higher income workers.

3.2 Methods

3.2.1 Data

For this section, I used the data discussed in section 2.2 of this thesis to examine the impact of parking-related policies, particularly of having employer-provided free or subsidized parking, on how frequently people use their car. Therefore, we are particularly interested in the response to the survey question "Does

your employer provide any of the following benefits?" which allowed respondents to select all that apply from:

- Subsidized or free parking;
- Discounted or free transit pass;
- Carpooling or other program to encourage taking non-single-occupancy vehicles to work; and
- Shower, indoor bike parking, or other bike commuting amenities.

I also added an additional variable to the "Value of Car Ownership and Use" dataset, EPA's Smart Location Database's National Walkability Index.[1] I imported the dataset into ArcGIS alongside the zip codes for each of the four metropolitan statistical areas studied.[2] I joined the Walkability Index layer to the zip code layer by averaging the Walkability Index for each zip code. I added this data into R and matched it to the survey data by the zip code of the respondent's home location.

To explore the impact of employer-provided free or subsidized parking and other parking-related policies on driving a personal vehicle, I ran two different regressions: 1) a negative binomial regression on the respondents' self-reported number of trips taken by personal vehicle as a driver or passenger in a typical week and 2) a beta probit regression on the proportion of trips taken weekly in a car as a driver or passenger.

3.2.2 Model specification

For both of the regressions, I went through a model specification process. I first included all possible independent variables from the data. I removed variables that had estimated coefficients not statistically different from zero one by one, checking whether the variable's removal improved the adjusted R-squared. The variables that were tested but eliminated due to insignificance include:

- Household Income
- Rural zip code
- Unable to use public transit
- Unable to use bicycle
- Unable to use ride-hailing
- Hispanic
- Car used for livelihood
- Has a driver's license

I left in variables that were insignificant but relevant to my research question. These included all the employee benefit variables, travel by mode variables, number of children and working adults in the household, educational attainment, and race/ethnicity. I also included any variables that were significant in only one of either the negative binomial or the beta probit model in both of the models, so that the models would include all the same variables.

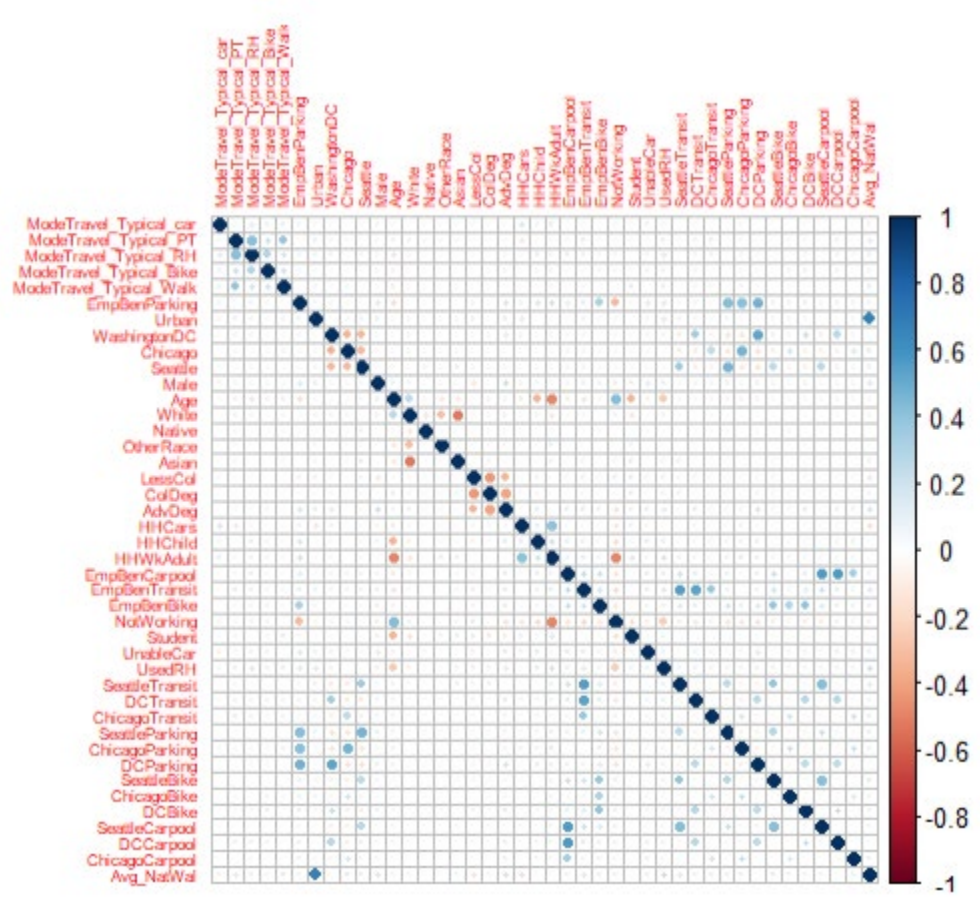
Lastly, I added in several interaction terms. I first tried adding in an interaction term to understand the impact of offering multiple employee benefits. I wanted to see if the parking benefit would outweigh other benefits, since they have the opposite effect on car trips and car mode share in the base model. None of the single combined interaction terms were significant (having parking and transit benefits, having parking and carpool benefits, having parking and biking benefits). When I ran an interaction term with all the benefits

[1] https://www.epa.gov/smartgrowth/smart-location-mapping#walkability
[2] https://catalog.data.gov/dataset/zip-codes-zipcodes

(having parking, carpool, transit, and bike benefits), it was significantly and positively related to car trip share. However, only 34 respondents had all of the benefits. This is too small a sample size to include in the model, so I removed it. However, I successfully added in interaction terms for each of the employer benefits combined with each of the MSA variables.

I also conducted a pairwise correlation matrix and found that no pair of independent variables had a linear correlation greater than 0.8. Figure 5 shows the results of the correlation matrix.

Figure 5. Correlation matrix for variables investigating car use



3.2.3 Average marginal effects (AME)

The coefficients of both beta probit and negative binomial regressions are not easily interpretable, so I calculate the average marginal effects for the variables in both models. I used the "margins" package in R to do this (Leeper, 2018). The output of this package is the average marginal effect of each variable in the model, the standard error, and the confidence interval for that effect. The average marginal effect can be interpreted as the average change in the dependent variable caused by a one unit change in the independent variable, holding everything else constant. Essentially, this command goes through every individual in the data set and sets the variable to 1 if binary, or adds 1 to each response if not binary. Then the command repeats, setting the variable to 0 if binary, or to the default response (without 1 added) if it is not binary. The difference in the dependent variable between those two runs is the average marginal effect of that variable. Lastly, I plotted the average marginal effects with error bars using ggplot, in descending order.

Regression 1: Negative binomial

For the first regression, I took as the dependent variable the respondents' self-reported number of trips taken by personal vehicle as a driver or passenger in a typical week. Because this dependent variable is a non-zero count, I tried modelling it as a poisson and as a negative binomial regression (see Table 4). The Poisson regression achieved higher pseudo-R^2 value but this was determined to be due to overfitting on central values of the outcome variable distribution. The negative binomial regression provided the better fit based on having a much lower AIC and more reasonable minimum and maximum deviance residuals, despite having a dispersion factor of only 1.09. These models were estimated using "lme4" package in R (Bates et. al, 2015).

Table 4. Comparison of fit of Poisson regression and negative binomial regression on number of weekly trips taken by personal vehicle (base model, without interaction terms)

	Poisson regression	Negative binomial regression
Final log-likelihood	-36248.96	-28181.54
AIC	72680	28268
Minimum deviance residual	-7.49	-3.25
Maximum deviance residual	48.43	6.61
Dispersion factor	1 (fixed)	1.14
pseudo-R^2 (based on likelihood-ratio)	0.844	0.193

Regression 2: Beta probit

For the second regression, I used a beta regression with a probit link function to appropriately model the dependent variable of the proportion of trips taken weekly in a car as a driver or passenger. Since the dependent variable includes data points with 0 and 1 values, I adjusted the dependent variable data to remove those values, using the formula: y * (n - 1) + 0.5)/n, where y is the data point, and n is the sample size of 4022 (Smithson and Verkuilen, 2006). Beta regressions were estimated using the "betareg" package in R (Zeileis et. al, 2020).

See Appendix Section A.2 for the complete R code.

3.3 Results

Section 2 explored how different variables impacted a person's likelihood to give up their car at a given compensation level. We then examined the indifference compensation—or the amount at which the respondent is equally likely to choose to keep one's car, or give it up—for various sociodemographic groups.

Car ownership has immense impacts on the built environment and vice versa, and also is a huge indicator of travel behavior. Since many of the negative impacts of car ownership result from car use, I identify how some of the variables from this research project impact car use directly. In order to explore this question, I used the data we collected as part of the "Value of car ownership and use" section to examine the impact of having employer-provided free or subsidized parking, and other parking-related variables, on how frequently people use their car.

3.3.1 Descriptive statistics

First, I examined the descriptive statistics for the responses to the employer benefit question (see Table 5)

Table 5. Distribution of commuter benefits received by survey respondents (%)

Benefit	Seattle	Washington D.C.	Chicago	Dallas	All Cities
Parking	26.8	33.0	26.0	29.7	28.9
Transit	16.7	15.2	8.2	9.5	12.4
Carpool	9.8	9.4	3.5	6.4	7.3
Biking	9.0	7.8	4.6	5.8	6.8
None	58.5	53.1	66.5	61.8	60.0

Note: Respondents could select multiple benefits, so the percentages here will not add up to 100%.

I found that subsidized or free parking was the most common benefit respondents received from their employers, with nearly 30% of respondents in all four of our cities indicating they received this. The number of respondents receiving subsidized or free parking was more than double the percentage of respondents that received other types of employer benefits. The proportion did vary slightly between cities, with Washington D.C. having the largest proportion with a parking benefit, and Chicago with the smallest proportion. The majority of respondents (60%), however, did not receive any of our listed employer transportation benefits.

Next, I explore the impact of receiving employer-provided free or subsidized parking, alongside other parking-related variables, on driving a personal vehicle using the two different types of regressions introduced above.

3.3.2 Negative binomial regression on number of weekly trips by personal vehicle

For the first regression, I took as the dependent variable the respondents' self-reported number of trips taken by personal vehicle as a driver or passenger in a typical week. As independent variables, I included built environment, city dummies, sociodemographic, household composition, and travel behavior variables, in addition to the employer benefit variables. Table 6 provides the results of the negative binomial regression model, which explains about 24% of the variation in the number of trips taken by car. Figure 6 show the average marginal effect (AME) of each variable on the dependent variable.

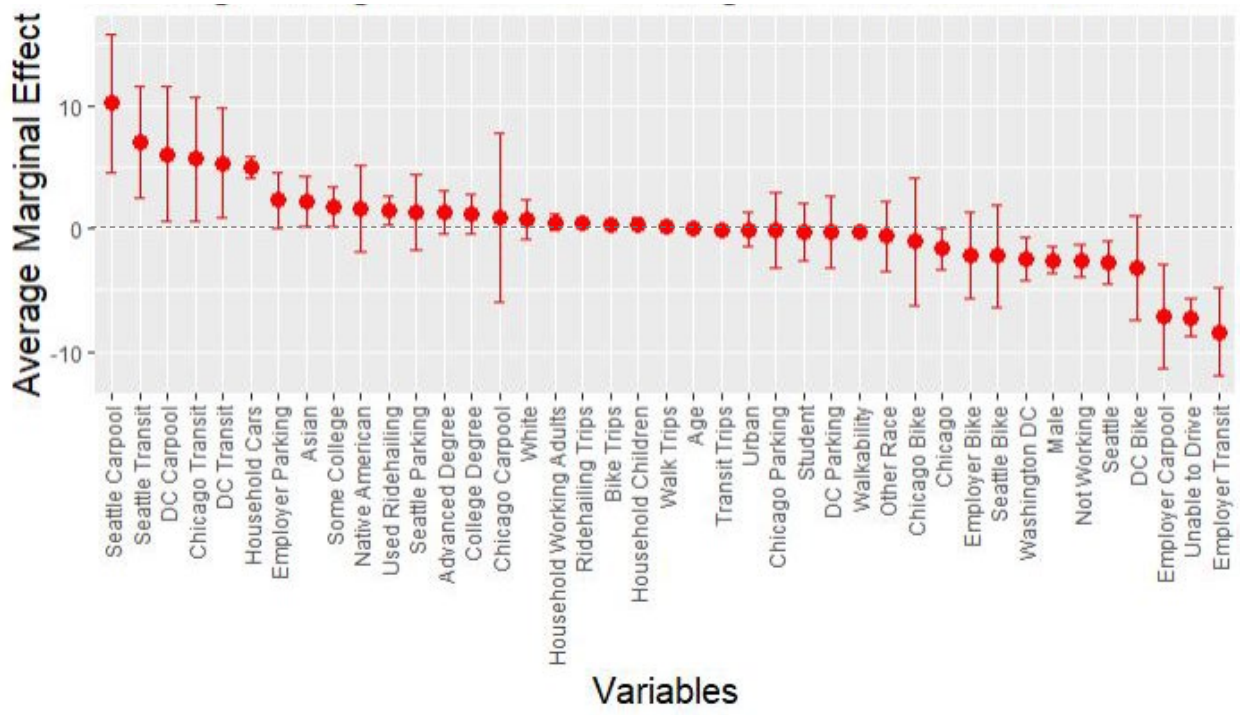
Table 6. Negative binomial regression model results

Category	Variable	Coefficients	Std Error	P-value	AME
	(Intercept)	1.56	0.23	0.00***	N/A
Built environment	Urban zip code (0/1)	-0.01	0.04	0.88	-0.10
	Walkability of home zip code	-0.02	0.01	0.00**	-0.32
City dummies (0/1); Dallas as reference	Washington D.C.	-0.15	0.06	0.01**	-2.30
	Chicago	-0.09	0.05	0.08 .	-1.48
	Seattle	-0.16	0.06	0.00**	-2.42
Individual socio-demographics	Male (0/1)	-0.16	0.03	0.00***	-2.51
	Log(age)	0.17	0.05	0.00 **	0.07
	White (0/1)	0.04	0.05	0.42	0.64
	Asian (0/1)	0.14	0.07	0.04 *	2.14

	Native American (0/1)	0.10	0.11	0.38	1.54
	Other Race (0/1)	-0.05	0.09	0.62	-0.72
	Some college (0/1)	0.11	0.05	0.03 *	1.70
	College degree (0/1)	0.07	0.05	0.18	1.10
	Advanced degree (0/1)	0.08	0.06	0.19	1.18
	Not working (0/1)	-0.16	0.04	0.00***	-2.45
	Student (0/1)	-0.02	0.08	0.79	-0.33
Household composition	Household cars	0.32	0.02	0.00***	4.88
	Household children	0.02	0.02	0.14	0.40
	Household working adults	0.03	0.20	0.15	0.47
Employer benefits (0/1)	Employer parking	0.16	0.07	0.04 *	2.41
	Employer carpool	-0.27	0.19	0.17	-4.11
	Employer transit	-0.56	0.11	0.00***	-8.65
	Employer bike	-0.21	0.18	0.26	-3.21
Employer benefits – city interactions (0/1)	Employer parking – Seattle	0.08	0.10	0.44	1.29
	Employer parking – DC	-0.03	0.10	0.77	-0.46
	Employer parking – Chicago	-0.00	0.11	0.98	-0.04
	Employer transit – Seattle	0.50	0.15	0.00***	7.58
	Employer transit – DC	0.32	0.14	0.03*	6.19
	Employer transit – Chicago	0.35	0.16	0.03*	5.45
	Employer bike – Seattle	-0.14	0.25	0.59	-2.13
	Employer bike – DC	-0.08	0.25	0.74	-1.26
	Employer bike – Chicago	0.03	0.27	0.92	0.43
	Employer carpool – Seattle	0.48	0.27	0.07 .	7.39
	Employer carpool – DC	0.33	0.25	0.19	5.01
	Employer carpool – Chicago	-0.19	0.30	0.51	-3.02
Travel behavior	Unable to drive	-0.47	0.05	0.00***	-7.26
	Used ride-hailing in past 30 days	0.09	0.04	0.02*	1.41
	Public transit trips	-0.00	0.00	0.22	-0.05
	Ride-hailing trips	0.03	0.00	0.00***	0.44
	Biking trips	0.02	0.01	0.00***	0.35
	Walking Trips	0.01	0.00	0.00***	0.14

Table notes: Model pseudo R-squared: 0.295; AME = Average Marginal Effect. Statistical significance of coefficient against zero is indicated by: 0.0001 ‘ *** ’ 0.001 ‘ ** ’ 0.01 ‘ * ’ 0.1 ‘ . ’

Figure 6. Average marginal effects of variables in the negative binomial regression (estimated value and error bars)



Impact of employer benefits

Across our four cities, I find that employer-provided free or subsidized parking is significantly and positively related to an individual's number of self-reported weekly car trips at the 95% level. There was no significant difference in this effect by metro area. The average marginal effect of the employer parking variable can be interpreted as follows: A person who has employer-provided parking benefits takes 2.4 more trips by car per week, on average holding all other variables equal. This is a fairly large impact, though it is important to note that binary variables are likely to show larger magnitudes than numeric variables, which are incremental by nature. Nevertheless, this result indicates that providing free or subsidized parking is correlated with higher car use. Removing these parking incentives and charging market rate prices for employer parking could be an effective mechanism by which to decrease car use.

While parking benefits were significantly predictive of car use, the largest impact was from having employer-provided transit benefits. On average, having employer-provided transit benefits in any city has a significant and negative impact on the number of car trips per week. A person receiving transit benefits takes 8.5 fewer trips by car on average compared to someone who does not have free or subsidized transit. However, living in Seattle, Chicago, and Washington D.C. and receiving transit benefits each have a significant *positive* impact on weekly car trips as compared to living in Dallas and receiving transit benefits. The effects were relatively large – A person living in one of these cities and receiving a transit benefit took between 5 and 8 more trips by car on average, as compared to living in Dallas and receiving a transit benefit. Dallas has a relatively less robust transit system compared to the other cities (Center for Neighborhood Technology 2019, University of Minnesota 2014, Holloway 2012), so this result indicates that receiving an employer transit benefit may be particularly impactful in places where people are not likely to be taking transit without an incentive. This also indicates that incentives may be an effective means to change travel behavior, even in places with less robust alternatives.

Though carpool employer benefits were not significant across the four cities, having carpool employer benefits and living in Seattle was positively predictive of car use at the 90% level as compared to living in Dallas and receiving a carpool benefit. One potential explanation for this could be that people in Seattle are more often switching from a non-car mode to carpooling when they receive a carpool benefit, increasing their overall car use. In Dallas, comparatively, people could already be using their car for most trips, and thus the carpool benefit would not impact that use as much.

Of all the variables included in the model, employer benefits have some of the greatest average marginal effects (see Figure 6). These results support the conclusion that employer-provided benefits, including parking are an important tool that can be used to shape travel behavior, particularly car use.

Impact of other variables

Being unable to use a car and the number of cars in a household were both highly significant predictors of weekly number of trips made by private vehicle. In line with numerous studies (Kitamura 1989; Prettenthaler and Steininger 1998), the number of cars in a household was positively predictive of car use, which supports our reasoning that greater car ownership leads to greater car use.

The variable for not working also was significant and negative. This could be because people who are not working may be taking fewer trips overall on any mode. However, the data shows that respondents who were not working actually took an average of 24 trips per week, which is 2 more than those who indicated they were working. Therefore, it is more likely that the negative impact of not working on car trips is because those who are not working may also have larger income constraints, and thus may not be able to afford to own or use a car. Respondents who were not working took 1.8 trips on average on public transit, which is 0.2 more than those who were working.

All three of the city variables were significant and negative: a person from DC, Chicago, or Seattle is likely to take between 1.5 and 2.5 fewer trips per week by car as compared to a person from Dallas on average, even controlling for an urban zip code. In the regression analysis for valuation of car ownership, none of these city variables were significant. This divergent result indicates that although people might value their car similarly across cities, people from the Dallas area tend to take more car trips than people from the Seattle, Chicago, and DC areas.

Living in an urban zip code became insignificant when I added in the EPA Smart Location Database National Walkability Index variable, which was significant. For every unit increase in the Walkability Index, the number of car trips a person takes per week on average decreases by 0.32. Although this is a smaller AME, this is expected for a numeric variable compared to a binary variable, because the independent variable measured is only changed incrementally. The Walkability Index ranges from 1, least walkable, to 20, most walkable, and includes metrics related to density, connectivity of the street grid, and mix of uses and employment types.

Being male negatively impacts the number of trips taken, in line with our results from the car valuation regression and with existing studies (Handy 2002, Handy et al 2003, Rosenbloom 2006). This could be because women still disproportionately take on household and caretaking work, which can involve more trips to transport children and run errands. The variables for number of children and working adults in a household are both also significant and positive, which is in line with existing literature (Bhat et al 2009). The variable for some college is positively and significantly related to the number of car trips as compared to no college, as is the variable for being male, being Asian as compared to Black, and for log(age).

The variable of having used ride-hailing in the past 30 days was positive and significantly predictive of weekly personal car trips. A person who has recently used ride-hailing takes 1.4 more trips by car per week on average. The literature has not conclusively determined the impact of ride-hailing on car use, but this finding contributes some evidence that people who use ride-hailing take more personal car trips overall. Additionally, the number of ride-hailing trip, biking trips, and walking trips taken per week all have a significant and positive impact on number of car trips. Since the dependent variable is total number of car trips, not proportion of trips taken by car, this result could be because some people take more trips overall, on multiple modes. However, the trips taken by transit is not significantly related to car trips, indicating that the same person is less likely to both drive and take transit than they are to drive alongside using other modes.

3.3.3 Beta probit regression on proportion of weekly trips taken by personal vehicle

Total car trips is an important variable to measure, since it is correlated with total vehicle miles travelled and environmental impact. However, there are other metrics of car use that may be of interest. For example, if an individual happens to travel a lot (across all modes), even a small share of those trips by car may mean a fair number of trips. In such cases, the proportion of trips taken by car may better illustrate how dependent a person is on using a car. I use a beta regression with a probit link function to appropriately model the outcome as a proportion of trips, bounded by 0 and 1. Table 7 provides the results of the beta probit regression model, which explains about 25% of the variation in proportion of weekly trips taken by car. Figure 7 shows the average marginal effect of each variable. Travel behavior variables for proportion of trips taken on non-car modes were not included in this model since they are part of the same proportionate whole as the dependent variable. Since the mean proportion of trips taken by car was 72%, including the proportion of trips by non-car modes correlates too highly with the dependent variable.

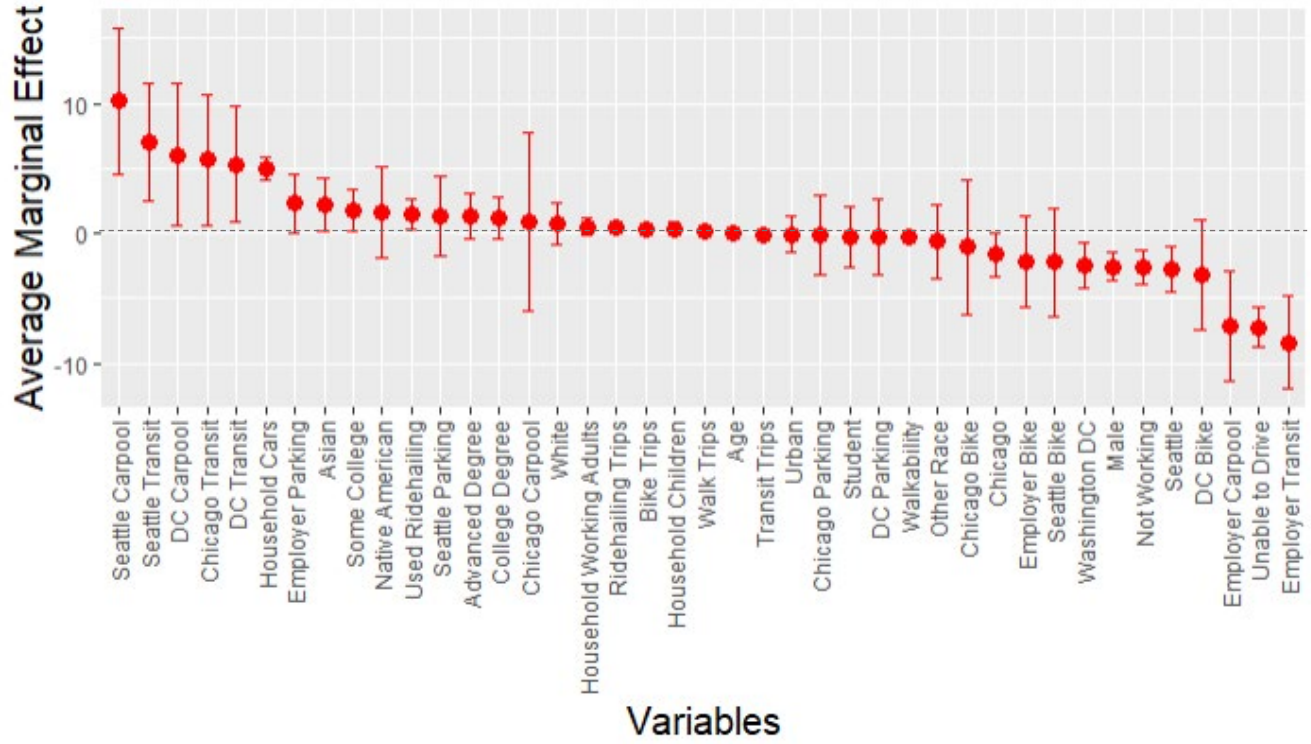
Table 7. Beta probit regression model results

Category	Variable	Coefficients	Std Error	P value	AME
	(Intercept)	1.91	0.18	0.27	N/A
Built environment	Urban Zip Code (0/1)	-0.03	0.03	0.43	-0.01
	Walkability of Home Zip	-0.03	0.00	0.00***	-0.01
City dummies (0/1); Dallas as reference	Washington D.C. (0/1)	-0.18	0.04	0.00***	-0.06
	Chicago (0/1)	-0.13	0.04	0.00 ***	-0.04
	Seattle (0/1)	-0.1	0.04	0.01*	-0.03
Individual socio-demographics; Female, Black, No college, Working, Not student, as references	Male (0/1)	-0.09	0.03	0.00***	-0.03
	Log(age)	0.19	0.04	0.00***	0.00
	White (0/1)	0.09	0.04	0.03*	0.03
	Asian (0/1)	0.13	0.05	0.01*	0.04
	Native American (0/1)	-0.14	0.09	0.12	-0.05
	Other Race (0/1)	-0.04	0.07	0.56	-0.01
	Some college (0/1)	-0.02	0.04	0.55	-0.01
	College degree (0/1)	0.00	0.04	0.91	-0.00
	Advanced degree (0/1)	-0.03	0.04	0.54	-0.01
	Not working (0/1)	-0.07	0.03	0.03*	-0.02
	Student (0/1)	-0.26	0.06	0.00***	-0.09
Household composition	Household cars	-0.22	0.02	0.00***	0.07
	Household children	-0.01	0.01	0.65	-0.00

	Household working adults	-0.05	0.02	0.00**	-0.02
Employer benefits (0/1)	Employer parking	-0.02	0.05	0.65	-0.01
	Employer carpool	-0.16	0.10	0.08 .	-0.05
	Employer transit	-0.13	0.09	0.14	-0.04
	Employer bike	-0.11	0.09	0.21	-0.04
Employer benefits – city interactions (0/1)	Employer parking – Seattle	0.12	0.08	0.10	0.04
	Employer parking – DC	0.18	0.07	0.02 *	0.06
	Employer parking – Chicago	0.07	0.08	0.36	0.02
	Employer transit – Seattle	-0.06	0.11	0.59	-0.02
	Employer transit – DC	-0.00	0.11	0.97	-0.00
	Employer transit – Chicago	-0.13	0.13	0.33	-0.04
	Employer bike – Seattle	0.08	0.11	0.48	0.02
	Employer bike – DC	0.03	0.11	0.78	0.01
	Employer bike – Chicago	-0.14	0.14	0.32	-0.04
	Employer carpool – Seattle	0.05	0.10	0.61	0.02
	Employer carpool – DC	-0.04	0.10	0.72	-0.01
	Employer carpool – Chicago	0.21	0.15	0.17	0.07
Travel behavior	Unable to drive	-0.09	0.03	0.01**	-0.03
	Used ride-hailing in the past 30 days (0/1)	-0.3	0.03	0.00***	-0.10

Table note: Model's pseudo R-squared = 0.8431; AME = Average Marginal Effect. Statistical significance of coefficient against zero is indicated by: 0.0001 ' *** ' 0.001 ' ** ' 0.01 ' * ' 0.1 ' . '

Figure 7. Average marginal effects of beta probit variables (estimated value with error bars)



Impact of employer benefits

These results show some differences in the impact of employer benefits on the proportion of trips taken by car as compared to on the total number of trips by car, as shown in the negative binomial regression. Notably, the impact for employer-provided free or subsidized parking is not significant in this model. While having a parking benefit was found to increase the total number of trips a person is likely to take by car, it does not appear to impact the proportion of trips taken by car. However, we found that impacts of employer benefits on proportion of trips made by car varied more by city. Living in Washington D.C. and also having a parking benefit is significant and positively related to the proportion of trips taken by car. A person living in DC and receiving a parking benefit takes six percentage points more of their weekly trips by car on average, as compared to living in Dallas and receiving a parking benefit. It's important to note that the AME measures just the impact of the variable – people in Dallas could still take a higher proportion of their trips by car than people in DC, but the impact of having a free parking benefit as compared to not having that benefit does not significantly impact the proportion of trips by car. Indeed, the data shows that the mean proportion of trips taken by car in Dallas is 79% as compared to just 66% in DC. One explanation for the significant impact in DC as compared to Dallas is that since many people in Dallas already taken the vast majority of their trips by car, having this free parking benefit may not change their behavior. In DC, more people take non-car modes more often, so having a free parking benefit may be a larger incentive to draw people away from taking other modes toward using their car more. However, more research would be needed to determine the specific reasons why we observe significant differences in impact of employer benefits across our four cities.

Additionally, the transit benefit is insignificant in this model, whereas in the negative binomial model it was highly significant, with the largest AME on the number of trips per week by car. While transit benefits may help to reduce the total trips taken by car, these results indicate that it does not necessarily reduce the proportion of trips taken by car. On the other hand, having a carpool benefit is significant and negatively related to the proportion of trips taken by car, unlike in the results of the negative binomial model for number of trips, where carpool benefits were insignificant. A person receiving carpool takes six percentage points fewer of their weekly trips by car on average.

Overall, these results complicate the narrative that employer benefits can be impactful on driving behavior. It seems that carpool benefits are impactful on proportion of car trips but not on number of car trips, and the impact of parking benefits on proportion of car trips appear to depend more on the metro region a person lives in. Transit benefits do not appear to be impactful at all when it comes to determining the proportion of weekly trips taken by car. The reason for these differences is not clear from this data, and merits future research.

Impact of other variables

Some of the same variables are significant in this model as in the negative binomial regression on number of car trips, including having used ride-hailing, being unable to drive, not working, the number of working adults in the household, the number of cars in the household, and being male. In addition to these household and sociodemographic variables, a few additional variables were significant. Being White or Asian has a positive and significant impact on the proportion of trips taken by car as compared to the reference variable, being Black, in line with Giuliano (2003)'s analysis that found significant differences in travel behavior by racial and ethnic groups. Being a student had a negative impact on proportion of trips by car. The variable for age has a positive impact.

All three of the city variables were significant and have a negative coefficient, indicating that a person from Chicago, DC or Seattle is likely to take a smaller proportion of their weekly trips by car as compared to a person from Dallas. Being from those three metro areas would result in a person taking three to six percentage points fewer of their trips by car as compared to Dallas. Once again, the urban zip code variable is insignificant, but the Walkability Index is significant and negative. An increase in the walkability index by one results in a person taking nearly 1% fewer trips by car per week.

3.4 Discussion

These regressions have provided mixed results on the impact of employer-provided benefits on car use. Carpool benefits appear to have a small but significant impact on car use in terms of proportion of weekly trips made by car, but have an insignificant effect on the number of car trips. On the other hand, parking and transit benefits appear to affect the number of car trips, but have an insignificant effect on the proportion of all trips taken by car. The negative binomial regression showed that a person who has employer-provided parking benefits takes 2.4 more trips by car, on average. The beta regression did not find a significant impact from parking benefits generally, but it did find that a person living in DC and receiving a parking benefit takes six percentage points more of their weekly trips by car on average, as compared to someone living in Dallas and receiving a parking benefit. This indicates that parking, in general or in combination with city-specific attributes such as parking availability (which Dallas has far more of than DC), may be an effective mechanism through which to reduce car use and dependence. Based on the findings in section 2, this reduction in car use could then be impactful on reducing the value of car ownership.

These results also illustrate that living in different metro areas has a significant impact on the total trips and the proportion of trips taken by car. There are many different features of metro areas that could contribute to this difference, but one of those factors are the policies in place governing the built environment and transportation systems. This is further evidenced by the fact that the Walkability Index variable was significant and negatively related to both the total number and proportion of trips taken by car, indicating that places that are considered more walkable have residents that take fewer trips by car. This result is similar to the finding from section 2 that the value of car ownership is impacted by land use planning and the quality of non-car alternatives. In addition to the direct contribution that parking appears to have on car use through employer benefits, parking also may have an impact on car use through its role in density of land uses and through making space for bus and bike lanes, and ride-hailing pick up/drop off zones.

Considering the finding that parking may be an effective mechanism through which to reduce car use, and that the metro area one lives in can impact car use, in the next section I will explore parking policy in the four metro areas. Using surveys and interviews, I will analyze to what extent government officials are working to reduce car use and car ownership, and how they approach various aspects of parking policy.

4. Parking policy in practice

Sections 2 and 3 of this thesis found that people value their car very highly and that parking policy could be an effective mechanism by which to reduce car use and car value. These are descriptive findings, providing an understanding of how our survey respondents actually feel they would behave, and how they report they behave. This section takes a more subjective approach. Given the descriptive results from sections 2 and 3 that identify employer-provided parking, walkability and density, and use of non-car alternatives as impactful on car use and car value, I have identified parking policy as a viable lever to use to accomplish the subjective goal of reducing car use and car ownership. This section explores how that lever can be used toward those ends, through a literature review, and survey and interviews with parking professionals in cities throughout the four metro areas of Dallas, Chicago, Washington D.C., and Seattle. First, I provide a taxonomy of parking policy and a review of existing literature that describes the effectiveness of parking policies on changing travel and car ownership behavior, describes the current state of parking in the United States, provides a review of recent parking policy professional guidance, and identifies sources of opposition to parking policies. This academic review provides a helpful framework for understanding the effect of parking policies to date and provides some hint at barriers to its implementation, but it does not provide a detailed understanding of the goals, governance, methods, and barriers for parking professionals who are currently working to implement parking policy. This gap will be addressed using surveys and interviews with parking professionals. I present the survey and interview methods and then the results—first in terms of goals and strategies for municipal transportation and parking policymaking and second in terms of process. In this section, I hope to understand how parking policy is currently being utilized, for what goals, and what barriers exist to block implementation. This insight will inform policy recommendations in section 5, which will provide guidance on how to better utilize parking policy to accomplish the goals of reduced car ownership and use.

4.1 A taxonomy of parking policy

The results of sections 2 and 3 both indicate that parking policy in different cities could be impactful on the value of car ownership and on car use. Most directly, employer-provided free and subsidized parking was shown to have a positive impact on car use. More indirectly, variables for use of non-car alternatives and more dense and walkable built environments were found to have a negative impact on car use and the value of car ownership. These features can be impacted by parking policies, such as through converting on-street parking into transit or bike lanes to improve attractiveness of using those modes, and through reducing the amount of space dedicated to parking as opposed to development that provides more density. This section will outline the taxonomy of parking policies and consider their effects on travel behavior and car ownership.

Parking policies span many different mechanisms and are the responsibility of many different roles within a city government. As described in section 3.1, parking policies can both disincentivize cars and incentivize alternatives. When parking a car takes more time or costs more money, people are less likely to drive or choose to own a car, thus disincentivizing car use and ownership. Parking also takes up space in a city – when that space is converted to wider sidewalks, bike lanes, or transit lanes, those modes are improved through higher quality service and more comfort and safety. This policy incentivizes people to use those alternatives. To break down the effects of parking policy on behavior further, I have identified six categories of parking policies that can be used to reduce car use and ownership, shown in Table 8. The rows identify the type of parking being targeted by the policy. The government can own off-street parking, in lots or garages. They also provide on-street parking. Private property owners provide off-street parking only. The columns identify the feature of parking that is the target of the policy. Parking availability or supply is often

the target of policies, which result in the removal of parking spaces and reuse of that space for other needs, or policies that reduce how much private parking can be built. The cost of parking is the other major target of parking policy, which can be changed directly by governments for publicly owned on- or off-street parking, or to a limited extent can be regulated through employer benefits laws and programs.

Table 8. Taxonomy of parking policies

	Reduce parking availability	**Increase parking cost**
Public parking, off-street	Often replaced with redevelopment of lots or garages	Usually traditional pricing methods
Public parking, on-street	Often replaced with alternatives like bus lanes, bike lanes, parklets, and commercial or passenger loading zones	Often using dynamic pricing and new pricing or meter technologies
Private parking, off-street	Through zoning and development review	Through employer benefits programs

Parking policy is not always, or even often, just aimed at reducing car use and ownership directly. Instead, for instance, parking pricing can have many different aims, including reducing time spent searching for a spot, increasing turnover for shopping areas, raising municipal revenue, and improving safety for vulnerable road users (Litman, 2018). Marsden (2006) grouped the aims of parking policy into: (i) regeneration, or providing parking to attract businesses and people; (ii) restriction, to restrain vehicle traffic and improve the environment and experience of non-car modes; and (iii) revenue, the need to secure sufficient revenue from parking. Though these varying aims will be explored in the survey and interview results, this review focuses primarily on the use of these policies for restriction, or reducing car ownership and use.

4.1.1 Increase parking cost

Several studies have found that parking cost can have a large influence on car use. Yan et al (2019) studied a large workplace parking scheme and found that parking pricing can reduce car use, but the majority of behavior change that occurs is to park in cheaper lots further away, indicating that implementing similar pricing for a larger area may be key in encouraging reduced car use. Richardson et al (2010) studied the impact of a parking policy that increased parking fees in Perth, Australia and found that the driving mode share reduced to 35%, down from 50%, after the policy was enacted, though many other factors could also have contributed to that decline. Similarly, Buehler et al (2017) found that five cities successfully reduced car share of trips over 25 years by implementing extensive transportation policies, including pricing parking and reducing parking availability. Litman (2018) reported that simply charging cost-recovery fees for parking typically reduces car travel by 10-30%.

Several other studies have found that parking cost can have a large influence on car ownership. Ostermeijer et al (2019) found that differences in parking costs between the city center and the periphery explains 30% of the difference in average car ownership rates. Though this study was focusing on the implications of reduced parking costs on AVs, the findings do indicate that the cost of parking may impact the decision to purchase or keep a car. Seya et al (2016) conducted a study in Japan and found that parking rent price elasticity of car ownership is fairly small and inelastic. However, the price of parking is negative and statistically significant with regard to car ownership. In bigger cities, they found that people may switch to owning no cars if the parking cost goes up, whereas in smaller cities it is more likely that people will go from owning multiple cars to owning one.

Public parking cost

A significant focus of both the literature and of parking management professionals is dynamic pricing, or demand-responsive pricing. This idea has been championed by Donald Shoup. He outlined the argument that 8-74% of traffic in cities is people cruising for parking, arguing this has a huge impact on both congestion and VMT (Shoup, 2004). He recommended that cities should charge market-clearing prices for parking varied by demand, leaving 15% of spaces open on each block. Shoup also argued that curb parking has the potential to bring in significant revenue that could be used to improve the immediate area or could be redistributed to surrounding areas that would not bring in as much parking revenue.

Recently, several cities have implemented new parking technologies that allow the cost of parking to adjust to the demand for parking, pricing spaces differently based on location and time of day. The aim of this method is often primarily to reduce cruising for a spot and improve the experience of people trying to find a parking space. However, recent studies have found that dynamic pricing does not always accomplish its aim. Chatman and Manville (2014) assessed SFPark, one of the earliest and largest examples of dynamic pricing at a city-wide scale. They found that the scheme did not result in greater parking availability and thus did not reduce the need to cruise for parking. They did find SFPark reduced average block occupancy, which is what the scheme was measuring to set prices, but this metric meant that for much of the peak time, there were no free spaces. They also did not find an increase in minimum vacancy, shorter parking times, higher turnover, or more carpooling.

Chaniotakis and Pel (2015) did a stated preference experience of cruising for parking and found the most important factor for people was the cost of parking; the second most important was the probability of finding a spot after 8 minutes of cruising. These results indicate that people may expect to spend a little time searching but care more that they do not spend an inordinate amount of time. This also indicates that people are sensitive to the cost of parking.

Private parking cost

In addition to the public parking that municipalities have more direct control over, cities have some limited power to regulate the price of private parking. This power mostly comes in the form of requiring market-based prices for private parking for employers, and requiring cash-outs for employer-provided parking. Cash-out programs are where employers offer their employees the cash equivalent of the cost of their parking space if they choose not to use it. This can come in the form of paying toward other commuter benefits, like transit passes, or as cash. Shoup and Wilson (1992) first proposed this policy, and predicted that if implemented for all commuters to Downtown Los Angeles, 30% fewer commuters would drive under a cash-out scenario. They found that solo driving share would reduce by 20%, transit share would increase by 67% and total cars driven would reduce by 17%.

In 1997, Shoup evaluated eight firms that implemented this policy and found that solo driving to work across all firms fell 17% after the cash-out was implemented. Car ownership impacts were not evaluated. More recently, Evangelinos et al (2018) found that parking cash-outs would lead to a significant reduction in private car use. California is the most notable example where parking cash-outs are required for employers in many circumstances, but the program remains largely unenforced except where reinforced at the municipal level (Bhatt and Ryan, n.d.). Washington D.C. also requires cash-outs (D.C. Municipal Regulations Section: 7-3301).

4.1.2 Reduce parking availability

Public parking supply

The first lever cities have to reduce parking availability is through reducing the supply of public parking, both on and off-street. City officials have direct control over public parking, and often end up removing public parking in the process of replacing that space with another use. For on-street parking, this could involve turning a parking lane into a bus or bike lane, or into a pick up / drop off zone for TNCs. For off-street parking, this often involves selling or gifting the land previously used for parking to developers to build on. This tendency for parking supply reductions to be paired with the addition of new transportation infrastructure or development that increases density makes it difficult to isolate the impact of parking alone. The analysis of the City of Perth's parking policy explicitly stated that they could not determine the specific impact of individual elements of the policy, since improving non-car alternatives were implemented at the same time (Richardson and Knight Merz, 2010). However, in practice city planners care most about the cumulative effect rather than the isolation of specific factors, since removing public parking rarely happens without the addition of a new use.

Reducing the supply of private or public off-street parking may also have an indirect impact on car ownership through the availability of on-street parking. Reducing off-street parking can push some people to park their car on the street instead, increasing congestion of on-street parking spaces. This is most often the concern that residential neighborhoods deploy to protest removing parking minimums for off-street parking. One method of reducing the supply of public parking is to use resident parking permits to restrict the supply of parking for visitors to an area. However, Albalate and Gragera (2019) found that this intervention has a significant positive impact on resident car ownership levels, since parking supply becomes much more readily available. They find that this increase in car ownership may offset gains from reduced car use by visitors. More evidence of the combined impact of parking supply and cost on car ownership and use is outlined in section 4.1.3.

Marsden (2006)'s literature review showed that people who must park on the street rather than in a garage often do not buy nicer vehicles for fear of vandalism, and may not use their car especially for shorter trips to avoid losing their spot. However, less than 10% of respondents to a stated preference survey indicated they would reduce the number of vehicles they owned due to increased parking congestion. This indicates that use can be reduced through restricting residential parking, but ownership may be less impacted, at least in the short term. This result differs from the results of other studies that found a significant negative impact of parking unavailability on car ownership (Albalate and Gragera 2019; Jiang et al 2017; Guo 2013). Guo (2013) did an intensive statistical analysis of the impact of on- and off-street parking with respect to car ownership in outer boroughs of New York City. He found that on- and off-street parking being unavailable had a statistically significant negative impact on car ownership. He found on-street parking to be more significant, and found that when on-street parking becomes almost unavailable, car ownership in the area would be reduced by 8.8% from current levels. When abundant, car ownership would increase by almost 18%.

Private parking supply

A major mechanism that cities can use to reduce availability of private parking is through zoning and regulating private parking. High parking minimums have been cited repeatedly as a major culprit in reduced density, increased car dependence, and increased cost of housing because of the huge expense of building parking in new developments. Recently, cities have begun to remove parking minimums, implement parking maximums, or otherwise adjust zoning in certain areas or in the entire city to reduce the supply of

private parking over time. San Francisco, Minneapolis, Chicago, Buffalo, NY, and many other cities, small and large, have recently removed parking minimums entirely (Nichols, 2019).

Li and Guo (2014) evaluated the impact of replacing minimum parking standards with maximums in London. They found that the change resulted in a reduction of approximately 0.76 parking spaces per unit in residential developments, reducing parking to 49% of the pre-reform level. They found a larger absolute effect on parking supply in suburban areas, but a larger percentage reduction and more car-free developments in inner city areas. They also found that removing the minimum standard was more impactful than implementing a maximum.

Richardson and Knight Merz (2010) reported on the City of Perth's parking policy which taxed all non-residential parking and implemented parking maximums for new developments. They found an immediate reduction of 10% in the parking supply when introduced, which was maintained over the long-term. Although it was impossible to determine the direct impact of this policy on driving behavior since many other factors occurred over the same time period, they did find that by 2010 only 35% accessed Perth by car compared to 50% before the policy, traffic volumes decreased by 3-20% over the first three years and continued to decline, and public transport use increased by 67%. The parking fees were used to subsidize a new free service and free transit zone, which increased ridership immensely.

4.1.3 Evidence of impact

Pricing and availability have both been shown to be impactful on car ownership and use, but several studies have explored the relative impact of these two mechanisms in particular. Studies have found that out-of-vehicle costs, whether in time or money, are more impactful on behavior than in-vehicle costs (Yan et al 2019, Marsden 2006). Yan et al (2019) found that people were more sensitive to changes in egress time, or the time to walk from the car to the destination, than to parking cost. Additionally, people were less sensitive to time spent searching for a parking spot. Hensher and King (2001) analyzed parking in Sydney and found that behavior change was stimulated more by supply restrictions than pricing. Lastly, Marsden (2006) also found that whether a parking policy resulted in people switching modes away from the car was highly dependent on whether high quality alternatives were available to people.

4.2 A review of parking policy conditions, guidance, and research

4.2.1 Current state of parking

There is very limited data on parking in cities, on both pricing and supply. Cities do not usually maintain accurate inventories of public or private parking, especially considering on-street parking spaces often include non-metered, non-painted parking in addition to metered spaces. However, there is some literature that has attempted to estimate how much parking there is in various cities, and what prices are charged for public parking.

A survey in 2010 captured pricing data for 107 cities in the U.S. and found that almost 45% of cities had "relatively high-cost parking," but that this mostly correlated with off-street parking prices. Mean hourly fees were quite low for all types of cities, and off-street fees were low in small cities (Auchincloss et al 2015).

Manville and Shoup (2004) conducted one of the most well-known surveys of parking. They analyzed Los Angeles, New York City, and San Francisco, and found the parking coverage rate to be 81%, 18%, and 31% respectively. Several other studies have estimated that parking accounts for anywhere from 10 to 40%

of land in urban areas (Akbari, Rose, & Tahia 2003; Marshall & Garrick, 2006; McCahill and Garrick 2010). McCahill and Garrick (2014) also found that off-street parking supply increased by 70-160% in the cities they studied between 1960 and 2000. They also found that parking increases appear to have a direct influence on rates of car use in each city. Studies also have found that parking supply is underutilized (Kuzmyak et al 2003; Snyder, 1999).

Increasingly, researchers are using satellite imagery and remote sensing to understand the extent of parking supply (Zambinini et al 2020; Koutaki et al 2016; Seo et al 2009). This methodology could be used moving forward to gain a better understanding of parking supply in cities.

The creation of this large supply of parking has been supported by public officials in their management of parking. Wilson (2000) surveyed planners about parking and found that their motivation for parking decisions were concerns of traffic mitigation, spillover parking, and risk avoidance, which tended to push parking into oversupply. More recently, Bonsall and Young (2020) analyzed the bureaucracy surrounding parking and found that a large portion of parking supply is not well controlled by public officials, since private parking can only be minimally influenced through regulation and licenses to operate, though they found variability in the extent of influence public officials had in different cities.

4.2.2 Professional guidance

There are several guidance manuals for parking management that provide insight into what parking professionals may be considering when designing and implementing parking policies. The Victoria Transport Policy Institute guide recommends implementing a package of several parking policies at once, rather than individual policies (Litman, 2018). APA's Practice Parking Reform Guide recommends a combination of removing off-street parking requirements, charging the right price for on-street parking, and spending the parking revenue on public services (Shoup, 2020). NACTO's curbside management guide focuses on interventions to improve transit service, and highlights several case studies where cities have created frameworks for decision-making on how to use curb space, as well as specific interventions like dynamic pricing and engagement strategies (Roe and Toocheck, 2017). ITE's Curbside Management Practitioner's Guide provides a step-by-step process for changes to the curb:

1. Inventory existing conditions
2. Identify land use and activity considerations to develop modal prioritization
3. Identify appropriate treatment alternatives
4. Assess and present alternatives for public feedback
5. Refine and implement treatments
6. Monitor performance using metrics like VMT, levels of traffic stress, walk/bike score, and economic impacts

The ITE guide also provides a broader overview for parking management, highlighting a number of goals cities might be working toward, including universal access, sustainable ecosystems, resilient economies, and a safe, reliable, equitable transportation system (ITE, 2018). Overall, much of the literature and guidance on parking management does not focus primarily on utilizing parking policies to reduce car ownership or use, but rather on other goals such as reducing cruising, reducing costs, increasing revenue, improving transit service, and freeing up space for development (Shoup, 2020; ITE, 2018; Litman, 2018; Roe and Toocheck, 2017; Marsden, 2006; Chaniotakis and Pel, 2015).

4.2.3 Sources of opposition to parking reform

Despite evidence of its impact on travel behavior and professional guidance, parking policy is underutilized in American cities. Opposition to parking policy by different interest groups present large barriers to implementation. The literature identifies general public opposition as one major barrier, with social equity being a major concern for some people. Business opposition is another major barrier to parking policy, and another barrier is opposition from those who think parking policy will reduce economic development.

Public/political opposition

Public opposition is recognized as a main barrier to implementing parking policies that make it more difficult or expensive to park a private vehicle (Litman, 2018; Roe and Toocheck, 2017; ITE, 2018). Kallbekken et al (2013) document the factors that influence public support for various transportation taxes. They find that expected impact on personal finances (self-interest), expected distributional effects (social equity), and perceived effectiveness at improving the environment and traffic congestions (perceived societal benefits) are the key determinants for acceptability. They also find that parking fees receive the least amount of support, in part because people do not perceive them to be effective at achieving societal benefits. People also overwhelmingly felt the taxes have negative social equity impacts, indicating that designing policies to address this concern may increase public support. Thorpe et al (2000) also found in the UK that increased parking charges was the least acceptable measure, out of road use charges, zone charges, and improving public transit. They also found that the higher frequency car users found these restraint policies less acceptable.

This public opposition to parking manifests in political ideologies. Henderson (2009) mapped the politics of mobility in San Francisco, outlining the major political positions on parking policy. He found that political progressives invoke environmental and social justice concerns and want the government to limit the overall amount of parking in the city in order to utilize urban space equitably and sustainably. Neoliberals instead focus on the need to efficiently price public access to space and privatize space through a parking regime shaped by pricing and markets. Neoconservatives celebrate car usage and demand government enable the preferences of individuals to own and use cars freely.

Public opposition is one of the most frequently discussed issues among professionals in parking management (Roe and Toocheck, 2017; ITE, 2018; Litman, 2018). Creative, context-specific ideas for how to win over the public for parking removal and pricing is clearly an important prerequisite for large-scale parking reform that results in decreased car use and ownership. However, the literature on who exactly opposes various parking policies and under what conditions is more sparse. Not including Henderson (2009), often researchers presents this public as a monolith. However, it is reasonable to assume that making parking more difficult and expensive is less popular with car users as compared to non-car users. More research is needed to understand the details of the public opposition to parking policy and whether and how some opponents can be converted into supporters.

Business opposition

One of the major stakeholder groups that is often opposed to removing or pricing parking are businesses who argue it will reduce their revenue if customers are not able to park easily nearby (Litman 2018; Richardson and Knight Merz 2010; Moutou 2009). Business owners tend to perceive far more of their customers arrive by car than actually do (Yen et al 2020; Aziz 2014; Shoup 2012; San Francisco Country Transportation Authority 2009). Shoup (2012) summarizes this sentiment well with a fictional character complaining: “If this city operates the parking meters in the evening, I will never drive downtown to eat in

a restaurant again." Shoup argues that performance-based parking will bring more people to a business district by encouraging carpooling and encouraging faster turnover, which both bring in more customers. Many other studies have also disproven this concern that removing or pricing parking will deter customers and reduce revenue in business districts (Mork 2016; Sztabinski 2009; Drennen, 2003). In areas with high economic productivity in particular, cities have successfully priced parking without losing business revenue or visitors to the area (Litman 2018). This is partly explained by the fact that pricing encourages more turnover and shorter parking times, which can bring more customers to the area. Several studies have also found that cyclists and pedestrians made more frequent trips to their study area's downtown business district, and spent slightly more money on average (Yen et al 2020; Popovich and Handy 2014; Transportation Alternatives 2012). Despite the evidence that maintaining low priced on-street parking does not necessarily improve business revenue, business opposition to parking policies persists, indicating a stronger or different argument is needed in order to gain their support for parking management projects (Litman 2018).

Opposition based on economic development

Some specific reasons for opposition to parking policies have also emerged and merit consideration. Some people are concerned that removing parking or making it more expensive will make the entire neighborhood or city an unattractive place to live, work, or play. This could impact the viability of an area and push people and businesses to locate in other neighborhoods or cities that do not have parking restrictions. This remains a common concern despite the fact that research suggests this outcome is unlikely, especially if cities coordinate parking policy across adjacent jurisdictions. Marsden (2006) concluded that parking restrictions are unlikely to deter people from seeking work in central areas, nor deter businesses from locating there. However, he also concluded that coordinating local and regional policies on parking will improve the impact of parking policies and outcomes. Hensher and King (2001) also found that implementing parking pricing in Sydney's CBD did not result in reduction in total number of journeys to the CBD. They also similarly found that modeling indicates there may be a negative impact on the city center if strong parking restraint is implemented only there and not in surrounding areas.

Opposition based on social equity

As cited in the public opposition section, there is also a concern for social equity and the regressive nature of pricing parking for lower income people who may be dependent on cars (Litman 2018). This argument is not as prevalent in the parking conversation as it is for road pricing, but it is still a concern. In response, many have pointed to the inequity of requiring minimum levels of parking at developments, which add substantially to the cost of development, and that cost is often passed on to residents and shoppers (Marsden 2006). Shoup (2004) also argued that because parking fees are only paid by car owners, the equity question is minimized. People with incomes less than $25,000 are nine times less likely to own a car, and renters are also six times less likely. He also noted the importance of revenue sharing, as poorer neighborhoods may not generate much in parking revenue, but should not suffer lower investment as a result.

4.3 Theory: Intermediate structure-oriented models of municipal governance

The intermediate models of municipal governance from Kirlin and Erie (1972) provide a framework for analyzing parking policy and identifying interventions for improvement. They outline six models of municipal governance, organized into three categories. Though they argue that policy analysis should focus more on the outputs and results of governmental activity for citizens, I find that the intermediate models are more useful for identifying leverage points to improve outcomes for cities.

4.3.1 The institutional model

The institutions, laws, and power structures of American cities contribute significantly to the overbuilding and underpricing of parking and high levels of car ownership. Most American cities, including the four under analysis in this thesis, have councilmanic ward elections, rather than at-large city council seats. Kirlin and Erie (1972) denote this as an "unreformed" rather than "reformed" governmental structure. This unreformed structure could contribute to the parking and car ownership outcomes we see today. Since most elected officials in American cities represent specific neighborhoods, they are less likely to act in a way that prioritizes benefits to networks that cross the entire city, like the bus system. They are more likely to act in a way that benefits localized people living or owning businesses in their ward or district. Those people are likely to show up to the polls and determine their re-election fate. Even administrative decisions made by un-elected officials can be influenced by this unreformed structure. Those officials are beholden to elected officials who can hire and fire them, or block the work they do.

Additionally, cities are fragmented into many jurisdictions within a metropolitan region and state. There is little governance power at the regional level in America, which again means that policies will focus on localized, rather than regional network benefits. Congestion and vehicle miles traveled take place on a regional level. Imagine a person lives in a neighborhood with decent public transportation built on policies focused on reducing car use. If it is much easier for them to take their car to get to their suburban job in another municipality where there is free parking, they will often continue to do that. The zoning code in that suburban municipality is not required to respond to the regional goals of reducing car use. The urban neighborhood may be governed by a municipality that has voluntarily chosen to implement policies to accomplish those regional goals, but they will be limited in their ability to change their residents' behavior if there is no requirement for other municipalities to do the same.

The point of leverage for the Institutional Model is to intentionally change the laws and institutions of government. This type of change is notoriously difficult, because it means forcing some to give up the political power that they currently have. However, changing the structure of city councils, the relative power of local governance and regional governance, and the power of planning relative to individual projects are all institutional changes that could be hugely powerful, and maybe even necessary, to change the outcomes of parking, car ownership, and car use in American cities.

4.3.2 The power model

The second intermediate-level model is the Power model. This model focuses on who has the power, what is their background and level of homogeneity, and how permeable are the power structures. Kirlin and Erie (1972) focus on the debate between elitists, who find businessmen to be in control, and pluralists, who find politicians to be in control. I generalize this debate as I apply it to my thesis, thinking instead about the relative power of the players that are impacted by these policies, framed as their access and influence over elected and un-elected public officials that make decisions. The planning and project processes that determine the implementation of parking reductions, parking pricing, and replacing parking with alternative uses of the curb all require public engagement. Academic literature and professional guidance frequently cite stakeholder engagement as a barrier, noting the near impossibility of those participation processes adequately representing all people impacted by decisions. Instead, people with more money that can be donated to campaigns, or with the time and education to more successfully have their voice heard, are the ones that are able to influence decisions. Usually, citizens that attend community meetings and participate in planning processes are disproportionately white, wealthy, educated homeowners (Rolheiser and Saiz, 2020). It can be very difficult to attend community meetings if a person works multiple jobs or has

significant caretaking responsibilities. Additionally, since poor, non-white voices have historically not been listened to, many do not feel it is worth their time to participate in these processes, whether they would be listened to in reality or not.

There are two possible points of leverage in the power model. Elitists say economic power is needed to influence institutions, and pluralists say that group organization can shift the power dynamics. Economic power is difficult to acquire quickly, though one option would be to change the hearts and minds of those with economic power to shift their loyalties to the side that benefits those with less power in the process. Alternatively, the planners and policymakers that are the main audience of this thesis could use their network to encourage foundations and other well-financed sources to contribute directly to existing or newly created advocacy groups that will advocate for those with less power. This bleeds into group organization. For instance, if transit riders are able to organize and send representatives out to community meetings to represent their riders, the riders that do not have the power to influence the decision individually could still see better outcomes.

These theoretical models will be used to analyze the survey and interview results to investigate how power and institutional structures may impact parking policy outcomes and processes, and to identify potential leverage points to improve outcomes.

4.4 Survey and interview methods

4.4.1 Interviews

Interviewee selection

I conducted a total of 16 interviews of policymakers in our four central cities using a semi-structured script. In particular, I conducted 4 interviews each in Seattle and Dallas, 3 interviews in Chicago, and 5 interviews in Washington D.C.

To select interviewees, I utilized each city's department of transportation organizational chart. I selected a person to interview in each of the following roles for each city:

- Director – oversees multiple functions related to parking, and generally maintains a bigger picture view of the department
- Curbside manager –directly involved with public parking, usually focusing on on-street parking. They often manage curbside management plans, pricing, and negotiate how the space is used with the complete streets managers. They often represent the needs for loading zones and implement Pick-Up-Drop-Off (PUDO) zone projects as well.
- Zoning professional – works on zoning or other planning interventions to regulate the parking in private developments
- Complete streets manager –implements treatments like widened sidewalks, bus lanes, and bike lanes that often result in the removal of on-street parking
- Commute Trip Reduction (CTR) manger – manages the commute trip reduction or transportation demand management program, often working with employers, developers, or other institutions to encourage policies and practices that incentivize people to use alternative modes and not use their car to get to those destinations. They also monitor compliance with commuter benefits laws. Only two cities have a person in this role.

These categories are general and not perfectly descriptive of each person's role in each city, but they communicate the general perspective the respondents are coming from.

Additionally, I interviewed one expert on car ownership who works in the private sector to provide context for how the cities they work with are deploying and thinking about data, parking, and car ownership. The results of that interview are not included in this section, but rather served to inform my conclusions and policy recommendations.

Interview design

I created an initial interview script, which included mostly uniform questions for all interviewees, but with a couple of city- and role-specific questions. After I completed the first four interviews, I revised the interview script and maintained the same script for the subsequent 12 interviews. The following questions were generally asked to each interviewee:

1. Would you say reducing car ownership is also a goal, for the department or for you informally?
2. Do you feel your department focuses more on incentivizing alternatives or on disincentivizing driving?
3. What goals do you aim to accomplish with your parking policy?
4. Do you actively try to remove parking spaces, or do you try to avoid removing parking?
5. What are the main things you consider when making decisions about removing parking or increasing the cost of parking?
6. To what extent do you coordinate with other departments?
7. From your position, does it feel like the City has an overall strategy for parking and street space, such as a system of priorities, overarching goals, identified metrics - and that you are able to operationalize that strategy with your work?
8. What is your experience with engaging communities when you work on a project taking away parking space? What approaches have worked best to ward off pushback? Do you experience more pushback in certain neighborhoods?
9. What do you find are the major barriers to accomplishing all that you would like to accomplish within your role as it relates to parking?
10. What impact do you think COVID-19 will have over the long-term on the work you do as it relates to parking?

Before finalizing each interview script, I conducted research into the parking policies at each of the cities. I examined any online documentation I could find related to removal of parking during COVID, specific planning related to curbside management or parking, general transportation plans and comprehensive plans, zoning regulations, commuter benefits regulations, and parking technology. I revised the base interview script to reflect what I'd learned, asking some additional questions or modifying questions to acknowledge projects that have been completed or trends I noticed.

Interview analysis

Next, I transcribed the recordings of the interview and imported those transcripts and audio into AtlasTI, an interview coding software. I added codes to the transcripts that picked out themes and main ideas from the interviews. I started off quite granular with coding, adding in many codes only applied to one or two interviews. Once all the interviews were coded in this granular way, I went back through and joined codes together that pointed to similar themes. I also coded the role and city of each interviewee to understand if there were differences in how a director feels about an issue as compared to a curbside manager, for instance. This re-coding formed the basis for my analysis of the interviews.

4.4.2 Survey

Identifying MSA municipalities

In order to acquire a list of municipalities in each of the MSAs, I found municipality lists from various localized GIS databases, including:

- Washington State city limits shapefile - https://geo.wa.gov/datasets/LNI::li-city-limits-statewide, Washington State Open Data
- Texas City Boundaries: http://gis-txdot.opendata.arcgis.com/datasets/txdot-city-boundaries, txdot
- Illinois city boundaries: https://clearinghouse.isgs.illinois.edu/data/infrastructure/municipal-boundaries-incorporated-places-2000, University of Illinois at Urbana Champaign, Prairie Research Institute
- Wisconsin Municipal Boundaries: https://geodata.wisc.edu/catalog/7E9313CF-F412-4764-9737-A3873D2A1E52, geodata Wisconsin
- Indiana - https://www.census.gov/geographies/mapping-files/time-series/geo/cartographic-boundary.html, US Census
- DC Boundary: https://opendata.dc.gov/datasets/washington-dc-boundary, Open Data DC
- Virginia - http://data-uvalibrary.opendata.arcgis.com/datasets/va-cities?geometry=105.348%2C-0.859%2C-103.129%2C76.480, University of Virginia Library
- West Virginia - http://wvgis.wvu.edu/data/dataset.php?ID=429, West Virginia GIS Technical Center
- Maryland: https://data.imap.maryland.gov/datasets/bd486d7feeec443c89a822dde5b86a1e_2, Maryland GIS Data Catalog

I added these to ArcGIS and selected those whose centroid was within the shapefile for each of the four MSAs of interest: Seattle-Bellevue-Tacoma; Chicago-Naperville-Elgin; Dallas-Fort-Worth-Arlington; and Washington D.C.-Arlington-Alexandria.

- TIGER/Line Shapefile, 2019, nation, U.S., Current Metropolitan Statistical Area/Micropolitan Statistical Area (CBSA) National: https://catalog.data.gov/dataset/tiger-line-shapefile-2019-nation-u-s-current-metropolitan-statistical-area-micropolitan-statist
- CBSAs and Zip Codes: https://www.census.gov/geographies/mapping-files/time-series/geo/carto-boundary-file.html

Random selection

Since many municipalities in these metro areas are extremely small, a random selection method would result in a heavy sampling of small towns that do not actually account for very much of the population of the metro area. Instead, I conducted stratified random sampling. I found 2019 population data from the U.S. Census for each of the cities,[3] and sorted the cities based on their population into three buckets:

Bucket 1. Under 10,000

Bucket 2. 10,001 – 50,000

Bucket 3. 50,001 +

[3] https://www.census.gov/data/tables/time-series/demo/popest/2010s-total-cities-and-towns.html

I selected 50 cities total from each MSA, with around 10 cities from Bucket 1, 17 cities from Bucket 2, and 23 cities from Bucket 3.

However, not all MSAs had a sufficient number of cities in each of these buckets, so the sampled cities were adjusted. The total number of cities available in each bucket per MSA and the number sampled are given in Table 9.

Table 9. Distribution of cities sampled by population size and MSA

MSA	Bucket (based on population)	Total cities in MSA	Number of cities sampled
Seattle, WA	Bucket 1 (under 10,000)	34	10
	Bucket 2 (10,000-50,000)	29	25
	Bucket 3 (over 50,000)	15	15
Chicago, IL	Bucket 1 (under 10,000)	170	10
	Bucket 2 (10,000-50,000)	149	17
	Bucket 3 (over 50,000)	24	23
Dallas, TX	Bucket 1 (under 10,000)	136	10
	Bucket 2 (10,000-50,000)	70	17
	Bucket 3 (over 50,000)	23	23
Washington, D.C.	Bucket 1 (under 10,000)	74	26
	Bucket 2 (10,000-50,000)	17	17
	Bucket 3 (over 50,000)	7	7

Following Cheusheva (2020), I used a random number generator and index formula to select 50 municipalities without duplicates from each MSA using the stratification shown in the table above. Across the four MSAs, this gave a pool of 200 cities for sampling. Two cities in Dallas-Fort Worth MSA and one in the Chicago MSA did not have contact information that I was able to find online, so the sample that was contacted was reduced to 197 (see below).

Contact searching

I then searched for contact information on the websites of each of the 200 sampled cities. I generally selected the best available contact based on the following ranking:

1. Director of Transportation Planning or DOT
2. Director of Planning or Public Works (depending on which department does transportation planning)
3. Director of Community Development/Economic Development
4. Village Administrator
5. Chair of planning-related commission
6. Mayor

Since many of the towns selected were quite small, almost none of the survey respondents contacted were transportation planners or work for a specific transportation department. The process of interpreting which departments and jobs would have experience with both regulation of private parking and planning around public parking was challenging and undoubtedly imperfect in execution. For many cities, I ended up e-mailing two people to increase the chance that the survey would find its way to the right person, though I would address the e-mail to the person whom I identified as the primary contact.

Survey design

I wrote survey questions based on the results from my interview analysis. I selected questions that would provide quantitative data informing points that came up during the interviews. For example, I found in the interviews that most people felt their city was both incentivizing alternatives and disincentivizing cars, but that incentives were dominant or communicated about more. I wrote a survey question to understand exactly the proportion of cities across the metro area that felt their city was disincentivizing cars compared to incentivizing alternatives. The full questionnaire can be found in Appendix A.3.

I used Qualtrics to host my survey. I sent out the initial request for responses to the 197 contacts on 11/16/2020. I sent one follow up one week later on 11/23/2020. I closed the survey on December 1, 2020.

Survey analysis

I received 82 complete and usable responses, for a response rate of nearly 42%. Originally, I received a total of 103 responses. First, I deleted any responses where the respondent did not answer any of the questions. Next, there were a handful of cities that had two or more responses submitted. In order to avoid giving extra weight to those cities in the analysis, I kept the responses that were either most complete, if one respondent did not answer all questions, or that indicated they spent a higher proportion of their time on parking policy work. Once those responses were deleted, 82 responses remained. Next, I checked the population size of the cities that responded and added an additional column indicating if the respondent came from a small (under 10,0000 people), medium (10,001 to 50,000 people), or large (over 50,001 people) city. One respondent did not indicate what city they were from and were not assigned a population size, though their response was included in the analysis as they answered all other questions.

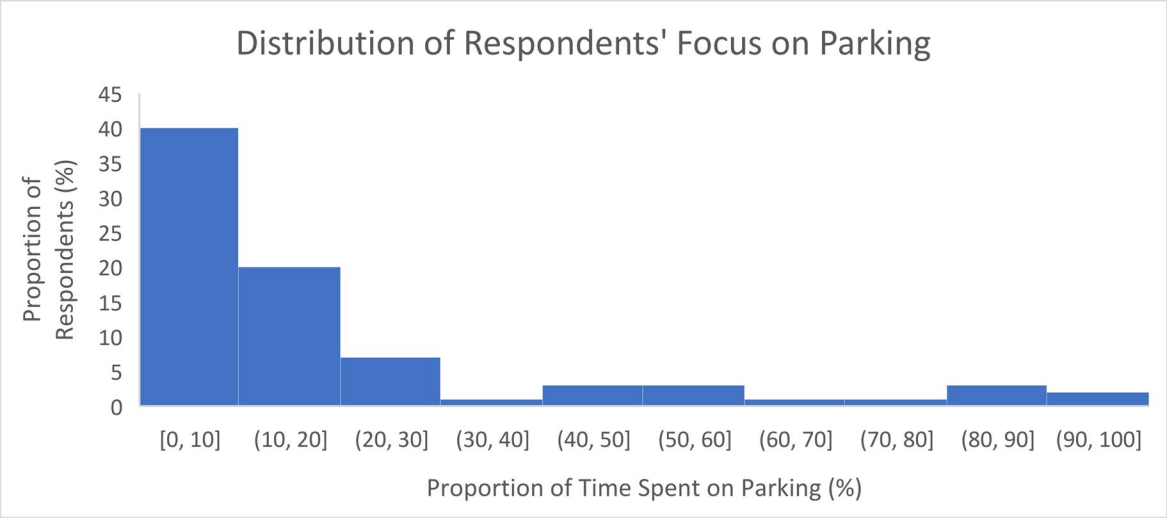
Survey respondents were fairly well distributed from each of the four metro areas. There were more respondents from large and medium sized cities, which is in line with the sampling method (see Table 10).

Table 10. Distribution of survey respondents by metro area (MSA) and by city size

Metro Area	Number of Respondents	Percent	City Size	Number of Respondents	Percent
Washington D.C.	23	28%	Small (under 10K)	15	18%
Chicago	19	23%	Medium (10-50K)	34	41%
Dallas	19	23%	Large (over 50K)	32	39%
Seattle	20	24%	No City	1	1%
No City	1	1%	**Total**	82	100%
Total	82	100%			

The respondents spent an average of 22% of their time on parking related issues. The distribution is clearly skewed to the right, and the majority of respondents spent less than 20% of their time on parking. This is to be expected, as very few cities beyond large principal cities have staff entirely dedicate to parking.

Figure 8. Distribution of respondents' proportion of time spent on parking policy



To analyze the results of the survey, I used several excel commands. I used the "countif" command to determine how many respondents selected a given text response, the "average" command, and various arithmetical commands to get sums and percentages. Lastly, I analyzed themes in the responses to the last two questions which were open ended.

4.5 Survey and interview results and discussion

In the following section, I will outline the results of the interviews and survey combined. As outlined in the interview methods section, I will refer to these different groups of respondents throughout the section:

- Director
- Curbside manager
- Zoning professional
- Complete streets manager
- Commute Trip Reduction (CTR) manger

In order to maintain the anonymity of the respondents, I will not refer to both a person's role and their city together, but I may refer to one of those identifiers in association with a theme or quote.

The following results should be digested with the understanding that parking policy impacts behavior in the aggregate over the long, rather than the short, run. The academic literature shows that parking policies that reduce the parking supply or increase its cost do often cause reductions in driving and car ownership. These analyses examine the parking supply or cost on large scales, for entire neighborhoods and across cities. Other non-causal analyses consider packages of policies implemented in cities but over a long time frame, and are unable to identify the direct impact of any one policy. In other words, it is difficult identify the impact of any single project removing fifteen parking spaces, or a zoning code change reducing the parking minimum down to 0.5 spaces per unit rather than 1 space per unit. It is likely that these discrete projects do have an impact, but on their own it is likely to be very incremental. Perhaps a couple of people each week would decide to take the bus to their favorite restaurant instead of drive because they know parking is a bit more difficult, and the bus route is convenient. Maybe ten people that move to the city and rent an apartment in a new development will decide not to buy a car because there is limited parking. However, the noticeable gains that will impact the vehicle miles travelled and car ownership rates for an

entire city or region will only come when many of these projects and policies are implemented, and people's behavior changes gradually over time in response to the increasing convenience of alternatives and inconvenience of driving and parking.

Many of these interview and survey responses discuss building the case for individual projects, so it is important to understand what those projects could do in aggregate over the long-term as compared to their more incremental impact that the neighborhood or city will see in the short term. This is a challenge when gaining people's favor is a necessary component of implementing these projects. People tend to discount benefits in the future, and costs in the present are more salient. Uncertainty and wishy-washy language can increase mistrust, where in many cases, a lot of people already are not particularly trusting of their local governments. Governments have had to respond to this challenge with different strategies of describing their vision and implementing their work. These results illustrate how they have been approaching their goals, and the barriers they face in reaching them.

This results section is entirely focused on the perspectives of local government officials who's work involves parking. Many more perspectives are important and impactful for parking policy, and these results should not be the last word. Instead, these findings should be tested and brought into conversation with different communities, road users, and elected and un-elected officials. It's entirely possible that what public officials perceive to be the reason a group of people do not support parking removal, or do support loading zones, or are concerned about removing parking minimums, could be entirely incorrect. This highlights again the importance of comprehensive community engagement that builds relationships of trust with people. This is especially important, as repeated throughout this thesis, to build with marginalized people who are often left out of these conversations and may be missing from the parking officials' perspectives as well. It is also important to understand the perspectives of other un-elected officials, like engineers, parking enforcement officers, public health specialists, and many others whose work is impacted by parking policy. Elected officials are portrayed by the results here as being relatively beholden to the desires of more powerful neighborhood groups – this is undoubtedly a broad stroke to paint all local elected officials with, and much more needs to be understand about their concerns and strategy.

Notably, this research was conducted entirely during the global COVID-19 pandemic. The pandemic had many different impacts on transportation and parking in cities – driving anywhere has become less in demand, outdoor space for socially distancing more so, but public transportation less so. Interviewees sometimes brought up specific impacts of COVID-19 on their work throughout the interview, but others did not. Many appeared to be referring to pre-COVID-19 times when discussing community engagement encounters and impact analyses, but this was not always clearly stated. Survey respondents received no instruction as to their consideration of the COVID-19 pandemic in their responses, so respondents there also likely responded in different ways. Some may have counted removing parking to build temporary parklets in their accounting of parking removal, whereas some may have seen that as non-permanent and thus did not count them. In any event, it is unlikely that the pandemic had no effect on my results, and the context of the world in which I conducted my research should be taken into account by readers.

I will first describe results relating to the goals and strategy for parking professionals. I will then outline the process that parking professionals go through when identifying, designing, and implementing a parking policy. Lastly, I'll outline barriers and some solutions that have been implemented.

4.5.1 Goals and strategy

Finding 1: Reducing car ownership is not a direct goal of municipal transportation policymaking

My results indicate that parking officials are not enacting transportation (or parking) policy with the goal to reduce car ownership. Only 6% of survey respondents felt that reducing car ownership was a formal goal for their city. Many more, 28%, felt it was a personal goal, though that still leaves the majority of respondents for whom reducing car ownership is neither a personal nor an official city goal. Table 11 shows the proportion of respondents that selected each goal as an official goal for their city, and as a personal goal. The most common goals were improving safety, improving connectivity and accessibility, and reducing traffic congestion.

Table 11. Percentage of survey respondents who selected each outcome as an official or personal goal

Goal	Official	Personal
Improve safety	91.4	53.1
Improve connectivity and accessibility (i.e. making it easier for people to get around)	90.1	56.8
Reduce traffic congestion	84.0	48.1
Improve economic vitality	77.8	58.0
Increase use of non-car alternatives (e.g. public transit, biking, walking)	76.5	56.8
Improve public health	54.3	35.8
Improve social equity	48.1	42.0
Reduce car dependence	38.3	42.0
Reduce GHG emissions	37.0	32.1
Reduce car use	33.3	45.7
Reduce car ownership	6.2	28.4
Other	4.9	2.5
None of the above	1.2	1.2

Table Notes: Respondents were able to select multiple goals unless they selected "None of the above."

No interview respondents felt reducing car ownership was a formal goal for their agency, and only two of the curbside managers felt it was an informal goal. Many explained that reducing car ownership would be an unpopular goal in the eyes of the public:

> *"People tend to react badly when they're told they can't do something, so that's probably why we haven't framed it in that way."*

Instead, most interviewees felt their agency's goal was to reduce car use. Often this goal was framed as providing options so that people did not have to use their vehicle for every trip:

> *"We always say that we don't have a war on cars. We have a war on the idea that cars are the only way to get around."*

Another common framing of this goal flipped reducing car ownership into a positive goal: to provide options that enable people to choose to live a car-free lifestyle if they wanted to:

"We're not promoting the elimination of cars or the reduction in ownership of cars, but we're trying to promote policies that encourage people to establish a lifestyle that is absent of cars."

I captured this concept as "car dependence" in the survey question, and found that 38% of survey respondents felt their city had a goal to reduce car dependence, many times more than the proportion that felt reducing car ownership was a formal goal (Table 11). About 33% felt their city had an official goal to reduce car use. About two thirds of respondents therefore still did not feel their city held these goals. Based on open-ended comments throughout the survey, it is likely that many of the city officials surveyed feel that high car use and dependence is a given that will not change for their residents, so they may see that goal as infeasible, or fear that reduced car use would result in reduced mobility and accessibility.

The majority of the survey respondents who did feel car use or dependence was a formal goal were from medium or large cities. This finding could suggest that smaller cities feel less empowered to take action that supports these goals, since they might have limited influence on the transit system and built environment of the entire region. Additionally, while this finding was generally true for cities in the Seattle, Chicago, and Washington D.C. MSAs, only two of even the medium and large cities in the Dallas metro area felt that reducing car use or dependence was a formal goal. Dallas cities appear to be less focused on reducing car use or dependence as compared to the other metropolitan areas. This is in line with the finding in section 3 that car use is higher in the Dallas area than the other three areas. However, it's unclear whether not having the goal could contribute to the higher car use, or whether having higher car use has made officials feel that holding that goal would be fruitless or harmful.

Additionally, many interview respondents felt that though they were decidedly not aiming directly at reducing car ownership, that result is both a potential lever for, and a likely and welcome outcome of, the work they are doing to reduce car use:

"I think there's an understanding that when people own a car it's viewed as a sunk cost and therefore there's a greater propensity to use it and produce VMT. So, I think we see reduced car ownership as one lever to reduce VMT, but I would view reduction of VMT and vehicle trips as the most important goals."

"If from that, reduced car ownership happens then I think we'd agree that that's probably a good thing."

This indicates that some interviewees saw reducing car ownership as an infeasible goal to have officially, but that the outcomes of reduced car ownership are still goals for their city. Survey respondents were more mixed on whether the outcome of reduced car ownership would be perceived positively in their cities: 32% felt it would, 11% felt it would be perceived negatively, and the majority, 57%, felt it would be perceived neutrally.

Interviewees clearly articulated that people do not like the government telling them what they cannot or should not do. If reducing car ownership were a goal, they feel it would be perceived as just that—the government telling people they cannot or should not own their privately-owned vehicle. As noted in the introduction, there is a clear sentiment among Americans of the sanctity of private property, so this is not an entirely surprising response (Alexander 2009; Nadler & Diamond 2008; Cohen 1954). Additionally, the results from section 2 that found how highly people value owning their car could contribute to this sentiment. If a person values their car at over $11,000 and the government is telling them they should not have it any more, that's a large loss to take. This is specially true, given that section 2 also found that alternative modes are not highly valued at all, indicating that for most people in these four metro areas,

having a car is the rational choice because they lack alternative options that provide what they need to get around.

Interestingly, reducing car use appears to be a more palatable goal, particularly in the perception of the interviewees representing principal cities. The goal of reduced car use was often framed as improving or adding more options for people, rather than forcing them to reduce their car use or taking things away from them. This goal therefore comes across more as improvements than manipulation or restriction. Similarly, reducing car dependence, or providing options to enable a car-free lifestyle if people want it, appears to be a more positive framing of the goal than reducing car ownership outright. Respondents feel that these positive framings are a better strategy considering the need to gain public acceptance in order to do their jobs. It is interesting then that the more suburban sample that responded to the survey mostly still did not report that reducing car use or dependence was an official, or even a personal goal. Car dependence in particular implies that people are trapped by using a car, and that reducing that dependence means offering more freedom. There is clearly an important distinction that favors the freedom to own a car over the freedom to not have to own a car, particularly for more suburban municipalities. This could simply be the result of the strength of car dependence and the inability of government officials to imagine a world where their residents would not require a car to make the majority of their trips, so that the goal of reducing car dependence seems naïve and pointless.

These results are based entirely on the perception of parking officials in local governments. However, it is likely that their perception is fairly accurate to how the general American public feels, considering our government and constitutional focus on preserving individual liberties and private property in particular. Additionally, Mayor De Blasio in New York City recently made a statement that New Yorkers should not buy cars, presenting a test for how people might react to a stated goal of reducing car ownership (Troutman 2020). This comment received significant backlash, particularly from communities in Staten Island, which does not have high quality transit infrastructure. The media reported the comment as elitist, since the wealthier people living in Manhattan can more easily access what they need without a car as compared to the less wealthy residents of the outer boroughs. Several interview respondents recognized this challenge in their own work, noting that many of the poorest neighborhoods in their city were the least connected to transit and thus would suffer if they had to give up owning a car. Since large swaths of even the largest American cities have poor alternatives to the car, perhaps it makes sense that parking officials are focused instead on getting the work done to provide better options to enable a car-free lifestyle for as many people as possible.

Lastly, it is notable that the only interviewees to agree that reducing car ownership was an informal goal were the curbside managers. Their job is entirely focused on parking—pricing it, removing it, or replacing it—and most directly contributes to disincentivizing car use and ownership. They talked extensively about their effort to convince car owners to accept projects that remove parking. Interviewees in other roles have broader foci that involve things like improving transit and bike infrastructure, changing many aspects of the zoning code, overseeing the entire transportation department, and/or regulating commuter benefits that include many options unrelated to parking. The curbside managers' singular focus on parking might make the need to reduce car ownership more salient. While it seems to be prudent not to have reducing car ownership as a formal goal, there could be some benefit to having curbside managers who do hold it as an informal goal. They may be more willing to push for removing parking and increasing its price than other staff, who can sometimes accomplish their goals without removing parking, avoiding the battle that would require with residents and businesses. This is the first piece of evidence of many that having curbside management staff is helpful in making progress toward reducing car ownership and use through parking policy.

Overall, the interviewees all expressed a desire to work toward sustainable mobility systems and travel behavior. However, they each saw reducing car ownership as either an infeasible, lower priority, or inconceivable goal to work toward within the larger category of sustainable mobility.

Lastly, it is notable that there was not significant variation between the different cities for interviewees, or MSAs for survey respondents. Generally, respondents shared very common themes about their transportation goals, with more of the variation occurring between role rather than jurisdiction. This relative uniformity will continue to be the norm throughout these findings – on most subjects, there was not significant variation between cities or metro areas. I have noted where there is variation, but it is the exception rather than the rule.

Finding 2: A mix of disincentivizing cars and incentivizing alternatives

Based on the proclivity toward positive framings of goals under Finding 1, I expected respondents to be quick to say they focus on incentivizing alternatives rather than disincentivizing cars. Instead, there was a mix. Directors and complete streets managers tended to say they were doing both. They focused their explanation on the fact that when they take away space from cars—either a traffic lane or parking—they replace it with infrastructure that improves an alternative; so they are inherently doing both disincentivizing and incentivizing simultaneously.

> *"It's both, we're stripping away that space that would typically and traditionally be used for car storage, and using that for other uses that transport more people or have less of an impact on the environment, so we're kind of doing both at the same time."*

Curbside managers and zoning professionals more often said that their focus was on incentivizing alternatives, particularly in external communication. These are the two roles that are most focused on removing parking, through development review and zoning standards for off-street parking and through designating non-car uses of the curb for on-street parking. Perhaps they are most at risk for public outrage because of this, and are more careful to communicate their work in terms of incentives. The focus on incentives also could just be more salient for these roles since their portion of the work on a project is often what is being downplayed when communicating with the public.

> *"The response we would likely get would be you're trying to take my car away from me, so we're trying to work more on the incentivizes."*

> *"We've maybe put a small thumb on the scale to try to disincentivize, but most of the weight has been on incentivizing alternatives."*

The CTR managers recognize that disincentives are more powerful in changing behavior, but also recognize that their programming still focuses on incentives. This is often because they largely rely on voluntary participation of employers, rather than on enforcing requirements.

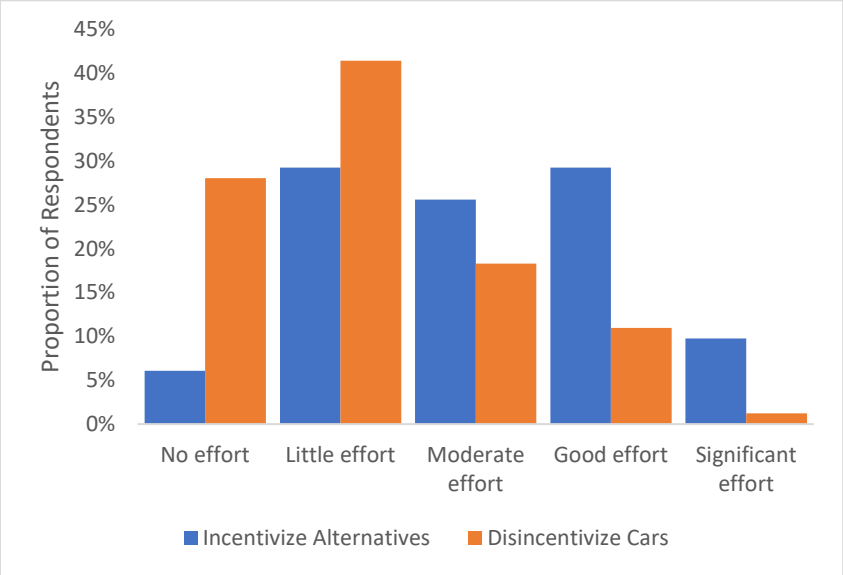
> *"We can provide transit cards and do different events and talk about discounted bike share rates and things like that, but taking away the option of parking or offering a parking cash-out, that tends to be the best way to go about it."*

> *"We are probably stick-ier than other places maybe would be, but the dominant discourse in transportation demand management tends to be more on the carrot side than on the stick side, and we are not an aberration from that."*

Two people also voluntarily shared that they were advocating internally for more of a focus on disincentives, based on the belief that this was vital in order to shift travel behavior. I did not ask every respondent whether they advocated internally in either direction, so it is possible that more would have shared this same sentiment. Many respondents specifically cite public or political barriers to focusing on disincentives, rather than a belief that this was the wrong strategy to effectively achieve the outcome of reduced car use or ownership.

Survey respondents displayed a more clear perception that their city puts more effort toward incentivizing alternatives as compared to disincentivizing cars. Figure 9 shows a distinct rightward skew for disincentivizing cars, with more respondents thinking their city expended little to no effort on this.

Figure 9. Distribution of survey respondents' perceptions on effort put towards disincentivizing cars and incentivizing alternatives



Most of the responses are in line with the theme in Finding 1 that officials try to focus on positive goals and actions. Here, the focus tends to be on incentivizing alternatives rather than disincentivizing driving. However, these answers did reveal that respondents are not necessarily completely avoiding disincentives, and many recognize their importance. As we'll see in subsequent answers, it is clear that though respondents are quick to acknowledge disincentives as a part of what they are doing, they are careful to focus public communication on the incentives. They are also restricted from implementing anything more than small, incremental disincentives that do not cause a significant disruption to the use or ownership of private cars.

Finding 3: Parking goals are not focused on reducing car use, dependence, or ownership

Similar to Finding 1, which looked at transportation goals generally, parking policy goals are not directly focused on reducing car ownership, and are also not focused on reducing car use or dependence. Only 27% of survey respondents felt reducing car use was a formal goal for parking policy, and only 5% felt reducing car ownership was. Of the survey respondents, 37% did indicate reducing car dependence was an official goal for parking. Once again, more respondents felt these were personal goals, but still far less than the majority. Considering that the academic literature has consistently found that parking policies that reduce supply and increase cost can reduce car use, ownership, and dependence, it is notable that the majority of practitioners do not see these as goals for their parking policy work.

Table 12 shows the full parking goals results. The most common official goals were increasing safety, reducing traffic congestion, and improving economic vitality. These goals show that parking policy is seen more as a tool to use to delivery mobility and other benefits, but not to disincentivize cars. A couple of goals were more frequently considered to be personal goals as compared to official goals – reducing car ownership, reducing car use, and improving social equity.

Table 12. Percentage of survey respondents who selected each outcome as an official or personal parking goal

Goals	Official	Personal
Increase safety	86.4	44.4
Reduce traffic congestion	71.6	37.0
Improve economic vitality	69.1	44.4
Implement efficient use of space	66.7	44.4
Improve aesthetics	61.7	40.7
Reduce stormwater runoff	60.5	40.7
Make space for alternative modes like bus lanes and bike lanes	42.0	39.5
Make space for commercial and passenger loading	42.0	27.2
Reduce car dependence	37.0	37.0
Make more space for public or business uses, like parklets or streeteries	37.0	33.3
Improve driver experience	35.8	33.3
Generate tax revenue	32.1	19.8
Improve social equity	30.9	38.3
Reduce car use	27.2	37.0
Reduce car ownership	4.9	22.2
Generate parking revenue	16.0	14.8
Other	2.5	0.0
None of the above	1.2	2.5

Table Notes: Respondents were able to select multiple goals unless they selected None of the above.

The interviewees' goals for parking were also often not connected to the goals found in Finding 1 for reducing car use and providing options that enable a car-free lifestyle. Additionally, interviewees were generally less clear on the goals they held for parking policy specifically as compared to for transportation generally.

> *"There are goals stated kind of higher up in the plans and policies, like up in the comprehensive plan… but within our program, we don't have stated goals like that."*

Some interviewees even had contradictory answers, where they did feel like they were working toward reducing the parking supply, but also that in reality they often tried to minimize its reduction:

> *"Yeah, I would say we are [trying to reduce parking supply]. I mean, there are some exceptions… when it actually comes to the project and the design, we are looking for ways that minimize the amount of parking removed."*

Curbside managers had the most clearly defined goals of all the parking officials. Still, their goals were not aimed directly at reducing car use, reducing the parking supply, or increasing its cost. Instead, they often

focused on a specific concept of efficiency, which is framed by the scarcity of curb space in their city and the desire to use that space to optimally provide for the needs of the community and the road users.

> *"We do one thing, and that is safe and efficient movement of people and goods to and from the curbside."*

> *"That means assessing the highest and best use of the curbside space."*

Over 67% of survey respondents also felt that implementing the most efficient use of curb space was a goal for parking policy as well.

Complete streets managers also had relatively clearly defined goals, to improve alternative modes of transportation.

> *"We have goals around improving the attractiveness and usage of transit."*

> *"Our goal is really to try to enable good, reliable, frequent alternative services."*

Only 42% of survey respondents also felt making space for alternative modes was a goal for parking policy. Considering the relatively limited spread of bus and bike lanes in American cities, this is still a large percentage for a suburb-dominated sample group.

Many interviewees across parking official roles mentioned economic development goals as well. They want to use parking to enable businesses to be successful and to attract new development and residents into their city.

> *"From an economic development standpoint, developers won't necessarily have to spend thirty thousand dollars per parking spot where individuals may not even utilize that."*

> *"Commercial parking, I think, is really the focus because we have a huge economy and we want to support the economy."*

> *"I think we've been a very progressive city in terms of using sidewalk cafes as a means of ensuring lively public space, economic development, and business support."*

Similarly, around 69% of survey respondents felt that improving economic vitality was a goal for parking.

Adjacent to economic development, some interviewees focused specifically on using parking to generate revenue for their city. This was often connected to the goals of efficiency and economic development: the goal is to identify the highest and best use of the curb based on its ability to attract customers or tax-paying residents that will increase both economic vitality, and government revenue. This goal was described almost entirely by curbside managers, along with one director. This could be because curbside managers are generally the role that implements parking pricing, and this policy lies under the director's larger vision for the transportation department.

> *"We define a parking space as 22 feet. In that 22 feet, I can earn up to $2.30 an hour if that space is occupied, but I don't know what that person does in terms of economic impact."*

> *"The little revenue that's coming in off those meters will be far offset if we have more people coming into our city spending money, or purchasing homes and then paying property taxes."*

Interestingly, this trend toward focusing on tax revenue rather than parking revenue bears out in the more suburban survey responses. Only 16% felt generating parking revenue was a goal for parking, whereas 32% felt that generating tax revenue was. This indicates that officials are seeing parking space as valuable real estate for their city, impacting far more about how people behave and spend money than a simple parking meter suggests.

Lastly, only one interviewee said that reducing congestion was a goal for parking policy. This is notable and surprising, since almost all of the planning documents guiding transportation and parking policy for these cities cite reducing congestion as a guiding goal for their work.

> *"Reduce congestion in travel lanes caused by drivers seeking on-street parking."* (Seattle Curbside Management Plan)
>
> *"Goal: Efficient transportation to reduce congestion"* (Sustainable Chicago)
>
> *"Promote non-automotive transportation and reduce congestion."* (D.C. Performance-Based Parking Pilot)
>
> *"Provide environmental benefits from reduced congestion, alternative transportation options, and water quality improvements"* (City of Dallas Complete Streets Design Manual)

Similarly, 71% of survey respondents felt reducing traffic congestion was an official goal for parking. This was the second most popular goal for parking, after improving safety.

It is possible that my framing of several questions in terms of reducing car use shifted the interviewees' mindset to using that language rather than language of reducing congestion. It is also possible that interviewees legitimately are aiming more directly at reducing car use and VMT overall, which was cited specifically. The congestion language may be used more often in public facing documents since it tends to be a popular goal with the general public (Taylor 2004).

It is firstly notable again that parking officials are not aiming directly at reducing car use, ownership, or dependency for their parking policy work. Literature has consistently found that parking policy can be effective in achieving those goals, and most of the interviewees did at least have reducing car use or dependency as goals guiding their overall transportation work. It is unclear why officials did not connect their parking work to these goals, though the responses indicate that public perception once again could be guiding their careful framing of parking in terms of economic goals, which tend to be more politically popular. Parking policy could also legitimately not be seen as the best mechanism to use for reducing car use and dependency, particularly when it can impact so many other goals that cities are often working toward, like safety and efficient use of space.

These results again provide evidence that having curbside management staff could be helpful in reducing parking supply and increasing cost in order to reduce car ownership and use. Curbside managers were clearer about their goals for parking policy and their work. The goal for efficient use of the curb is often based on their curbside management studies' prioritization frameworks, which systematically prioritize mass transit, bike lanes, and loading zones over private car uses. They also are thinking more holistically about the curb's role in government revenue. Since parking revenue can be a large portion of government revenue, staff may need to be able to effectively argue that the revenue loss from removing parking will be

offset by people spending more money and businesses being more successful. Additionally, shifting the focus from parking revenue to government revenue generally enables a higher priority on things like sales tax and income tax revenue, that also produce environments with density and vibrancy that reinforce the attractiveness of alternative modes.

However, equity goals were notably absent in any of these responses. Improving social equity is a goal for less than a third of cities, and a personal goal for just over a third of city officials that responded to the survey. This omission is unsurprising, consider Kirlin and Erie's Power-Structure model, which shows that people without money or political know-how are likely to be left out of engagement processes and thus may not be able to advocate for equity goals to be included. This absence could result in parking policies that jeopardize the ability of low-income people to access needed businesses or force them to park illegally thus generating unpayable fines. Alternatively, parking policies could dismiss the benefits of things like bus lanes and bike lanes that help people who cannot afford a car get where they need to go. If equity were incorporated alongside or within the efficiency goals for parking policy, these inequitable outcomes could be foreseen and avoided. Equity goals would also likely result in the dual benefit of higher prioritization of mass transit and other non-car modes, producing better outcomes for low income people and for reducing car use and ownership.

Finding 4: Reducing the parking supply is not being used for disincentivizing cars

Despite many interview respondents feeling their agency was trying to disincentivize cars, most respondents did not feel that they were using parking to do so. Many respondents cited stakeholder pushback as a core reason this was not a viable strategy. Instead, many reported that they were trying to minimize parking removal, and only removed parking when unavoidable for the purpose of making space for an alternative use. Similarly, zoning professionals had to compromise in their work to reduce parking through the zoning code, and sometimes prioritized other goals more strongly.

> *"It seems like if we can find a way to fit in a bike or bus lane while maintaining parking, that seems to be the silver bullet."*
>
> *"We are not taking out parking for the sake of taking out parking."*
>
> *"We don't put in bus lanes purposefully to make driving or parking less convenient."*
>
> *"Right now, all we're getting is parking reductions that benefit the developer and their projects. It would bring more long-term benefits to the city if we also tied it in to an expansion of affordable housing."*

The survey results also show that cities are mostly not reducing the parking supply. 67% of survey respondents felt their city generally tries to avoid removing parking when redesigning a street. Only 18% do not think they avoid removing parking. Additionally, 84% of survey respondents had not removed any public parking spaces or prevented the construction of private parking spaces in the past two years. Only 10% had removed parking, and several of those respondents noted it was only a few spaces. Clearly parking removal is not taking place at any significant scale in suburban municipalities, and is only minimally occurring in large principal cities.

Several interviewees explained their hesitance to removing parking for the purpose of disincentivizing cars. For some people and neighborhoods, there are currently no sufficient alternatives to car use and ownership. Interviewees thus were focusing on making those alternatives better and enabling more people to live in new developments near transit made cheaper by the lack of parking and affordable housing requirements.

"Part of what we're trying to accomplish with this new version of the zoning ordinance is how can we make these options more flexible in certain neighborhoods or more strict in others depending on what the specific circumstances are."

"Some areas of the city tend to be lower density development, and car ownership can be a lifeline. This idea of a walkable transit utopia city doesn't play the same way in every part of the city and everyone that you talk to."

"If you're going to start squeezing those lanes down and try to push people out of their cars and onto transit, the transit does have to be really good or else you're just screwing those people. You're telling them you can't drive, but you also can't take transit because transit sucks."

Additionally, complete streets managers brought up a competing objective for on-street parking. It can be helpful to have on-street parking for street safety and traffic calming goals. Rather than focusing solely on disincentivizing driving through reduced parking, complete streets managers are focused on multiple, sometimes competing goals like traffic safety, which impact the way a street is designed.

"There's a competing objective that having parked cars adjacent to a sidewalk on a commercial street is a form of traffic calming."

"There are instances where we have maintained or added parking to serve a traffic operations purpose, like to increase the safety of a protected bike lane with a turn pocket."

For both on-street and private off-street parking, respondents felt that they focused their efforts where urban space has been wastefully given over to parking. In these locations, removing on-street parking or reducing the amount of private parking serves to correct for that over-building, or "right-size" the amount of parking supply to the demand. This strategy, again, is not intended to disincentivize car use, although to a small extent that could still be an outcome. Instead, it echoes the goals for efficient use of space found under Finding 3 – officials want to ensure that space is not sitting unused, but do not want to underbuild parking to the point where driving and owning a car would be inconvenient.

"There's often a lot more parking capacity than people perceive in a community. And it's not that it's going to be impossible to find a parking space, but that the convenience or the distance from where you want to go might change."

"We are doing what we can to ensure that people aren't overbuilding parking."

"The guiding principle today is that we should be trying to do whatever we can to discourage excessive parking."

Despite these policies not being focused on removing parking for the purpose of disincentivizing cars, many interviewees still felt that the parking supply was being reduced over time. Respondents did not have data to back up this assertion and did not speak to the extent of this reduction, or what the impact of this reduction was having on travel behavior and car ownership levels.

"We are definitely losing the street parking over time with respect to transit and bicycle facility projects being built."

"There's an effort to try and encourage developers to build the appropriate amount of parking. So there's more and more housing that's built with fewer parking spaces or no parking spaces."

This resistance to directly using parking as a mechanism to accomplish the stated goals of reducing car use and dependence is interesting. The academic literature is fairly clear that parking is a very powerful mechanism with which to impact car use, and car ownership. Respondents, to some extent, acknowledged this. However, they also acknowledge that not every person or neighborhood in their city has sufficient alternatives that people can turn to in response to a disincentive to driving. In those situations, improving alternatives and ensuring more affordable housing near transit may indeed more effective and fair means to achieve reduced car use and ownership.

Additionally, it is likely that the unpopularity of removing parking and disincentives for cars generally are influencing the officials' strategies. Since most people do not like to hear that parking is being removed or reduced, officials know they must focus instead on what they are adding in its place. For private developments, they are reducing development costs to enable more affordability, and restricting parking garage eye sores. For on-street parking, officials are replacing the parking with needed transit and bike infrastructure. Even so, officials see the need to avoid removing parking as much as possible. They see removing parking as a hinderance to accomplishing their true goals, improving alternative modes and generating more affordable housing, because public resistance might stop or slow the project. Disincentivizing cars is decidedly secondary, if even a goal at all.

It is impossible to know if this non-disincentive approach that often avoids parking removal is still resulting in meaningful progress toward reducing car ownership and use. Even if officials are focused only on reducing the parking supply to improve alternatives, this could be an effective strategy for reducing car ownership and use. The results in section 2 indicate that people with higher quality alternatives value their car less highly, which might lead to more people giving up owning their car in favor of cheaper alternatives. It is hard to know the exact impact of any of these policies. Parking data in particular is incomplete in every American city, and it is also very hard to identify the individual impact of policies and projects on car use and ownership.

Based on these results, I do not think that changing the public message from "we're removing parking so you can have better bus service" to "we're removing parking so it's less convenient for people to drive" would be effective. There could still be an opportunity to aim more directly at parking removal in the name of equity. Parking takes up a huge amount of space that disproportionately is used by wealthier people. Rather than simply focusing on improving bus service as a general benefit, the benefit could be framed as taking space that is wastefully given to wealthier people and giving it to an efficient, and sustainable, use that benefits predominantly low-income people. This speaks to the efficiency/highest and best use goal touted by curbside managers under Finding 3, which is perceived to be well-received by the public. Additionally, the protests and Black Lives Matter movement following the murder of George Floyd during the summer of 2020 indicate that an equity-centered argument, particularly in these large, liberal cities, could finally be compelling for more people than in previous years. However, the interviewees have reminded us that removing parking to disincentivize cars would only be equitable and effective in places where there are sufficient non-car alternatives available to get people affordably where they need to go. Unfortunately, that often depends on regional land use and transportation infrastructure, which is not under the control of any given municipality.

Finding 5: The price of parking is increasing and becoming demand responsive in principle cities, but still is not aimed at disincentivizing cars

Interview respondents consistently reported that their city is increasing the cost of public parking, although still this policy is not aimed directly at disincentivizing cars, despite respondents' remarks under Finding 2. However, it appears to be politically easier to implement policies that increase the price of parking, than policies that reduce the parking supply. This may be because respondents feel they can more clearly link increasing the price of parking to the economic and efficiency goals for parking found in Finding 3. Price increase policies were often implemented for the purpose of achieving more efficient use of parking that reduces circling behavior, provides more assurance that spots will be available when needed, and encourage a better balance of utilization with off-street parking facilities. A few respondents cited Donald Shoup directly as the thought leader behind their implementation of increased, demand-responsive pricing for parking.

> *"Our commercial areas are in high demand and usually the most occupied are over the 85% threshold. So that's when we start making different policies on pricing, to promote that availability and turnover of the space."*

> *"We created that program to put the price of that on-street asset so its comparable to what the off-street experience is."*

Some respondents recognized that this strategy for increasing pricing would not necessarily always make people drive less. Instead, the policies are aimed at improving the balance of price between on- and off-street parking. The increase in price still might spur some people to take a non-car mode instead, but many will simply fill the off-street parking that had previously not been full, or park further from their destination where the price is cheaper. Additionally, there's a recognition that the price often still did not get as high as it really should be to be "efficient."

> *"It's basically using the Shoupian model, where you set availability targets for the curbside and you use pricing to ensure that. That doesn't necessarily cause a reduction in driving. Some of those people might use transit instead which is great, and some of those people might choose to use private parking."*

> *"In the high demand neighborhoods there's still a pretty big gap between the elevated rates for those larger number vehicle households compared to what people would be willing to pay on the market."*

> *"People complain that they pay $35 a year for a residential parking permit and it doesn't guarantee them a spot in from of their house any time they want it. They just can't wrap their head around the fact that on Craig's list I can find ads for private parking spaces going for 10, 12, 15 thousand dollars. That's the market, and $35 doesn't even make a dent in that."*

Survey respondents did not necessarily bear out this trend. Less than 8% of respondents had converted on-street parking from free to paid, or raised the cost of parking. Only 11% are considering starting to charge for some parking spaces, and only 5% are considering increasing prices. Additionally, only 5% are considering implementing dynamic pricing. Of those that have increased the cost of parking, three out of the four worked for large cities. Although it seems that charging more for parking is a viable policy option for large cities, particularly as compared to removing parking, non-major cities appear to be unable or uninterested in implementing parking pricing. It is also possible that cities that might otherwise be

implementing pricing changes are not currently doing so because at the time of the survey responses, cities were still dealing with the COVID-19 pandemic, and many cities stopped charging for parking altogether to lessen the financial burden on essential workers.

As respondents themselves pointed out, the neoliberal strategy for parking pricing will not necessarily reduce driving, nor is it focused on accomplishing that goal. As Yan et al (2019) found in their study, when prices increase, the most common response is for people to simply park somewhere else, rather than not drive at all. They found that travelers were more responsive to parking availability than cost. While there may still be small benefits of pricing in the form of reduced VMT from less time spent searching for a parking space, and from some people at the margins switching to non-car alternatives, this pricing policy is unlikely to achieve significant reductions in driving or car ownership on its own.

However, in terms of the levers that are available within parking policy, pricing appears to be a much more politically and publicly acceptable policy. For the interviewees, the goal of pricing is to bring the public asset of curb space into a neoliberal management structure, imitating market forces. This policy may be more politically popular because the incremental increase in prices is less salient than the inconvenience that comes from a whole block of parking spaces being removed, or filling up with people who no longer have a parking space in a new development due to reduced parking requirements. The efficiency argument respondents use for these pricing policies could also simply be more palatable for people, since it is framed as a benefit to them – if prices are right, they will have to spend less time searching for a parking space and there is higher certainty that there will be a space available within a reasonable distance. The argument for reducing supply, that using the curb for a bus lane benefits more people overall, instead relies on drivers' altruism in being willing to bear the negative effects of the project while the supposedly higher positive effects accrue to bus riders. The fact that parking pricing appears to be much more well accepted by drivers suggests that framing arguments for parking policies in terms of how they'll benefit drivers may be more effective than relying on their altruism.

Additionally, the perception that pricing policy is less likely to draw public resistance might indicate that the "public" that officials are interacting with are wealthy enough to be relatively unconcerned with the increase in the price of parking.

The same equity concerns brought up under Finding 4 are also relevant here. In all of these cities, there are low-income neighborhoods that have poor access to non-car alternatives. Some respondents indicated that those neighborhoods generally did not have high, if any, pricing for parking because of the lack of in-demand commercial districts. They argued the market thus solves this equity problem. However, people in those neighborhoods that are made to be dependent on their cars also have to leave their neighborhood to access jobs, goods, and services in other higher demand neighborhoods where parking is priced much higher. This places an inequitable burden on them to pay high parking prices when they do not have a viable alternative to driving. This provides another example of why placing equity at the center of parking policies is vital.

Another reason this policy may be more politically popular is that it actually increases revenue that can be used to pay for general functioning of the government, or for other transportation improvements. If the prices were set so high as to disincentivize driving, rather than targeting 85% occupancy, revenue would likely drop and those spaces would be empty, wasting valuable public space. This is another reason that policymakers may be focused on demand-based pricing, rather than pricing as a disincentive. Washington D.C. is also exploring how to price the curb for non-parking uses like TNCs and delivery companies. A pricing policy like this that shifts more of the revenue-earning burden on to these larger corporations that tend to serve wealthier populations can also improve the equitability of parking pricing.

Lastly, literature on congestion pricing has found that it can be an equitable policy if the revenue is invested back into the transit system or other improvements to non-car alternatives (Manville and Goldman 2018). For D.C. and Seattle, the parking revenue does appear to be invested back into non-car alternatives. Ensuring this is true in every city is key in both accomplishing goals of reduced car use and of improving equity.

Finding 6: Employer benefits are most effective with free, government-adjacent programming

Commute Trip Reduction (CTR) managers work on all fronts of parking policy – supply, pricing, and making alternatives more attractive. The quantitative analyses in sections 2 and 3 found that employer benefits can be impactful on changing people's ownership and use behavior, indicating that CTR managers could have important insight on how employer benefits laws and programs are structured and how they could be leveraged more effectively.

The two CTR managers that were interviewed worked in D.C. and Seattle, the two places that have a commuter benefits law in place at the state and/or local level that requires certain employers to provide certain benefits. In both places, the city's department of transportation contracts out services that help employers comply with the law and encourage even more programming to reduce commute trips.

> *"We work with an outside group to help us implement the program. That way its framed as a business to business program – it's not just the government coming in and saying you have to do this. It's really about support and assistance rather than regulation and requirements. And that's been very intentional because we've found that that's what drives its success."*

As this quote implies, CTR managers were focused not on enforcing compliance with the law, but rather on encouraging employers to do even more than the law requires. In both Seattle and D.C., laws require employers to give their employees a pre-tax payroll deduction for non-single occupancy vehicle (SOV) commute expenses (Seattle Municipal Code Chapter 14.30; D.C. Transportation Benefits Equity Amendment Act of 2019). In D.C., employers must offer parking cash-outs to employees that do not use their free or subsidized parking space (D.C. Municipal Regulations Section: 7-3301). In Seattle, another law requires employers to choose a handful of TDM measures across different categories to implement, including parking (Seattle Municipal Code Chapter 25.02). Seattle also implemented Director's Rule 09-2015 that requires developers and property owners to implement transportation management programs that include many of the same types of features as commuter benefit laws, such as requiring market-rate prices charged for parking, offering transit passes to employees, bike parking, and more. GoDCgo and Commute Seattle are the two entities that provide the CTR programming. They are both offered to employers for free, and are staffed by contractors paid for by the city government.

Despite laws requiring specific actions, CTR managers overwhelming felt that their work focused on incentives rather than disincentives, such as providing subsidized transit passes, bike share passes, bike storage, and carpool programing.

> *"We are probably stick-ier than other places maybe would be, but the dominant discourse in transportation demand management tends to be more on the carrot side than on the stick side, and we are not an aberration from that."*

The CTR managers also shared that the laws did not require that much of employers. Instead, the majority of the progress they made with employers implementing TDM measures came from measures the

employers implemented voluntarily. This voluntary work came as a result of the free programming and resources offered by the CTR managers, who could guide employers in TDM implementation.

> *"I would say 90% of employers are already compliant with the commuter benefits law. Our goal is to move them along those milestones and get them to add more and more TDM measures in order to decrease the amount of single occupancy vehicles on the road."*

This required CTR managers to be focused on building positive relationships with employers, and illustrating the positive benefits of these policies, rather than being watchdogs bringing negative consequences for noncompliance.

> *"It's much more focused on carrots because we find its more impactful that way. It drives better participation, and that counts as much as anything toward compliance."*

> *"People would be directed to work with our free TDM program, and people would understand that we are free and we can consult with them and help them, and why turn that down?"*

Another reason this relationship-building strategy is so necessary is that the commuter benefits laws are often targeted at larger employers who tend to have disproportionately wealthier employees. While the laws might require market pricing of parking or other financial disincentives, wealthy employees may not be swayed by the magnitude of the change. Instead, CTR managers work to find ways to incentivize those employees out of their cars with attractive alternatives.

> *"I think this is where the options and carrots strategy comes in, because you need to create a more compelling array of options for someone that has income discretion. That can perhaps work where pricing doesn't."*

Developers under the Seattle TDM law, and employers in both cities, tend to respond positively to this type of programing that makes non-car alternatives more attractive because they are often competing with other employers for these high-end employees. This competition drives them to provide amenities for their workers, similar to how residential developments use building amenities to attract high income residents.

> *"There's these free services I can take advantage of and make my building look much more attractive to tenants and add to the suite of services I'm offering them."*

> *"It depends on location, so where things are very competitive downtown, people really want to make sure their rent is at whatever level and meet their pro forma, there's much more of a desire to hit all of the stops for whatever services they can provide to tenants."*

One major benefit of having laws on the books is that they often require data sharing. As with other parking data, commuter benefits-related data is hard to come by. CTR managers do not have a clear picture of how many parking spaces there are, what the prices are, and what benefits are in place. Without that information, they are less effective at designing needed programming and forming arguments for CTR measures that will resonate with employers and developers. When commuter benefits laws require creating plans and sharing progress reports, that data can be used to create more effective programming.

> *"I think we will get the most impact when we start require employers to create transportation plans with us, because that gives us the data and information to really*

understand where they started from and where they are now, and where our funding should go."

"We do have the monitoring aspect, so for the life of the building we are now tracking their performance and their program."

CTR managers do face barriers in implementing their work effectively. First, there is a lack of understanding of commuter benefits laws, their free programming, and the benefits employers might get from implementing substantial TDM measures.

"Employers often think, okay, we did the commuter benefits law requirements, we're all set. They don't really understand that they can add more to it and how much that really helps."

"It's just very difficult for people to understand that, yes, money is being withheld from your check, but it's not as much as you think and its saving you more than you think in the end, almost 40%."

Addressing that barrier would require more staff capacity and resources, which is not available.

"I think that we can be a lot more effective if we had a lot more resources."

Lastly, CTR programming and commuter benefits laws are implemented after the building and its design has already been approved through the zoning process. This means that CTR managers are unable to influence the parking supply, density, or where office buildings are located within the city. Those factors can demolish any benefit that would come from additional TDM measures.

"We tend to engage with a development project at the point at which it's basically done. Sometimes that's a problem. There are a lot of things that would enhance a commute trip reduction program from an infrastructure standpoint that aren't thought of at the point of development review."

"We do find that to be challenge sometimes, because we'll come in at the end of the project and say, if it were up to us, there wouldn't be so much parking on this project."

"We can provide transit cards and do different events and talk about discounted bike share rates and things like that, but taking away the option of parking… tends to be the best way to go about it."

The survey responses indicate that most people do not have commuter benefits laws or voluntary programs. Around 16% of respondents indicated their city or state has a law requiring certain commuter benefits, and 23% had voluntary programs focused on commuter benefits. However, eight respondents from the State of Washington responded no or not sure to this question, when in fact there is a state-wide commuter benefits law. Considering the impact commuter benefits appear to have from the quantitative results in sections 2 and 3, and the effectiveness of voluntary programming as reported by CTR managers in D.C. and Seattle, it may be valuable for more cities to implement laws and programming for commuter benefits.

The structure of the CTR programs as a quasi-private entity providing free TDM consultation with employers seems to be an effective way to amplify the commuter benefits laws. CTR managers felt their influence helped employers and developers to implement many additional TDM measures. They also felt

that their work was positively received by the employers and the public, a stark contrast to other parking policies implemented by city governments.

Still, the commuter benefits laws themselves seem to be less stringent than they could be, considering most employers are complying with them easily and the CTR managers are able to get employers to voluntarily do much more. It is possible that implementing more stringent laws, based on the lessons learned by the CTR programs, could be an effective way to ensure all employers are implementing as many TDM measures as possible.

Additionally, the CTR managers did see value in the data they were able to collect from employers on commuting behavior, parking supply and prices, and other facilities and amenities available. This was largely seen as a way to monitor compliance and better tailor their consultation. However, I think this data could also be shared with transportation and planning departments. This data could be used to build the case that reducing the parking supply or increasing its price works to reduce driving, and thus parking requirements should be reduced or removed city-wide.

CTR policies in these two cities are currently limited to providing incentives to use alternatives, and requiring employers to charge higher prices for parking. The CTR managers also mentioned that often this high price still would not deter the very high-income employees that they are often working with. Overall, I think CTR policies can be used to achieve marginal gains in people using alternatives rather than driving to work, and perhaps have a small impact on car ownership. However, considering these policies have no impact on the parking supply or the quality of transit and other non-car alternatives, these policies are likely to limited in the gains they can achieve in isolation. Instead, they should be treated as part of the package of policies aimed at reducing car use and ownership.

The interview results do indicate that they can still be effective, and Seattle in particular has touted the Commute Seattle program as one reason why they've seen decreases in driving in their Downtown despite a period of high growth in employment (Lloyd 2018). Still, these programs are entirely paid for by the government. They should be evaluated based on their effectiveness in comparison to other programming that the funds could be used for to ensure they are the best policy option. GoDCgo's annual report does not tie their programming to specific outcomes of reduced SOV commutes, or compare outcomes at affected versus un-affected sites (District DOT 2020). Commute Seattle does survey commute mode between affected and un-affected worksites, which could serve as a template for how to evaluate the effectiveness of the law and programming. However, their 2019 Mode Split Final Report found that the affected and un-affected sites have been converging, indicating the gains that the CTR law and programming was likely producing may have been borne out (EMC research 2019). However, each year sees many different factors that can impact commute behavior, so this year's result could have simply been due to other factors rather than the disappearing benefits of the CTR programming. Officials should conduct consistent evaluations to determine the effectiveness of these laws and programming year over year.

4.5.2 Parking policy process

A large section of the interviews focused on the process behind the creation of policies and projects that impact parking. While many elements of this process were fairly uniform across different cities and positions, cities with curbside management plans did have a more formalized process that guided decision-making about on-street parking. The cities without curbside management plans tended to follow a more ad-hoc process, and expressed a strong desire and plans for doing curbside management planning in the near future. This indicates that a more formalized process has strong benefits. For private off-street parking, interviewees had similar processes of stakeholder engagement and impact analysis, but did not have

formalized prioritization or decision-making framework. Often, the final decision would be up to a city council-designated commission, taking that out of the hands of the staff I spoke with. Additionally, stakeholder engagement emerges as a key area for intervention for all interviewees, which officials saw as the source of many barriers to implementing parking policy, as well as important opportunities for change.

CTR managers did not utilize this process. Instead, their process focused on monitoring for compliance with laws, marketing to attract more employers to work with them, convincing employers of the benefits of implementing CTR measures, and evaluating outcomes as much as possible. Since this is an outlier compared to the other interview and survey respondents, the CTR results are presented under Finding 6 above.

Additionally, this section of results focuses on projects that impact parking supply, rather than cost. Most interviewees responded to process questions with answers focused on supply of their own accord. It is possible that implementing parking pricing policies does not require as much process. Additionally, the results under Finding 5 indicates that parking pricing was easier to implement for interviewees. Public and political support was easier to come by, and though certainly an analysis process was needed to determine the correct pricing policy, there was not a need for prioritization or analysis of impacts to different street users, as the pricing would only directly impact people parking.

Rather than organizing by findings, as in the goals and strategies section, this section will be organized into the following process categories, with several findings described within each category:

1. Catalyst
2. Curbside management study
3. Impact analysis
4. Stakeholder engagement

These processes are not in temporal order. Each project might proceed differently. For instance, a catalyst for a project might be a stakeholder complaining that there is not enough parking for residents. A curbside manager might take this concern and skip to stakeholder engagement to broaden the conversation and hear from other stakeholders. Then they might consider a specific project to address the concern and conduct an impact analysis on that project to ensure it would be beneficial. In a different example, a city might start with an analysis of utilization of private parking, which identifies a need to reduce minimums. They might then reach out to stakeholders to gain their input on this finding. Then they may take the lessons learned from engagement and add on additional impact analyses based on additional community concerns. Despite not illustrating a specific step-by-step process for parking policy development and implementation, these four categories did emerge as common and important elements of most policy development processes that have an impact on the outcomes of parking.

Catalyst

There were two types of events that would catalyze a parking removal, reduction, or pricing project: an internal analysis or plan identified the need or project, or a stakeholder brought a complaint. Most cities referenced both of these catalysts occurring at different times for various projects.

In many cases, a project came about based on a curbside study, bus, bike, or pedestrian strategic plan, or a private off-street parking study. Typically, these studies would identify street segments best suited for the modal intervention, or would identify a need to amend the zoning code.

"We would look at all the bus transit travel times and see where we either see below average travel times or spots where there's a lot of very specific delay."

"We're trying now to select projects based on a data-driven approach, so that they are not as much of an ad hoc approach. Not where do we as planers just think we need a bus lane or where do we hear from the community that they want a bus lane, but rather where is there the most transit need or the most need from an equity perspective."

"We've been to the zoning committee with a few reports, on the existing code requirements, on planned development districts, downtown parking studies, and on what other cities are doing."

In other cases, stakeholders with some political clout and know-how would complain of a problem or demand a change in their neighborhood or block. Staff would then work with that stakeholder, sometimes broadening their engagement to ensure more stakeholders are represented and the problem is correctly identified.

"Something triggers attention coming to an area. Not necessarily let's do a curbside management look at this corridor, its stakeholder politics. And certain stakeholders aren't well represented necessarily."

"Everybody hated how much parking we have and wanted us to do something about it."

"When you call me to enact some sort of program or policy or something like that, my first question is what problem are we solving."

These quotes illustrate that officials do hear from people on an ad-hoc basis about what they should be implementing for parking policy. Respondents in nearly all cities and positions acknowledged the fact that this ad-hoc process gives a platform to well-organized and well-funded groups and interests, which has significant equity implications. This is a core reason why those who mentioned this phenomenon also expressed that they would like to have a more formalized plan or process to avoid the bias that comes from relying on complaints and connections of a neighborhood or interest group.

However, as the barriers section of these results will show, identifying projects through strategic planning can be challenging as well. Often, those projects that were approved of at the plan-level hit severe roadblocks when officials actually move to implement them. Stakeholders often became much more engaged and opposed to projects once officials started to move from them from general lines on a map in a plan to actual changes to the street. Still, officials felt that using strategic and comprehensive planning to identify projects was the best way to start, rather than relying on complaints.

This result highlights a tension that will be repetitive throughout these results. Parking is a complicated policy tool with widespread effects that are often not salient for individuals experiencing those policies at the individual level. This reality prompts officials to try to use data and educate people on those non-salient impacts of parking, which are often what they are aiming for. Reduced car use, better bus travel times, more affordable housing – these are all city- or even region-wide benefits that are the focus of policymakers, but may not be well understood by one person facing the loss of the parking on their street or more crowding of those spaces due to a development being built with less on-site parking. However, this strategy treads toward technocratic elitism, downplaying the needs and experiences of community members on the ground.

Serving the community is also a main aim of policymakers and planners. On the other hand, engagement and political processes often inequitably favor people with money and political know-how. This tension, between serving the community and convincing the community to approve of policies thought up by professionals, is present throughout the process and barriers sections.

Curbside management study

This process section pertains only to on-street parking. Several types of studies are used to guide private parking regulation, but most of the time zoning professionals did not report using a prioritization system or decision-making framework to organize those studies into policies. Instead, they presented the studies and their recommendations to zoning commissions, which then made the final decisions.

Curbside management studies are a means by which cities create a formalized plan and process for evaluating the use of the curb. Curbside management as a concept, and dedicated plans for it, have gained popularity over the past five or so years. This has in part been a response to the increasing demands on the curb, from TNCs, delivery vehicles, food pick up/drop off vehicles, and even shared bikes and scooters. Seattle and D.C. both have curbside management plans in place. Tables 13 and 14, and Figure 10, show their prioritization frameworks. Dallas is embarking on a parking study next year, which likely will produce a similar output. Chicago is doing a curbside management study for a specific neighborhood in the near future, and plans to then use that study as a template to apply to the rest of the city.

> *"One of the intents of the parking study is that it will help create this sort of curbside management framework that will serve as a more succinct and clear policy guide about these decisions regarding what do with excess curb right of way."*

Table 13. Seattle curbside management frameworks

Function	Definition	Examples of use
Mobility	Moves people and goods	• Sidewalks • Bus or streetcar lanes • Bike lanes • General purpose travel lanes (includes freight) • Right- or left-turn only lanes
Access for people	People arrive at their destination or transfer between different ways of getting around	• Bus or rail stops • Bike parking • Curb bulbs • Passenger load zones • Short-term parking • Taxi zones
Access for commerce	Goods and services reach their customers and markets	• Commercial vehicle load zone • Truck load zone
Activation	Offers vibrant social spaces	• Food trucks • Parklets and streeteries • Public art • Street festivals
Greening	Enhances aesthetics and environmental health	• Plantings, including boulevards, street trees, and planter boxes • Rain gardens and bio-swales

Storage	Provides storage for vehicles or equipment	• Bus layover • Long-term parking • Reserved spaces (e.g., for police or other government use) • Construction

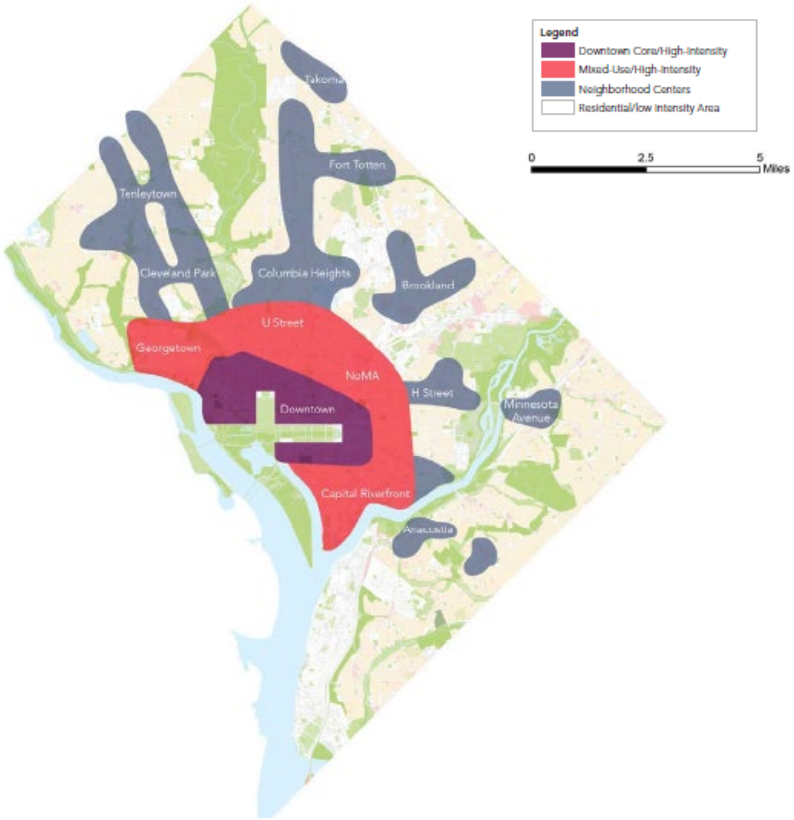
Reproduced from: Seattle Department of Transportation (2020)

Table 14. Seattle prioritization of curbside management functions based on surrounding land use

Priority	Residential	Commercial & mixed use	Industrial
1	Support for modal plan priorities		
2	Access for people	Access for commerce	Access for commerce
3	Access for commerce	Access for people	Access for people
4	Greening	Activation	Storage
5	Storage	Greening	Activation
6	Activation	Storage	Greening

Reproduced from: Seattle Department of Transportation (2020)

Figure 10. Washington D.C. neighborhood typology for curbside management and matrix for parking approaches



Zones	Managed Availability	Resident Protection	Equitable Access	Local Amenity Support
Downtown Core	X			
High-Intensity	X			
Neighborhood Commercial (established)	X			X
Neighborhood Commercial (emerging)			X	X
Residential Low-Intensity (high-demand)	X	X		
Residential Low-Intensity (low-demand)		X	X	

Reproduced from: Nelson/Nygaard (2014)

As illustrated in these figures, curbside management studies provide a formalized framework to guide prioritizations and analysis of trade-offs. They utilize neighborhood typologies to combine the land use and transportation context harmoniously, and they consider the needs of different modes and curb users. They do not provide a definitive answer for what curb use goes where, but they provide a guide.

> *"There may be differences that pose operational or policy challenges between neighborhoods of the same typology that are located in different areas of the city. But it gives me a nice little fence, these are the things that we can do here. It's not to say we can't do something else that doesn't fit the typology, but it's a quick short cut."*

> *"It's a way for us to have discussions with those that work on other modal efforts – what are the fundamental uses of the curb and how do we both integrate modes but also serve those fundamental access needs that have to happen somewhere."*

The curbside management studies also use a data-driven approach. This was seen as a benefit in selecting the most effective and needed projects. This value was often noted by curbside managers, who tend to be the staff that actually use the framework and data to do the analysis and identify the best use for a given segment of curb space.

> *"We started introducing data into our discussions when we were going to communities and they were complaining about, we can't find parking, we can't find parking."*

> *"I think it's helpful for us to take this approach so it's not just anecdotal, there's some data to it."*

Another value respondents' saw in the data-driven approach was its positive effect on communication with the public, and political will. This value was often brought up by complete streets managers, who more often are using the study's framework as a way to convince communities to allow their bus or bike lane projects to proceed. It seems to help dispel some of the emotion that is often present in these conversations, by using orderly frameworks and data. This allows the policy solution to be presented in a more value neutral frame, at least by perception.

> *"The neighborhood might yell at me because it's some important persons parking space that I didn't know about, but really and truly the agency is going to back me up. It's really easy to say, this is downtown, I don't need residential parking, I need mass*

access, I need metered parking, commercial loading. So it helps short cut a lot of those conversations."

"The curb space use hierarchy has been really helpful in our communication."

Overall, the curbside management frameworks provide a foundation for analysis but do not necessarily prescribe an answer for every individual situation. Because of this, complete streets managers generally do not use the framework in their daily work. Instead, they coordinate with curbside managers who use the framework more actively to guide their analysis and decisions.

"It's still very much there, but I think we have trouble translating that into actual projects and actual trade-offs in individual projects."

"It's not prescriptive. It's not if x then y, so it doesn't answer all the questions and it doesn't take the place of the sort of professional evaluation and judgement."

"We definitely coordinate a lot with curb space. We usually a member of that team in our project team. They're pretty involved in the assessment of any capital improvements and impacts, and help develop solutions or mitigation measures."

"I think more what we're doing is trying to consult with the curbside team early in projects."

Curbside managers tend to prioritize commercial and passenger loading in particular over other uses. This was not because they perceive it to be the most important use of the curb, but rather because commercial loading must happen somewhere in order for a business district to function. If a loading zone does not exist, then delivery activity will continue anyway, blocking travel lanes and creating significant traffic and safety concerns.

"We really prioritize loading, both commercial urban goods delivery and passenger pick up and drop off."

"Our internal priorities are making sure that there's loading access, making sure there's access to the curb for pick up and drop off and quick turnover."

I hypothesized that this prioritization would result in conflicts with complete streets managers, who tend to prioritize bus lanes or bike lanes. However, this turned out not to be true at all. Both curbside managers and complete streets managers spoke highly of each other and felt that there was a high degree of cooperation and shared goals between them.

Curbside manager: *"I don't want to be the reason why a bus project can't go forward."*

Curbside manager: *"If we're going to bring a transit lane through, we're going to make that a priority."*

Complete streets manager: *"This is the only load zone within three blocks of this apartment building, and we want people to not have cars, and that means they need their amazon deliveries, they need their grocery deliveries."*

Complete streets manager: *"We all sat down in one room to decide what we are going to do. We both have really compelling cases, and ultimately we decided to stick with the loading zone."*

Complete streets manager (referring to curbside managers): *"I would say by and large we're usually on the same page because they are really supportive of transit and are usually pretty solutions-oriented folks."*

Clearly, interviewees feel that curbside management frameworks and staff are very helpful in making the best decision about use of the curb, and in communicating about that decision with the public. The survey responses indicate that unfortunately, most cities do not have a framework or set of priorities that guide decision-making for use of the curb, as in a curbside management study. 62% of respondents did not feel they had this at their city, though 28% did. Additionally, 37% of respondents felt they had done either a curbside management study or a parking study in the previous 7 years. 50% have not, indicating that studying and planning for parking is not common for suburban and exurban cities.

Curbside management studies appear to be very helpful in both identifying the best use of the curb considering public goals, and in communicating about projects to potential opponents. It also seems that having dedicated curbside management staff is key in the success of this planning work. In Seattle and D.C., those staff are assigned to bus lane or bike lane projects and apply the curbside management framework to help identify the highest and best use of the curb in various segments and times of day. Complete streets staff are unlikely to be able to take the time to work through the curbside analysis on their own, in addition to the other work they do to plan and implement a bus or bike lane project.

Additionally, these responses indicate that curbside managers and complete streets managers have aligned goals. Though their responses did not always identify specific goals they were both working toward, they did mention wanting to improve service quality for non-car alternatives, to allow for the success of businesses, and for some, to reduce car use and ownership. In some contexts, those goals meant that a loading zone would be prioritized, and in others a transit lane would. Although each position might lean toward prioritizing one use of the curb over the other, they are both dedicated to the overarching goals before they are dedicated to a particular use. It is possible that this harmonious coordination is in part due to the curbside management studies, which defined those goals. This indicates that conducting those studies has value in getting staff united behind the same goals, in addition to its' value in guiding decisions and serving as a communication tool.

Lastly, though these plans seem to be helpful in decision making, staff alignment, and communication, I do think it's important that the engagement strategy backing up their application for different parking projects is well thought out. If these frameworks are used only to dispel emotion and convince people to approve of a project that is seen to be best by the technocratic experts, I think officials will miss out on rich and important feedback and insight from the community. Curbside management frameworks should be used as a tool to aid in prioritization, but should not be the final word. They should also not be presented as final or objective. The people who created the framework, and the officials wielding the framework in any given project, will always be imbuing some of their own biases into its utilization. It's important that officials recognize and communicate this, and do not discount the experiences of people on the ground in the process.

Impact analysis

Most interviewees described some type of analysis of how a project would impact various stakeholders. This process was usually used more for on-street parking than for regulating private parking, though zoning professionals did report analyzing impacts on development pro forma, housing affordability, and parking supply. The on-street parking analysis usually includes a number of things, including impacts to bus service or bike level of comfort, pedestrian safety and comfort, car travel time, parking spaces, access for delivery vehicles, and access for people with disabilities. Seattle also looked at social and racial equity impacts.

Washington D.C. is also planning to incorporate equity metrics in their upcoming comprehensive transportation plan.

Despite the fact that curbside management frameworks prioritize non-car uses, severe impacts to driving times and parking were reported to halt projects that were otherwise beneficial, explaining why so many respondents tried to avoid removing parking for any given on-street project.

> *"Often, if we're trying to minimize political blowback, we'll try to pick an alternative – or leadership will advise us to pick an alternative – that minimizes the amount of parking removal."*

This result is borne out through the survey data as well. Parking availability is the top concern for survey respondents when conducting a street re-design or zoning revision that might impact parking. Public transit service is ranked near the end of the priority list, as is social equity. The full list of priorities and the average rankings from all survey respondents is:

1. Parking availability – 4.4
2. Nearby residents' concerns – 4.5
3. ADA compliance – 4.6
4. Nearby businesses' concerns – 4.8
5. Non-motorized transport (biking and walking) safety and convenience – 4.9
6. Passenger loading – 7.2
7. Car travel time or traffic congestion – 7.4
8. Public transit service – 7.5
9. Commercial loading – 7.7
10. Social equity – 8.3
11. Parking revenue – 9.7
12. Other tax revenue – 9.8

It is notable that the two revenue items are at the very end of the priority list. It seems that officials do not see parking as primarily a revenue tool. This could make it easier for cities to remove parking, since it is likely not seen as a huge fiscal impact. However, this also indicates that city officials do not necessarily see parking or curb space as valuable. If it is not valuable, it might be easier to give it away to long-term free car storage, rather than thinking critically about the highest and best use of the space.

Many interview respondents also reported that the data they used for this analysis was often not high quality and did not necessarily highlight the most useful or comparable impacts.

> *"When we look at vehicular speeds, typically we're getting that from Inrix and it's not always the best data for a congested urban environment."*

> *"It's sort of a mix of qualitative and quantitative data. We can get data on transit travel time, but we might have a low/medium/high score on more qualitative impacts."*

Lastly, these two quotes illustrate the prioritization given to localized impacts over network impacts. Even when the data is quantifiable and clear, neighborhoods are prioritized over transit riders and other non-car users passing through the area.

> *"That's another interesting dynamic. You can make investment in one neighborhood, but it benefits somebody who lives in another neighborhood. So we talk about making*

sure if there are impacts on parking that they [local residents] are still seeing some benefit."

"No doubt if it was strictly numbers based, it would have qualified for a 24-hour bus lane. But we have to be contextually sensitive to how the neighborhood functions."

It appears that even when curbside management frameworks prioritize non-car uses of the curb, in practice impacts to cars are highly prioritized in almost all types of neighborhoods. This disconnect between the guiding plans and the actual implementation is concerning, illustrating that simply having a curbside management framework will not immediately result in the prioritization of non-car users. Stakeholder pushback clearly plays a big role in causing this disconnect.

Data has emerged repeatedly as both a challenge and a valuable tool. Getting the right data that highlights the true experience of all users of a space or transportation system appears to be key in both enabling officials to make better decisions about use of the curb, and also in convincing stakeholders and higher-up decision makers of a project's value. Data on its own may not be sufficient to convince people to support a project. Instead, data could be used as supporting evidence in a compelling story that the people who are not immediately supportive of a project will resonate with. However, even with the right data put toward the right story, officials still have an obligation to engage with people impacted by the project. No amount of data can replace the information provided by an on-the-ground expert, and the relationship-building that occurs in that interaction.

The metrics used in these impact analyses are usually local and quantify the things that are easier to quantify. It is difficult to put a number on the value of a bike lane that connects key routes as compared to one that parallels bike infrastructure a couple blocks over. It is also hard to put a number on the value of making space for a bus shelter on a street where the sidewalk is currently too narrow to do so. Alternatively, it is much easier to measure level of service impacts to driving and total number of parking spaces removed in a distinct area. This imbalance in ease of measurement means that the analysis is likely to put greater weight on localized, car-based impacts for which there are compelling numbers as compared to network, non-car impacts which are often more qualitative in nature.

Additionally, it is clear that equity metrics are lacking from this impact analysis in most cities. This might be due to the low prioritization of social equity impacts, as shown by the survey respondents' prioritization. Measuring the demographics of the neighborhood the project is taking place in could help to clarify, for instance, to what extent parking impacts or accessibility for people with disabilities should be prioritized. Additionally, if the demographics of the bus riders who would benefit from a bus lane project were taken into account, this could illuminate an equity benefit of a project that helps build the case to higher-ups that the project is worth any negative impacts to parking.

If different metrics were used, the impact analysis might produce different conclusions about a potential project or design. Reform of these metrics to prioritize network benefits and equity, rather than localized impacts, could be an impactful change to the process. However, the last two quotes in the section illustrate that those metrics have been selected based on political needs to prioritize neighborhood impacts over benefits to transit or bike riders, or delivery vehicles. That political reality may need to shift, using engagement, in order to gain the support needed to change the impact analysis metrics.

Lastly, there is still a tension here between whether officials act as facilitators, helping the community to define their concerns and needs and designing a project based on that, or if they use the data and impact analysis to convince communities to support what they already think is the right policy. Interviewees seemed to be limited in removing parking not by their own proclivity but by the desires of the community.

Interviewees appeared to bend to those desires, playing more of a facilitator in this process. By doing this, however, they end up restricted in their ability to reduce the parking supply or increase its cost. This tension is highlighted further in the stakeholder engagement section below.

Stakeholder engagement

Stakeholder engagement was the most popular topic in my interviews—in the 16 policymaker interviews that I conducted, I received nearly 40 comments on the subject, with at least one from every single interviewee. The academic literature and professional guidance found that public opposition to parking policy is a major barrier. These comments make clear that parking professionals are trying to address this barrier with engagement. However, engagement is challenging to do right, and is one of the biggest barriers to implementing projects that would remove on-street or prevent off-street parking. This section will outline how respondents conduct stakeholder engagement. Barriers related to engagement will be discussed more in depth in the pursuant section.

Interviewees listed any types of stakeholders that they engaged, including: real estate developers, Business Improvement Districts (BIDs), neighborhood associations, the restaurant industry, residents, TNCs, transit agencies, bus riders, individual businesses, environmental groups, hotel associations, apartment associations, night life associations, and regional councils of government. However, the two groups that stood out as most commonly engaged by interviewees, and as being crucial in the engagement process, are business associations and neighborhood associations. Interviewees felt it was important to gain those groups' support in order to see a project implemented. Respondents often felt that those groups' needs and concerns were legitimately important, but also many felt that they have disproportionate power in the engagement process. And importantly, interviewees reported that these groups often opposed projects that removed parking.

Neighborhood and business associations seem to have disproportionate power in part because other groups are often much harder to engage. Other groups, such as public transit riders, cyclists, and pedestrians, tend to be made up of more low-income households, people of color, and people with limited English proficiency. This was mentioned as a challenge in every city.

> *"There are neighborhoods where it has been hard for us to figure out how to engage effectively with different populations for a variety of reasons, like income, language, and other things."*

> *"We don't really hear from the transit riders."*

Complete streets managers tended to engage most directly with the public out of all the roles interviewed. All complete streets managers specifically mentioned that they are trying to improve their engagement to be more inclusive and equitable.

> *"We also partner with community groups, along the theme of not making people come to us, but going to a senior center or community center night where people already are."*

> *"We definitely have been making more of an effort to reach communities that don't traditionally participate as much, with translating materials and having folks, usually consultants, who speak the top three non-English languages in a corridor."*

"That's something we recognize and we're trying harder to get them engaged to make sure they are okay with things."

"Now in our transit corridor projects, we have a community outreach person assigned from the beginning."

Often, respondents spoke of their genuine desire to listen to and serve the needs of the communities they engaged. I would call this the "serving approach," and it reflects the facilitator role mentioned in the impact analysis section. In this approach, respondents are facilitating community conversations about problems and needs, and what solutions fit those needs, based on what the community says.

"We very much have a back and forth with public outreach, because we don't want to pose what see as experts on the neighborhoods, we want to make sure it's an open process."

"We have this whole stakeholder roundup, where we figure out what people have, what they used to have, and what they want. And we work to find out what policy or programming supports the operations that they're looking for."

"I think there's a natural reflex to sort of roll your eyes and say people can't see the forest for the trees and they're kind of getting in their own way. I think that's kind of true to an extent, but I am a public servant and I am reasonably accountable to the will of the people."

"Our chief traffic engineer talked to every single business and had to find solutions for them."

However, sometimes respondents were focused less on listening and responding to community desires, and more on convincing people to support the project they wanted to see implemented. I would call this the "convincing approach" as opposed to the "serving approach."

"There was a lot of time spent going to the neighborhood associations and trying to talk it out."

"We certainly engaged with them proactively because we knew we needed support for where we thought the right direction was."

"There was pushback right, and so we negotiated. We said, okay, we're going to have to keep some requirements, so let's just make it really really easy to request relief from those requirements."

It is worth noting that often respondents described themselves using the convincing approach when they were trying to represent the interests of groups that were not present, like transit riders. Curbside managers actually spoke the most about using the convincing approach. This could be because they use these curbside management frameworks that produce a solution based on an attempt at comprehensively considering the needs of the neighborhood, and all street users. Considering how commonly respondents shared their engagement was not yet effective at reaching marginalized populations, perhaps the convincing approach, rather than bending to the will of the neighborhood, is actually more equitable in this context. However, without those voices adequately represented, the framework for analyzing and prioritizing impacts then becomes particularly important to get right. A different approach (that was reportedly not usually taken)

would be to expend more effort on engaging those under-represented voices instead of expending so much effort on technocratic data and impacts analysis.

Another challenge that pushed interviewees to take the convincing rather than the serving approach was when the project was in line with a previously approved plan. Those plans came with significant engagement and often engaged the very users that would benefit from the project (often transit and bike riders) more holistically than a project-level engagement budget was able to.

> *"So what ends up happening is you'll have a line in the strategic bike plan, and then you have to have another planning study done on whether that was the right line on the map."*

> *"You basically have to ask permission again to update anything."*

In line with the convincing approach, some respondents felt their role in engagement was also to educate the community. This indicates the presence of some technocratic elitism, where the expertise the community has on the subject is deemed less legitimate than what a professional analysis has found. However, many of these comments more so highlighted the challenge of dealing with projects that have both hyper local impacts and large network impacts. Individuals are indeed experts at local impacts, but may not be aware of the impact that a project might have at the network level, or on other people.

> *"The general public does not have the understanding of the issue that I have. We spend a lot of time and energy trying to learn about something, and then explain to the world, the world is not what you think it is. Because the practical impacts on a person's life are what stand out."*

> *"I think the bigger issue is when you interact with the general public about whatever the project is, you have to explain it to people who don't deal with this on a day to day basis. They see it very hyper locally, on their block or at their house or business."*

Lastly, the zoning professionals tend to conduct their engagement more so with committees and representatives rather than open meetings or the general public. Often this was written into laws dictating the public process for changing the zoning code.

> *"We may have dealt some with individual neighborhood groups, but it was more focused on these citywide neighborhood association umbrella groups."*

> *"We are presenting all of this to our zoning advisory committee."*

Though this engagement process also often resulted in committees that tended to disapprove of policies that would reduce the parking supply, interviewees still shared that they were able to make incremental progress that likely will have a reasonably large impact over time.

Despite the efforts of many of the interviewees, stakeholder engagement appears to heavily prioritize the voices and needs of adjacent residents and businesses over that of non-local people like transit riders, pedestrians, cyclists, and even delivery drivers. Additionally, marginalized populations still appear to be under-represented even when they are the adjacent residents and businesses, and definitely when they are the transit riders, cyclists, and delivery drivers. This engagement process clearly needs to continue to be improved upon, and though they appeared to be committed to this, respondents did not seem to have clear answers as to how to do so.

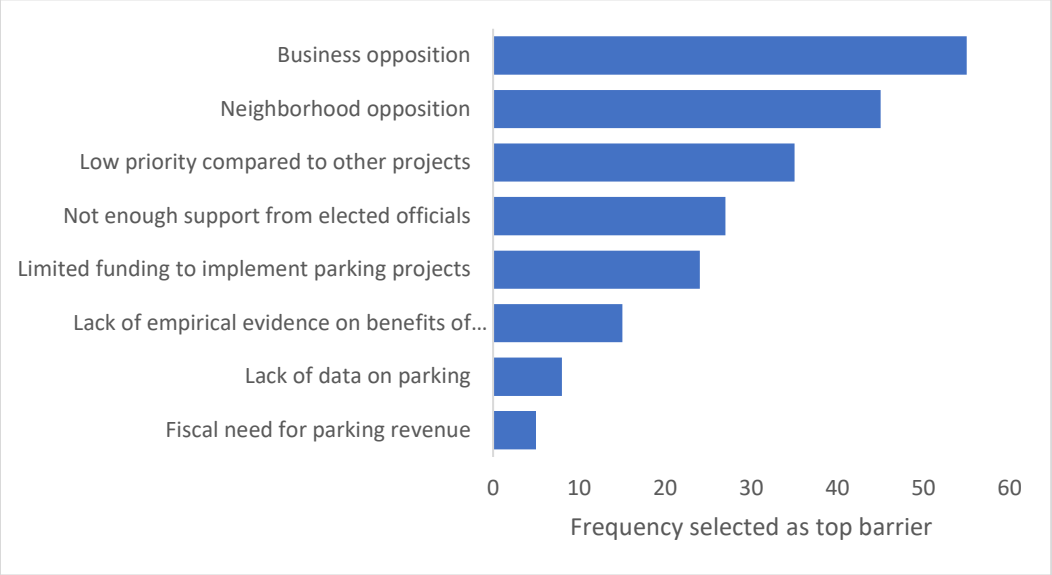
There is a clear tension between the needs and desires found in the stakeholder engagement and the impacts found through data at both the project-level and in broader comprehensive plans. Engagement finds that local residents will bear an unacceptable burden of losing parking spaces, whereas the impact analysis might find that travel times for buses carrying thousands of people would improve significantly, suggesting the parking removal would be worth the cost. Currently, stakeholder engagement and neighborhood impacts appear to be winning out in this battle. It is unclear to what extent this tension between neighborhood and network is inherent and un-solvable, or if it can be lessened by more comprehensive plan-level stakeholder engagement, more comprehensive impact analysis, and more equitable stakeholder engagement. Cities could try to implement these improvements and evaluate whether they enable better outcomes.

4.5.3 Barriers

Nearly all of the discussion around barriers focused on reducing the supply of parking, rather than increasing its cost. Interview responses about increasing cost illustrate that this policy is not particularly unpopular and increases in pricing can often be implemented without repeatedly asking for permission from elected officials, which is likely why this was not the focus of the discussion on barriers.

Survey results in Figure 11 illustrate the top barriers to implementing parking policies. By far the largest barrier reported by interviewees is the resistance of people, particularly nearby residents and businesses, to any loss of parking, but particularly on-street parking. Nearly every interviewee also discussed this barrier, and it spanned all positions and all cities. In addition to nearby residents and businesses opposing parking policy, insufficient data, interviewees also identified the decision-making process for local-level projects, and funding as barriers.

Figure 11. Top barriers to implementing parking policies



Nearby resident and business opposition

Interviewees routinely spoke of the opposition they faced in implementing parking policies. These interview quotes illustrate the strength of emotion these officials were met with when they work with communities on parking:

"Everyone has a personal experience with parking or using the space what used to be parking."

"The community gets up in arms about the loss of parking space."

"Parking is a very emotional topic."

"Anytime there's a hearing on parking, there will be a litany of community witnesses who want to come up there and talk about all the things that are wrong."

"Sometimes we get pushback from businesses that don't want to lose their parking, and sometimes we have given up bike routes along a corridor because of that."

Interviewees also reported a very specific response they have gotten or expect to get from the public when considering removing parking: this project somehow indicates that the government is trying to take their car away from them. This could help to explain some of the emotion behind a loss of parking, as it is perceived as a taking of their personal property, and specifically the property that gives them freedom of movement, and is highly valued, as found in section 2 of this thesis.

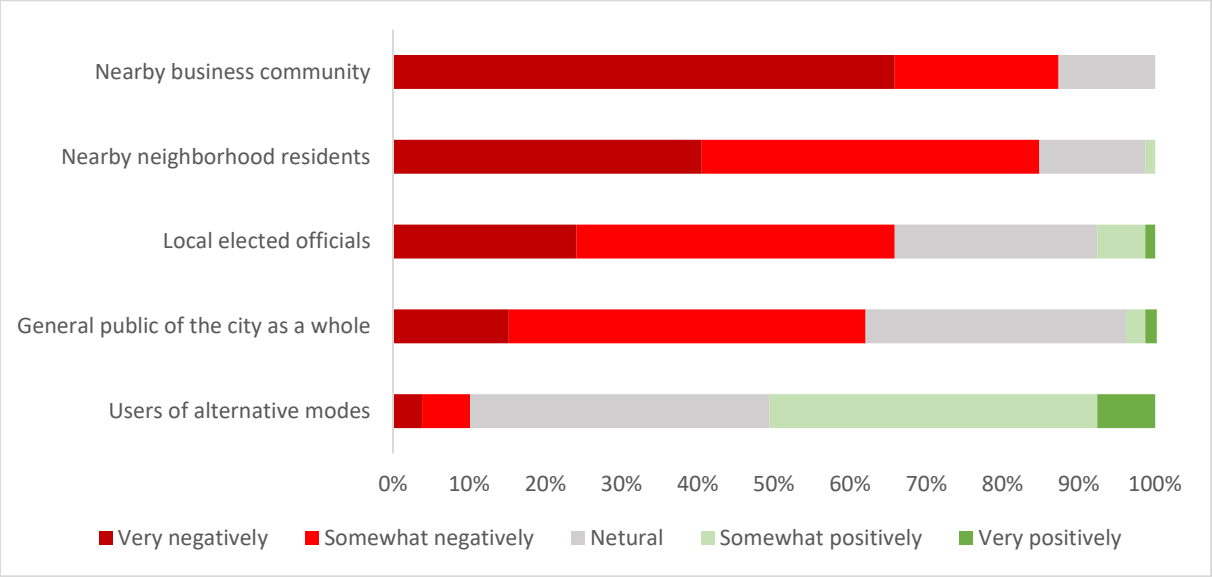
"The perception is that we're getting rid of cars. I don't want this new project because you're taking away my cars."

"The response we would likely get would be you're trying to take my car away from me."

"It means automatically, if I'm not going to be able to park, then you're taking away my car."

When interviewees discussed this public resistance to reducing the parking supply, they often spoke in general terms, referring to the "community." In other portions of the interview they used more specific language to refer to businesses or nearby residents that opposed their projects, sometimes specifically mentioning car owners as the main opponents. Survey results illustrate that these different groups are perceived to have different levels of support for removing parking (Figure 12).

Figure 12. Stakeholder perceptions of removing parking



However, when reporting this resistance as a barrier to their work, it is notable that interviewees revert to the broad term of community. This indicates that for the purposes of implementing a project, or getting a policy approved by elected officials, this specific subset of the community, nearby residents and businesses that see removing parking as negative, matters far more than the non-car users. Similarly, survey respondents felt that the general public overall feels very negatively toward removing parking, despite users of alternative modes feeling positively overall. Clearly, those users carry less weight than car users. Nearby businesses and residents as a group tend to be vocal, show up to community meetings, and often have more know-how as to how to fight these projects and policies and access their elected officials. They are also the group that tends to be prioritized outright for on-street projects, as shown in the stakeholder engagement section.

There are several different angles to approach the problem of public resistance to reducing parking. One method is to consider the political strengths of opponents and supporters of parking policies. The content of the arguments used to try to convince people to support the policies is another point of leverage. And lastly, the process that projects and policies must go through in order to be implemented could be an area for intervention.

This opposition by a powerful portion of the community translates into political power that convinces elected officials to also oppose parking policies, which several interviewees mentioned as a barrier to their work.

> *"The letters that go to councilmembers, that has influenced things. The councilmembers get to our directors, and a project that was going full speed ahead one day can be halted the next based on the outcry from the public."*

> *"A lot of our elected officials are reluctant to stick out their necks on an issue like this. There's not a lot of upside to them."*

> *"There are populations and communities that are really good at figuring out how to get access to decision makers."*

> *"Political will is something we could use more of. Political will to make those hard trade-offs which is typically to remove parking, and making people mad."*

The power model of governance points to the impact of the nature of the people in power, and their permeability, on outcomes (Kirlin and Erie 1972. In this case, it appears that elected officials are mostly just permeable to those who have know-how and connections, and are able to show up at community meetings and write letters. In order for projects removing parking to gain support from elected officials, large numbers of people, or people with better access to decision-makers, need to emerge as vocal supporters. As with many issues in government, the minority that strongly oppose something are often more convincing than the majority that feel somewhere between neutral and positively about it. Almost no interviewees mentioned that advocates or any portion of the community were actively advocating *for* projects that remove parking. This likely is still happening, but considering that interviewees did not perceive it to be an important feature to mention, it appears to be on a smaller and less politically powerful scale than the opposition. Changing this balance of voices in the ears of elected officials is one way that the barrier of public resistance to parking could be addressed.

A different angle to take on the community resistance to loss of parking is to convince the naysayers to shift their allegiance toward supporting parking policies. This strategy requires examining the arguments that officials use to convince people to support these projects. Several interviewees reported they find it difficult to make an argument that resonates with car owners and users, and their elected officials.

> *"We're trying to tell mostly drivers how important it is to reduce the bus travel time by ten, fifteen percent over these critical blocks for these thousands of people you don't know."*

> *"We're trying to make that relatable but I think we're still trying to work on how to message that so it relates to people and most importantly so it relates to decision makers."*

Interviewees did share they had some success with convincing would-be opponents to support a project by communicating clearly, using data, and illustrating a robust process that analyzes costs and benefits.

> *"They may not like the message, but I try to be as clear as possible as to why we're doing what we're doing and see how they reply."*

> *"I think if you take the time to explain whatever the regulation is, you might get some feedback that is very helpful and you can neutralize a lot of objections, because people simply don't understand."*

> *"It's always good to be able to visualize it and help the public understand that we're not making these decisions in a vacuum or making them willy nilly, but that these decisions are based on some in-depth analysis."*

> *"If you can show evidence and demonstrate the quality of data, it changes the way people perceive it."*

Another strategy that came up was to engage people directly in the collection and analysis of data. This approach removes some of the technocratic elitism present in the strategy of using data to better educate people as to why a parking policy is being pursued and what impacts it will truly have. Instead, this method

allows the community to decide what data and metrics will help them to clarify the problem they are experiencing, and identify solutions.

> *"We actually took the opportunity to include them in the research and the data gathering in these communities. Giving them the opportunity to engage with that data helped them to rethink their goals and their actual requests and desires for the parking interventions or parking policy changes in their area."*

> *"The business association commissioned a parking study maybe five years ago which found that the increased turnover from parking meters would benefit the businesses, so there was a lot of support for it."*

Another strategy that interviewees used to neutralize opposition is a design solution: time-managed curb uses. This design feature was often used as a compromise. For instance, the curb would be used as a bus lane during peak times when the most buses and passengers are passing through, and as a parking lane in the evenings when people want to park to go to businesses or their homes. This was seen as an initial step that could turn into a full bus lane in the future.

> *"For a couple different bus lanes, we have proposed hours of operation that align with where there's rush hour parking restrictions on the streets. It allows us to get a bunch of red paint down without removing parking as an initial step, and then later we might come in."*

> *"We're not proposing full-time bus lanes because we currently have parking for small businesses and we don't think taking away parking all day will be feasible. So we're proposing peak hour peak direction bus lanes initially, and then we'll look for future opportunities to expand the hours of operation."*

All of these strategies would likely have a positive impact on reducing public resistance to reducing the parking supply. However, all of these strategies also require funding, and staff time. Cities that have implemented these various strategies should evaluate and share their findings on how impactful these strategies are compared to their cost, even if those evaluations are more anecdotal and less based on data.

Additionally, data appears to be a potential way to achieve better outcomes. However, there is a risk that technocratic expertise might become overly valued as compared to on-the-ground experiences. Qualitative data and survey data should be well-integrated into all efforts to analyze impacts and needs. Enabling the community to lead the process of data gathering and analysis is another way to ensure their perspective is valued and centered.

Insufficient data

Although many interviewees mentioned using data to better argue for implementing policies and projects reducing the parking supply, many interviewees also brought up the lack of good available data as a barrier to using this strategy. Without the data to form strong arguments, those arguments are bound to be unconvincing as well as incomplete or inaccurate.

> *"There's an expectation that because we've done that analysis, we can just spit something out really quickly. No, it takes time, and it's expensive."*

"My first question was how many parking spaces do we have for each resident. We don't have that overall city data."

"Some industries, like Uber, are very protective of their data."

Of the cities interviewed, only Seattle has a fairly complete database of the designated uses of all of their curbs. Even in Seattle, there still is not a comprehensive count of free on-street parking for the entire city. As noted in the quote above, data is expensive and time-consuming. Seattle has ensured that there is always funding for curb and parking data gathering and analysis by codifying this into the municipal code and budget, so they do not have to get permission from city council every year. This undoubtedly contributes to their more comprehensive data. It may also contribute to their success in implementing projects that remove parking, though it would be difficult to determine the isolated impact of this feature.

Decision-making process for local-level projects

The process by which localized projects move forward is also seen as a barrier.

Zoning professionals were generally able to do a comprehensive, city-wide examination of the zoning code to adjust parking regulations. While they still mentioned challenges from industry groups and community groups who were concerned about reducing the parking supply too far and causing spillover effects in neighborhoods around new developments, they generally appeared to face less resistance with zoning policies than on-street parking projects faced. The survey responses also provide evidence that regulation of private developments may be easier to implement, despite the negative perception of stakeholders on reducing the parking supply. The majority of survey respondents have either already decreased, or are considering decreasing, minimum parking requirements through the zoning code. This was the most commonly implemented parking policy. There are several potential reasons this is more common. It could be in part due to the engagement process focusing on committees and engaging the public to a lesser extent. However, it is likely also because of the diffuse, non-local, and gradual nature of the impact of these policies, rather than the hyper local impact of removing specific on-street spaces. Lastly, this policy reduces what will be built, rather than takes away what has already been built. Since people tend to be loss averse, preventing parking that doesn't already exist will likely face less opposition. Still, the process by which zoning requirements for parking are changed could provide some insight into better ways to implement public parking policies.

On-street parking projects usually have to be implemented using a localized impact analysis and engagement process, even if those projects were identified by a city-wide plan. Interviewees shared that they were often doing engagement and decision-making about the same streets multiple times. Strategic or city-level plans could designate a set of blocks for a bus lane, but design and implementation of that project would still have to go through another engagement and approval process. That project-level process is where neighborhoods would start to influence the project design and location, despite what the original plan might have recommended.

"You'll have a line in the strategic plan and then you have to have another planning study done on whether that was the right line on the map."

"You basically have to ask permission to update anything."

"Our strategic bike plan had one street on the map, and then one of the neighborhood associations in the study area suggested we do a different street since it was more commercial and we wouldn't have to remove as much residential parking. The

original street was the obvious choice because it's the only one that connects all the way north and south. But we ultimately went with the street the neighborhood association suggested, and we have to do a jog over."

Unfortunately, interviewees did not see a way out of this process conundrum.

"The question everyone is grappling with is how we do make our city-level plan have teeth. Because we seem to lack the political will to actually move forward with the lines on the map."

Plans generally do not have teeth because funding is dedicated on a project-by-project basis, rather than for implementation of an entire plan. Additionally, it can be difficult to engage every neighborhood in-depth on a planning document, as many people do not see the point in participating in defining projects that are likely to change in actual implementation, and unlikely to be implemented for years to come. Because of this, additional engagement is needed when projects are being implemented to consult with the surrounding community and make sure everyone that did not participate in the larger planning process has their voice heard.

Limited and uncertain funding

Funding is the final barrier that nearly all interviewees mentioned, often as an obvious problem inherent to working in the public sector. Interviewees mentioned lack of funds overall, but also the challenges of assembling funding from many different sources with bureaucratic requirements that slow implementation. This likely contributes to peoples' wariness of participating in planning processes, since they know the projects would not get implemented for years, if at all. This assemblage of resources also means that funding can be volatile and uncertain, a challenge for staff trying to be accountable to communities and do things like evaluation and data analysis that may not be part of a baseline budget.

"I would be remiss if I didn't say budget."

"We rely pretty heavily on outside funding. We seek funding from state grants, federal grants administered through our MPO, and big federal grants. It takes time to seek that funding, secure it, administer it."

"The volatility of our funding sources in Washington is a barrier"

"Resources, they come and they go."

"We don't have the resources lined up to do the evaluation we've talked about."

Respondents did not provide many solutions to the funding problem, though section 4.4.3 suggests that there is growing interest in identifying additional sources of revenue from the use of public on-street parking, through things like charging for TNCs' use of the curb, or for commercial pick up and drop off.

The root barrier to implementing parking policies appears to be the resistance of nearby residents and businesses to any reduction in the parking supply. The current political system and processes favor the concerns of these residents over others. Changing those processes would be the ideal way to shift the balance so that other stakeholders, particularly those that stand to benefit from the reduction in parking, can have more weight. Changes in process could also serve to reduce the opposition by giving more teeth to city-wide plans designating a network of streets for bus or bike lanes, which tend to draw less ire from nearby residents than when the projects are presented alone. However, process changes are the most

difficult to implement since they tend to require laws being changed by city council, who might face political pressure from those same opponents not to change the system. Another option is to try to match or exceed the political power of these groups by organizing constituents and advocacy groups that are in favor of policies and projects that reduce the parking supply, such as groups advocating for transit riders, bike riders, pedestrians, delivery drivers, and social equity. Lastly, government officials could work on improving their argument to convince opponents to support these types of projects. This may require more funding for data. Centering and empowering communities to lead the process of gathering and analyzing data is key to ensure their perspective is not lost or replaced with technocratic expertise that may or may not be able to understand the true experiences of people on the ground.

4.5.4 The impact of COVID-19

Every interviewee was asked about their perception of COVID-19, and the long-term impact it might have on their work as it relates to parking. Most interviewees felt a healthy degree of uncertainty as to the impacts.

Several did predict that some stakeholders might have a more permanent change in mindset about use of the curb, particularly considering the increase in need for PUDO zones for restaurant take-out, and outdoor dining space. Interestingly, all of these comments came from interviewees in Washington D.C. and Dallas, two very different cities for use of the curb. Pre-pandemic, D.C. had implemented far more PUDO zones and parklet programming as compared to Dallas.

> *"My opinion is that business and commercial needs have shifted and it's not going to come back the way it was."*

> *"All of our behaviors have changed as a result of this pandemic. There will be an expectation that there is cleared space for me to go pick up, not only for delivery companies, but also for citizens."*

> *"Now maybe we can get more public support."*

Dallas and D.C. staff also both felt that the pandemic was pushing them and their higher-ups to consider how to gather revenue from non-parking uses of the curb.

> *"We have to start thinking about our revenue a little more now and being strategic about where we collect revenue."*

> *"There are different ways of collecting revenue that are not just from vehicle storage, but maybe from curbside access and things like that. Where it was scary at first, now it is an opportunity."*

These interviews were all conducted during the month of October, so the weather had not yet turned cold, and no reports of a vaccine had been released at that time. The fact that some staff were hopeful that the new pandemic-induced uses of the curb have permanently shifted perception is encouraging. When discussing stakeholder engagement, interviewees mentioned the challenge of getting people to envision a future condition. This pandemic has caused officials to rapidly build some of those conditions right before our eyes, as parking spaces were whisked away and replaced with parklets in a matter of weeks. Business opposition was the top barrier for survey respondents to projects that remove parking. Perhaps seeing these new uses of the curb and the positive impact they have on businesses could help with public opinion on removing parking.

This finding also illustrates the value in pilot and pop-up projects, an increasingly popular strategy particularly for less traditional street and public space designs. These projects tend to draw less opposition since they are temporary, and they can even be timed so as to create the most optimal image of the project, such as installing parklets in a business district only on evenings and weekends when people are most likely to be using them, and when traffic is less.

4.6 Discussion

This section built off of findings from sections 2 and 3 where I concluded that parking policy could be a viable mechanism by which to reduce car ownership and use. By honing in on in-depth interviews and quantifiable survey respondents, I was able to make more nuanced findings about how parking policy is currently being utilized by parking professionals in the Washington D.C., Dallas, Chicago, and Seattle metro areas. These findings help to illuminate how city officials are trying to use parking policy, which I find is not very focused on reducing car use and ownership despite findings from the literature, and from sections 2 and 3 that highlight the potential for parking policy to accomplish those goals. Understanding the mindset of the officials, and the concerns they hear from residents and businesses, clarifies that this is due in large part to people's resistance to removing parking or increasing its cost. Understanding the process by which parking officials make decisions about parking policy helps to identify ways those decisions could be made differently to better accomplish the goals of reducing car ownership and use, but also improving social equity and responding better to the concerns of people and businesses. Lastly, officials shared the barriers they already know they are facing that hinder implementation of otherwise positively impactful policies. These findings, alongside the understanding of how people value and use the private car, illuminate what is not working well for parking officials. The next section will present potential solutions to some of these barriers in the form of policy recommendations.

5. Policy recommendations

From the results in sections 2, 3, and 4, I have identified a number of policy recommendations. These are aimed at enabling city governments to better use parking policy to reduce car use and ownership, as well as improve social equity.

The framing of these policy recommendations is my subjective desire to reduce car ownership and use in U.S. cities. Though this desire is held by many, and there is significant evidence as to why these outcomes would be beneficial for many, it is important to recognize that these are not objective recommendations. Readers might disagree with my singular focus on reducing car ownership and use, and through the analysis process of this thesis, I myself discover that a coordinated focus on improving social equity is really vital to ensure that lasting, equitable benefits come from this work.

I also want to acknowledge that I am a young, white, highly educated, middle class, urban, straight cis-gendered female, who does not currently own a car (though I have in the past – I do have some personal experience dealing with parking as both a driver and passenger). I undoubtedly have written a different thesis on this topic with different policy recommendations than someone with a different mix of identities would have written. I am also certainly biased toward policies that make it more difficult to own and use a car, and make it easier and more attractive to use non-car alternatives. These results also reflect my identity as an urban resident in that I spend much of section 4 on the results of interviews with officials in large urban cities, only supporting and supplementing those findings with the survey results from suburban and exurban municipalities. This choice was aldo intentional, because parking policy is often led by principal cities, and many suburban municipalities simply do not have the parking demand, traffic congestion, or quality non-car alternatives to warrant parking policy action. However, these cities are still very much an audience for my results and policy recommendations, and I have attempted to make them applicable to many different types of municipalities and contexts. For all of these reasons that produce biases in this thesis, I have focused significant space on the importance of not taking my word for it, and instead conducting deep, relationship-building engagement with people that are impacted by this work, particularly the marginalized groups that have not historically been heard or included.

The policy recommendations are organized into sections for: 1) goals and metrics, 2) shift power, 3) tried and true, and 4) change the context. Many of these are adapted and expanded from ideas presented directly by interviewees and survey respondents.

5.1 Goals and metrics

Goals that guide policy-making about parking have a significant impact on eventual outcomes. I found that policymakers are not focusing on reducing car ownership, or disincentivizing cars, using parking policy. Instead, pricing and supply both seem to be used to achieve efficient use of space, safety, and reduced traffic congestion. Aiming more directly at car ownership, as well as at social equity, will guide policymakers in decisions that produce a more sustainable and equitable mobility system, rather than simply an efficient one that still prioritizes cars.

Recommendation 1: Include, but reframe, the goal to reduce car ownership

All interviewees felt reducing car ownership would not be perceived positively as an official goal, and almost no survey respondents said their city held this as a goal either. Section 2 proved that people value their cars very highly. This is true in part because most Americans do not have access to quality non-car alternatives that they can reliably use to replace all trips they make by car. Any suggestion that the government wants them to give up ownership of that highly valued possession, without adequate

alternatives, is unlikely to go over well. This is especially true because people seem to perceive the stated goal to reduce car ownership as an individual mandate, rather than as a responsibility of government and policy.

However, reducing car ownership is still an important component of transitioning to a more sustainable and equitable mobility system. The academic literature has found a clear link between car ownership and higher car use. Car ownership takes up significant amounts of space in cities, reducing density and thus viability of non-car modes of travel, and also reducing the supply of usable space for other uses, like housing. Car ownership also represents a disproportionate cost burden on people with low income. The goal to reduce car ownership is still worth pursuing, but it must be reframed to clarify that the responsibility to accomplish this goal is entirely only the government, not on individuals. Specifically, cities could have an official goal along the lines of "make it possible for people to not own a car." This phrasing more directly addresses the need to make changes that enable reduced car ownership. Car ownership levels should still be a metric used to evaluate progress toward this goal, alongside intermediate goals more related to government action such as comparing accessibility metrics for car and transit. The subject of the command is the government itself, rather than the public, and should generate a more positive response because of this. Additionally, although I think cities should still work to disincentivize cars in parts of their city that are already well-served by non-car alternatives, I think the regional nature of American cities means that the emphasis to achieve this goal still needs to be on improving alternatives. It is unfair to expect people to change their behavior based on disincentives if there are no viable options to turn to.

Recommendation 2: Add social equity goals to parking policy and incorporate equity metrics into decision-making framework and impact analysis to produce more equitable, and likely less car-oriented, outcomes

Social equity was very low on the ranking of goals for survey respondents, and was not a big focus in the interviews either. I think there is an opportunity to center social equity as a goal of parking policymaking. These results have shown that without centering equity, inequitable results are likely to follow. In addition to ensuring more equitable outcomes, however, I think most of the time having equity as a goal will also produce outcomes that favor non-car users. Low income households and people of color tend to own and use cars at much lower rates, and use non-car alternatives far more. Policies centering their needs will thus also often center the needs of non-car users.

Social equity goals also must be backed up with metrics to ensure policies and projects actually produce outcomes in line with those goals. Interviewees from Seattle mentioned using their Racial Equity Toolkit to analyze the equity impact of projects that remove on-street parking. This is a great example for other cities to follow, though others can also incorporate equity metrics more directly into the impact analysis process, rather than as a subsequent step. The demographics of the surrounding neighborhood as well as the demographics of users of the street could be measured to understand how the distribution of costs and benefits are falling on different groups of people. This means that analyses of transit routes that connect low income, low car ownership neighborhoods to business centers through a wealthy neighborhood should be considering the benefit that would accrue for the people that are riding the bus, boosting the equity score.

However, when projects are being implemented in a neighborhood with low transit access, and a high proportion of marginalized populations, it is possible that this equity analysis might mean that bus lane, bike lane, or widened sidewalk projects that remove parking would not move forward. In some of those cases, removing parking might actually strand vulnerable people without a viable non-car alternative. They may then be at higher risk for fines and interaction with the police due to enforcement of bus lanes or removed parking. I believe these equity impacts are important enough to be included in the impact analysis,

even if they sometimes mean that a project with benefits to non-car alternatives or to disincentivizing car use does not move forward.

The following are examples of equity metrics that could be incorporated into this decision-making process, though each city should work directly with their community and advocacy groups to identify the best metrics for them:

- Impacts to housing affordability
- Demographics of bus riders, bike riders, pedestrians, and other non-car users
    - Alongside metrics for changes to level of service and comfort for those users
- Demographics of surrounding neighborhood residents and business owners
    - Consider the number of elderly or disabled people, and children, in particular
- Likely increases in policing from the project (i.e. if police will enforce a bus lane or parking changes)
- Changes in air quality or likely traffic collisions due to changes in vehicle miles travelled or street design
- Likely changes in small business revenue
- Predicted revenue impacts, which can be used for transit and other improvements

The needs and benefits for marginalized populations should not only be incorporated into the impact analysis, they should also be prioritized in the decision-making framework. Another way to implement this prioritization could be through geography. For instance, Chicago has the INVEST South/West initiative, which prioritizes investments in certain neighborhoods that have been disinvested historically (City of Chicago, 2020). This could be applied to parking policies to ensure that bus lanes, bike lanes, and other parking policies, as long as they benefit those neighborhoods, would be prioritized there. Additionally, bus routes that might go through wealthier neighborhoods but serve people that are predominantly coming from an INVEST South/West neighborhood could also be prioritized, and the benefits that would accrue to those neighborhoods could be weighted higher than negative impacts to the neighbors adjacent to the project. An interviewee also shared that Chicago is working on an amendment to their equitable TOD overlay, which will reduce parking requirements but will also require more affordable housing in new developments. Policies like this accomplish both goals of disincentivizing driving and providing needed affordable housing, and could be considered in other cities.

Commuter benefits policies should be analyzed for their equity impacts as well. Often these laws are targeted toward white collar workers. Instead, these laws could be redesigned to apply to temporary workers, hourly workers, and others that are not currently included. People that work at diffuse worksites for a large company, like fast food locations for instance, should be included in the commuter benefits programs that are offered to employees at fast food company's headquarters.

Recommendation 3: De-prioritize parking and re-design impact analysis metrics for parking to consider the capacity of the surrounding parking supply

I do not think it is yet politically feasible for cities to state a goal to use parking policies to disincentivize cars – to remove parking or increase its cost for the sake of making it more costly and difficult to park. However, I think the needs of people trying to park their car should be deprioritized as compared to other goals for parking policy. Car storage is prioritized last in Seattle's curbside management framework, for instance. More cities could consider creating these prioritization frameworks which de-prioritize car and parking needs. Political reasons may emerge that overrule that framework, but interviewees felt having it

in place was still helpful for many projects. Additionally, the prioritization of car needs should be gradually deprioritized over time, as non-car alternatives are improved.

In section 4, interviewees reported that parking impacts are measured simply as the total number of spaces removed for a given project. Some interviewees and survey respondents mentioned that they are trying to present these impacts within the context of the parking supply near the project, to illustrate that people will likely still be able to park even if those particular spaces are removed. This could be formalized into the impact analysis process, by measuring the number of spaces removed that could not be absorbed by the parking supply within a 5-minute walk. The parking utilization within that 5-minute walk should be studied on any project that removes parking, and the metric should be based on some point near the peak utilization, but not at the peak. At peak utilization, people are likely willing to walk a little further. However, accessible spaces should be analyzed separately to ensure ADA compliance of a project. This is actually similar to how parking supply impacts are analyzed for zoning changes. Rather than simply predicting the number of spaces that would be prevented, parking studies analyze the current supply of parking in a city and its utilization as a basis for whether reduced parking requirements will lead to an undersupply of parking, or if spaces can be absorbed by the oversupply that exists (which is true most of the time).

5.2 Shift power

Many of the barriers found in the interviews and survey have to do with certain stakeholders having the power to stop projects that may have negative side effects for them, but have large benefits for others or for the city as a whole. These recommendations are ways to shift some power back toward people who do not currently have it. It's a difficult line to walk. Listening to the community is still vital, and I do not think that engagement should become a smaller part of the policy process. However, these recommendations provide some possible reforms that will help ensure that all the people who are impacted by the policy are heard more equitably, rather than just a powerful or wealthy few.

Recommendation 4: Change the decision-making structure to reduce the power of district-level politicians

Some of the resistance to reducing the parking supply and increasing its cost comes from elected officials who represent specific districts of their city. When powerful residents or businesses in their district complain about a project or policy, elected officials are incentivized to stop or alter that project to appease their constituents in order to win re-election. This was cited as a barrier by interviewees and survey respondents. Changing this political system could help to reduce the inequitable power that some people hold compared to others who might benefit from the project. The following options all involve bringing the decision-making power for these projects up to a higher jurisdictional level, including city-level or state-level, or placing that power in the hands of an administrative official.

One option is to change some or all council seats to go to city-wide representatives. Portland, Oregon has a couple of city-wide elected officials like this. Though they certainly still face challenges in implementing parking polices and projects, Portland is known for having a very robust network of bike lanes which necessarily take road space that often took the place of parking. Academic literature has found mixed results on the impact of district compared to city-wide elections on diversity of elected officials, indicating more research should be done before implementing this policy (Trounstine and Valdini, 2008). I acknowledge that this is a change that would require a high level of political will and effort, and is unlikely to take place in most cities. I do think it is worth exploring, particularly in places that have already been contemplating a change to council structure.

Cities also have varying processes for project approval when parking is removed or a street is redesigned – not all cities require projects go through city council directly. Although councilors still have political

leverage no matter what the process is, the nature of the project approval process can still help to reduce the politicization of the decision. In my interview with Kate Elliot, a Senior Program Manager with the National Association of City Transportation Officials (NACTO), she shared some examples of cities where approval processes are more removed from politics. In Seattle, transportation projects do not have to go through city council approval. Most projects are simply signed off by the City Traffic Engineer. The Mayor still has the power to stop a project, and of course councilors still can leverage their power by pressuring the Engineer or Mayor, but overall this process reduces the influence of politics in transportation decisions. In San Francisco, a Transportation Board appointed by the Board of Supervisors approves any changes to parking. While these appointees could certainly feel pressure from various Supervisors on a given decision, the Board is nonetheless a step removed from the decision. Elliott (2020) felt that the more administrative the approval process, the better. These projects have already been vetted through robust community engagement, and involving elected officials can often serve to amplify the voices of the more wealthy and powerful in a city, demolishing any effort to hear from more marginalized people through engagement. Changes to the approval process for street and parking projects could be helpful in reducing the power and influence of elected officials and the political goals they serve, over parking policies and projects.

Another option for a structural change is to pass laws at the state level. For example, the City of Seattle is governed by the State of Washington's commute trip reduction law. The law requires all employers in the state to implement specific commute trip reduction measures, including charging market-rate for parking. Though state-level policies regarding parking have thus far focused on commuter benefits, states could consider implementing other types of laws controlling parking. California has been attempting to pre-empt local zoning powers as well by requiring cities to allow higher densities and affordable housing near high frequency transit, though they have not yet been successful (Canon, 2020). Similar laws could be passed to pre-empt high minimum parking requirements, or impose maximum parking requirements.

Lastly, a law could be passed at the state or city level that would give more teeth to the city-wide plans that are created. This could simply codify a requirement that street designs that are included in the broader plan are implemented as planned, unless unforeseen circumstances make their implementation have very severe impacts to the neighborhood or street users. I am unaware of a law of this type being implemented anywhere in the United States as of yet, but it would serve to give teeth to plans that considers network benefits, rather than just local impacts. It could also decrease the amount of time it takes a city to implement a plan.

These changes do run the risk of decreasing the amount of influence that individual constituents have in a decision about parking. District-level elected officials do listen to people on the ground, and while this tends to favor those with more power and money, it does still provide an avenue for people to have their voices heard by a powerful person who is incentivized to listen to them. It is vital that in designing these changes, community engagement at the staff level is funded and strengthened. Laws requiring certain levels of community engagement, such as a minimum percentage of community members engaged, or a number of engagement events at each level of project design, could help to codify community engagement. Additionally, these structural changes should mostly apply to things like project approval for projects that are already part of a larger plan that gets approved by elected officials who must engage with their constituents.

Many of these options are also difficult to implement. I know of no state laws on the books that preempt local parking requirements. It is very difficult to implement changes to city council structures and approval processes as well, and also happens quite rarely. State-level commuter benefits laws may be the most feasible option of these. However, there appears to be an increasing recognition of the flaws of the strongly localized power of planning. States have been increasingly considering pre-empting single-family zoning and other exclusionary zoning laws. Parking requirements could be wrapped up into this movement with

some advocacy work and thoughtful policy design. Additionally, some elected officials might be interested in reducing their role in parking policy approvals, as it would take some blame off of them when constituents are unhappy with a decision – they can blame it on the City Traffic Engineer or Mayor. Cities should consider where the pain points are for their own city when implementing parking policies, and where there might be the best opportunity for structural change.

Recommendation 5: Ask the community to define the metrics and share their stories.

The interview results in section 4 revealed two related findings: 1) that parking data and metrics are almost always defined by transportation experts, and that 2) these metrics are not very effective at convincing most people to support parking policies that reduce the parking supply. Section 2 also revealed that there is much more to understand in what aspects of owning and using a car are valuable to people. Clearly, cities need to engage more with communities to understand what transportation and parking policies will be most effective at reducing car use and ownership, without unfairly leaving people with no viable transportation options.

Cities should consider working directly with communities to define the metrics that best measure what communities are concerned about, and even to collect and analyze the data. By centering the community in this vital part of the decision-making process for parking policies, cities can build trust, gain vital understanding of what project goals should be, and how to best design the project to accomplish those goals. The "community" here must also be better defined – this must include *all* of the people impacted by a parking policy. Transit riders should be asked what makes their ride better, and what they care about. Cyclists should be asked what makes them feel safe or unsafe on their ride. Businesses should be asked what enables their success. Residents should be asked what they care about for their street and neighborhood. Lastly, planners need to take in all of these concerns and facilitate a conversation on how to best measure these impacts, identify the goals of a policy, and eventually assemble these findings into the design of a policy solution.

In D.C., respondents shared one project they worked on where city staff invited the resident and business community in a neighborhood to participate in the data collection and analysis. This was seen as a generally positive experience because the community bought into the results of the analysis and the design of the policy solution. They also re-oriented their own policy goals based on the experience, resulting in their support for a less car-oriented solution. I think this example is one to follow.

Businesses are also a particular opportunity here, as research has often found that they benefit from the implementation of things like bike lanes and widened sidewalks. However, businesses are often resistant to removing parking spaces because they see those as customers who will no longer come to their business. There is a clear disconnect in the technocratic-defined metrics and messaging, and the experience of being a business owner on the ground. The City of Seattle conducts regular Neighborhood Business District Intercept Surveys where they work directly with business associations to understand how to make changes to improve both transportation outcomes and business outcomes. They analyze how people are accessing a business district, how much money they spend, how frequently they come, and where they park if they drove. These surveys can help to tell the story to businesses that usually a huge proportion of customers are not drivers at all, and actually might visit the district more if there was a bike lane, widened sidewalk, pick up/drop off zone, or bus lane. These types of surveys could be done relatively cheaply using interns or partnering with universities. By engaging the business districts in this work, officials can build trust in the results, and know better what questions to ask to gain information that is relevant to the businesses.

A large portion of a planner's job in this process will be to identify ways to actually measure what people and businesses are interested in measuring, without huge expense. Though this task will require creative problem solving unique to each situation, there are some ideas being put into place already to measure what happens on streets more effectively. Seattle is using video cameras to analyze conditions near Amazon, where many different curb and street users converge (Elliott, 2020). They want to better manage that area to improve safety, especially for cyclists and pedestrians. With video footage that allows them to see exactly who is using the curb, when, and where conflicts are, they can design a better solution *and* they can better understand how a solution might impact every user of the street.

Many of the interviewees talked about trying to remove the "anecdatal" nature of the work they do by using real data to understand the conditions on the ground. This shift was motivated by people complaining that there was no parking, or that people from a certain business or apartment building are parking on their street, based entirely on their own experience. Cities understandably want to confirm what is really taking place and the extent of any problems before determining solutions. However, I think stories and experiences should not be written off writ large. People's perceptions and experiences matter, cities just need to make sure they are hearing a balanced story that includes the experiences of all users of the street, and of marginalized people that may be harder to reach. Often times the metrics used to describe benefits of a project do a very insufficient job of describing the impact. For example, implementing a bus lane might shave off one minute of a bus ride on this one block. However, that metric means very little to anyone, even transit riders. Another way to understand the impact of this bus lane project could be using anecdotes. The pandemic has brought to the fore the importance of many of the people who ride transit. The story of this bus lane may be that it will enable a healthcare worker who frequently was delayed up to 10 minutes, to get to her job on time to save lives. That story likely resonates with people far more than an average one-minute time saving (Elliott, 2020). City staff should actually ask people for their stories of how they are impacted by the street. These individual stories can be very compelling and illustrate impacts and conditions that data cannot show. I caution officials to continue bearing witness to those stories and using them as valid data points, alongside the community-defined metrics, in their quest for the best solution.

Recommendation 6: Amplify the voices of non-car users

All users of a street should be engaged on any street re-design project or policy change. Section 2 and 3 found that people who take transit, bike, walk, and even use ride-hailing tend to use their car less, and value their car less. Those people are more likely to support projects that have a negative impact on the convenience or cost of driving. Engagement staff could engage bike riders at a stop light or at bike racks. Pedestrians could be surveyed throughout the project area. Bus riders could be surveyed at bus stops in the project area, but also staff should actually ride the bus routes that would be impacted and talk to riders that do not necessarily get off or on in the project area, but would still be impacted by the project. Delivery drivers for passengers and commercial goods should be engaged as well if they will be impacted.

In addition to project-level engagement, the political strength of these users could be improved. My results suggest that neighborhood and business groups are very politically powerful. Other groups impacted by parking policies could gain strength in order to make the political process more responsive to people that are not part of those groups. While government officials cannot directly engage in political organizing, local foundations and other advocacy groups could engage in this work. Existing groups, such as bike advocacy groups which tend to be well organized and funded, could expand their advocacy work to other parking projects like zoning policies, commuter benefits, parking pricing, bus lanes, and pick up drop off lanes. Local foundations could also better fund transit riders' unions or new groups to do this advocacy work. National groups, like the National Resources Defense Council (NRDC), sometimes will fund a new

organization or existing groups to do work like this also. In Washington D.C, the NRDC alongside several other foundations, have funded the Transportation Equity Network, which organizes several local advocacy groups into a coalition to advocate for equitable mobility policies (Thompson 2020). The American Cities Climate Challenge is also working to build up advocacy organizations for transit riders, and has done this in both Philadelphia and Cincinnati (Elliott, 2020). This type of coalition group could be replicated in other cities to elevate the voices and needs of non-car users and marginalized populations in transportation and parking policy making.

Recommendation 7: Hire community engagement staff

Considering how important I found stakeholder and community engagement to be in the success of a project, cities should consider investing more in staff dedicated to engagement. Recommendations 4, 5, and 6 all require community engagement staff. Seattle interviewees mentioned that they have an engagement staff member assigned to every project they implement, which helps to ensure engagement is prioritized and that an expert with relationships in many communities is doing the work. Those experts also know best how to translate some of the more technical transportation jargon into language that can be understood by people. These skills are quite specialized, and facilitation can have a big impact on the outcome. Not every planner or traffic engineer will be equipped to lead these community conversations. Although this appears to be an added cost to a project, if the project would otherwise be delayed or halted because of community pushback, the city may actually save money by investing in engagement up front and making sure the community's needs are being met and compromises are reached early on.

5.3 Tried and true

Several policies emerged from this research as tried and true. These are politices for which interviewees felt that there were relatively few nuances to work through that depended on context. These policies simply worked well, and did not face too much resistance from the public or political leaders. Still, each policy will need to be adapted somewhat to the specific context of a given city.

Recommendation 8: Pilots can be used, carefully, to test and demonstrate a potential project

Some interviewees felt that the COVID-19 pandemic led to an increase in public acceptance for things like PUDO zones, parklets and streeteries, and bus lanes. These uses of the curb were implemented quickly in many of these cities, and people immediately saw their benefits, and saw that the negative impacts were not huge either. Clearly the pandemic involved many different factors that led to this shift in opinion, but it does point to the idea that pilot projects could be one way to improve public acceptance of new uses of the curb, and to test the impacts of a possible project.

Kate Elliott (2020) shared that orange cone pilots, which are really intended to test out the impacts of a project, have been effective in many cities. This can serve to gain a better understanding of the impacts and be an impetus for community engagement informed by the actual condition on the street. However, Elliott warns that community engagement is still important to get right. In any location, but especially in a marginalized neighborhood, it's important that some engagement is done and that a relationship of trust has already been built up with the people living there over time. Additionally, cities should be clear about the purpose of the pilot. If they are actually planning to implement the project and very little about the pilot period would change their decision, the community will likely see that this is not real engagement and trust will be lost. Instead, the pilot should be a tool to engage the community further and hear from a wider swath than those who usually show up at community meetings.

Recommendation 9: Implement commuter benefits laws paired with free programming that requires data collection

The CTR managers contrasted many of the other interviewees in feeling that their work was quite effective and barrier-free. Additionally, section 2 and 3 both suggest that commuter benefits can reduce the value of car ownership, and reduce car use directly. These results suggest that other cities should also considering implementing laws and programming similar to those found in D.C. and Seattle, which are reportedly working quite well. The free programming in particular seems to be impactful in guiding employers to implement TDM measures. Additionally, legislation that requires employers and/or building managers to share reports and data with the government could be key in improving the effectiveness of CTR programs, but also of private parking regulation throughout the city. However, I think it is valuable for cities that implement these laws and programming to evaluate the benefits they are producing as compared to the costs of the program, and how that funding could otherwise be spent.

Implementing CTR laws and free programming does require political will and funding, which may not be possible for many cities. Pointing out the success of cities that do have these programs in place is one way to convince decision-makers that these actions are worthwhile. Alternatively, non-profit groups and foundations could consider creating programming to help employers and building managers implement more TDM measures if the government is unable to gain the political support to implement these programs.

Recommendation 10: Explore both parking and non-parking curb space revenue generation

Though revenue generation was low on the list of priorities for survey respondents, and not discussed at length by interviewees, it remains an important and under-implemented area of parking policy. I found that there is less resistance to increasing the price of parking than there is to reducing its supply. Additionally, the pandemic has decimated city budgets, making new sources of revenue increasingly necessary. Dallas and DC both have started to consider charging for use of the curb by users such as TNCs, food delivery vehicles, and commercial delivery vehicles since the pandemic has increased the amount of space dedicated to those users and decreased parking revenue. These companies have also fared better financially as compared to many small businesses and individuals during the pandemic. Raising costs for those companies as opposed to struggling businesses or families is more likely to be politically popular, generate more revenue for the city, and be economically beneficial and equitable.

Still, most curb space in cities is dedicated to private-car parking. Though many of the large, principal cities in the US are already implementing demand-based parking pricing, many smaller, suburban cities still do not charge at all for parking, as shown by the survey responses. Charging higher prices for these parking spaces is also an important strategy that both disincentivizes car use and increases city revenue. Section 3 found that having free or subsidized employer-provided parking can increase car use, indicating that the reverse is also likely true – charging market-rate for parking can reduce car use. Smaller cities that compete with neighboring cities' commercial districts for customers could coordinate parking pricing. Several cities could collaborate to use the same parking pricing technology and payment system, and coordinate prices so that customers are less likely to choose to patronize a commercial district just for its cheaper parking.

Ideally, parking and non-parking curb space revenue should go to funding non-car transportation alternatives. Funding was a top barrier cited by nearly every interviewee, and this could be alleviated to some extent by additional revenue from curb space. Additionally, charging more for parking or even for things like TNCs and food delivery, can disproportionately impact people with low income that still use a car or those services. When those funds are invested back into making it more possible for people to use non-car options, like transit, walking, or biking, the social equity impact of the policy is improved.

5.4 Change the context

Unfortunately, parking policy on its own can only be so effective at reducing car use and ownership. As the literature found, implementing a package of policies all aimed at those goals is the most effective way of achieving those results. No matter how inconvenient and costly parking is made to be, people will not change their behavior if they do not have viable alternatives to owning and using a car. The viability of those alternatives depends largely on land use and on the alternatives themselves. These recommendations are unsurprising, and repeated ad nauseum in the transportation literature. However, they bear repeating, since they are so vital to achieving significant magnitudes of change in car use and car ownership.

Recommendation 11: Implement land use policies that increase density and walkability

Land use policy is likely to be a vital part of reducing the value of car ownership and use. Section 2 found that individuals who live in the urban core are much more willing to give up their car than those who live on the periphery. Additionally, section 3 found that people who lived in more walkable places used their car less. These results imply that long-term land use planning that encourages dense, mixed use, walkable, and potentially transit-oriented neighborhoods could be a viable and powerful intervention to reduce car ownership and use. Parking policy is one way to shift land use toward a more urban and walkable form – zoning requirements that reduce or restrict the amount of parking for new developments can be used to increase density and walkability. Space that is used for development, rather than parking, increases density and makes an area more walkable by putting more destinations in a concentrated area and making an environment more pleasant than a sea of asphalt would be. Similarly, land use planning that prioritizes existing surface parking lots, or parking garages, for redevelopment can increase density and walkability. These parking policies should be implemented alongside other land use policies like increased density allowances in the zoning code, setback, access, and other requirements that make for a more walkable environment, and prioritizing these types of dense, walkable land uses near transit infrastructure.

Large cities, especially cities that are already relatively urban, are often already working toward these land use goals of more dense and walkable places. It is outside of the scope of this thesis to recommend specific policies to accomplish those goals broadly. Instead, this recommendation is a reminder than parking, car use and ownership, and land use are all interconnected. Land use, transportation, and parking officials should continue to coordinate on policies to best leverage their multi-faceted impacts. Reducing the required parking in the zoning code, and redevelopment of parking lots, should be made a priority in land use policy.

Recommendation 12: Improve non-car alternatives

Successful parking policy requires successful non-car alternatives. Reduced car use and ownership cannot happen at a large scale, or equitably, without it. Section 2 revealed that people value owning and using a personal car more than its cost, on average. Increasing the cost of owning and using a car might cause some people on the margins to own and use cars less, but most people will not be impacted as they will still likely value their car higher than its cost. Additionally, section 2 found that people value all non-private car alternatives very lowly. Section 2 also found that individuals who travel less by car and more by other modes are more willing to give up private car ownership and use. Therefore, if non-car alternatives were improved so that people used them more, and their value rivaled that of the private car, people would likely own fewer cars overall.

I am not abandoning my contention that disincentivizing cars is important. Both existing literature and the qualitative and quantitative data collected in this study demonstrate that disincentives are important.

However, results from section 2, 3, and 4 all point to the need to improve non-car alternatives in American cities. Having viable alternatives seems to be impactful on reducing the value of car ownership, and on reducing car use. Interviewees also shared the more nuanced finding that they, and other decision-makers, continue to face a trade-off when implementing car disincentive. They must decide whether it is worth it to achieve some reduced car use and ownership on the one hand, when it will generate undue hardship on some people who don't have an alternative. Without adequate non-car alternatives throughout an entire metro region, and particularly in low-income neighborhoods, there will always be an equity trade-off for car disincentive policies.

Non-car alternatives must operate at the regional scale, which is a huge challenge for individual cities that do not have that scale of influence with their policies and investments. This is particularly true for public transit, which is almost always the backbone of non-car transportation options in a city. Transit agencies continue to struggle with simple maintenance in American cities, let alone expansions and improvements to service. The COVID-19 pandemic has only worsened this budget crisis for transit agencies. However, the urban public has continually voted to fund transit year after year in city after city. Cities should continue to put these funding measures on the ballot, and should continue to focus as much government revenue as feasible toward improving non-car alternatives to make a car-free lifestyle a truly viable alternative to owning and using (and parking) a car.

6. Conclusions

This thesis has emphasized the challenge of reducing car use and car ownership, and articulated what stands in the way of officials implementing parking policies that achieve those goals. In section 2, we found that people highly value owning their car, even more than they value using it, and magnitudes more than they value access to any non-private car alternatives. This negates the dominant explanation for high car ownership rates in the US that suggests that people would own fewer cars if they just understood the cost better. Instead, we find that people do not have sufficient high quality non-private car options available to them that could actually replace the value they get from owning and using a car. We also find that people who use their car more also value it more. Therefore, in section 3, I examine the impacts to car use. I find that in contrast to the factors impacting car ownership value, the context of what metro area a person lives in, as well as commuter benefits, can impact how much a person uses their car. Specifically, in some circumstances, having free or subsidized parking at one's workplace can cause a person to drive their car more overall. The impact of various commuter benefits on driving behavior sometimes depended on the metro area in which a person resides, indicating that policies, the built environment, and the transportation systems available to people might be important factors for car use.

In section 4, I explore the potential of parking policy to impact car use and ownership in practice. I continue to consider commuter benefits, finding that much of the value of commuter benefits laws comes from the fact that they often spur cities to set up free programming that convinces employers to implement even more CTR measures than is required by law. I also explore officials' goals for transportation broadly, and for their work on parking. In both cases, I find that reducing car ownership is not seen as a viable goal. As section 2 found, car ownership is valued very highly, and any suggestion that the government might be trying to take away that valuable asset is perceived very negatively by the public. Large cities still work toward reducing car use and dependence, but suburban and exurban cities still do not see these goals as viable or important. Parking goals also focus less on reducing car use, and more on efficiently using the valuable space, improving economic vitality, and improving safety and traffic congestion.

Some of the reasons for officials' resistance to focusing on reducing car ownership, car use, disincentivizing cars generally, and removing parking specifically, become clear when the process by which parking decisions are made is analyzed. Through the catalyst for project consideration, the impact analysis, and through stakeholder engagement, nearby residents and businesses hold disproportionate sway over what parking projects are implemented. Those groups strongly oppose parking removal. Curbside management studies and staff can help to guide decisions to de-prioritize car uses, but those frameworks can still be dismissed if stakeholder resistance is too high. Data and metrics emerge as challenging but potentially helpful tools by which to re-orient the parking decision-making process toward projects that are more equitable, consider network benefits more strongly, and further prioritize non-car uses of the curb. However, respondents felt torn between the desire to use data and metrics to identify objective realities and solutions, and the need to seek out and serve the needs of people that would be impacted by a project. Since wealthier and more politically savy constituents tend to be heard most loudly, parking officials overall expressed a desire to move away from serving those voices and instead focus more energy on use of objective data and metrics.

The policy recommendations reflect primarily the need to more effectively understand and engage with the proponents and opponents of a parking policy. Data and analyses are indeed key in better understanding what the true impacts of a policy will be for different groups of people. However, I find that even with robust data and analysis, the experience of people on the ground is vital in understanding a problem and devising a solution. Officials should continue to improve the equitability of stakeholder engagement, including engaging the community in defining metrics and data analysis, and political organizing can

amplify the power of those currently deprioritized by elected officials in making parking policy decisions. Lastly, political structure changes could be one of the most impactful means to remove barriers to parking policies that improve social equity, reduce car use, and reduce car ownership. The approval process for parking projects should lie with apolitical, or at least less political bodies that are bound to those goals. State-level policies could also be used to require better parking policies of suburban municipalities as well, addressing the need for regional coordination in order to impact behavior.

In order for any parking policy to be successful, cities still need to improve non-car alternatives and the density and walkability of land use in order to make giving up one's car to own or use a viable option. There is no city in America that has viable non-car options in every single neighborhood. This is in part due to low density land use making it very difficult to walk to destinations, and for transit to effectively service the area without hemorrhaging money. Additionally, for many cities, the neighborhoods that are left out of the transit system are increasingly low income, making policies disincentivizing car use unfairly burden those people. For many other cities, suburban and exurban municipalities have repeatedly resisted the expansion of public transit infrastructure into their cities. In either case, people cannot reduce their car ownership or use levels unless they have a viable alternative. Disincentivizes using parking policy can still be effective, but they should be as targeted as possible to places with quality non-car alternatives.

There are a number of limitations to this research. First, this research, including all three sectiosn fo results, was conducted entirely during the COVID-19 pandemic. It is likely that the unprecedented context has impacted this research, since it dramatically shifted travel behavior and even has impacted car ownership and the use of parking. It is possible that some of these findings will not bear out in a non-COVID-19 time. Second, this research focuses just on four metropolitan statistical areas in the United States. Though I often generalize the findings to American cities, it is likely that there are some specific features of these regions that have led to different findings and recommendations than if different regions had been studied. I did find that generally, interviewees and survey respondents expressed similar views across these regions. Undoubtedly there are still nuances that I have not captured that make it difficult to truly generalize these findings to all American urban regions. Lastly, with only 16 interviews and 82 survey respondents, the sample size of section 4 is small. It is possible that these respondents are not truly representative of their jurisdiction, region, or of American officials in those roles generally.

This thesis also highlights several areas for future research. Interviews and surveys with more parking officials in more cities is one potential area for expansion that would enrich these findings and enhance their applicability in different American contexts, or even international contexts. Additionally, the qualitative results of this thesis highlighted several different types of parking policies. The quantitative results did not explore the impact of any of these specific parking policies, except employer-provided free or subsidized parking, on car value or car use. Future studies could quantify the impact of different policies such as dynamic pricing, parking minimums and maximums, on-street parking supply reduction, and the different uses that can replace on-street parking. This insight is vital to help guide policymakers to prioritize these policies based on impact, particularly considering there is a high political expenditure involved in pursuing many of these. Lastly, future research could use more qualitative analysis to explore parking policies from the perspective of the different people and businesses that are actually impacted by them. These results provide insight into those experiences only through the eyes of parking officials. The true opinions and experiences of nearby residents, businesses, car users, bus riders, cyclists, delivery drivers, and pedestrians are vital in understanding how to better design engagement methods to understand those needs, and how to better design policies to respond to them.

I hope this document can be used by government officials and advocates alike to generate ideas and strategies for how to reduce car use and ownership in U.S. cities, and how to implement parking policies

aimed toward those goals. The COVID-19 pandemic has only highlighted the immense value that curbs and developable land in our city have, and how much they impact our daily lives, health, and social connectivity. The policy recommendations are ambitious, but I hope that any local government official reading this document can find new ways to approach prioritization, data, engagement, and political structures in their municipality. There are many coalitions of cities that come together to collaboratively tackle these problems and identify potential solutions. I hope readers will consider engaging with the National Association of City Transportation Officials (NACTO), the American Planning Association (APA), and the Institute of Transportation Engineers (ITE), to name a few that are working to guide cities in parking and other transportation policies. The best way for cities to move forward is to learn from one another, and from the people we serve.

I conclude with a message of thanks. Not a single person I reached out to denied my request for an interview, despite the unprecedented time of crisis that undoubtedly made their time even more valuable than usual. Many followed up with additional resources and connections for me to draw upon as well. A survey response rate of 42% was also humbling, considering the pandemic has placed even greater demands on public officials' time. Many survey respondents also followed up with e-mails, many of which made me laugh or otherwise brightened my day. The many contributors to this thesis all expressed nothing but the deepest desire to serve the people in their cities, and to do their work better. Parking professionals must continue to be willing to rethink those processes, try new goals and metrics, invite more and more people into all parts of the process, listen better, focus on equity, and most of all, continue to fight for policies and processes that reduce car use and car ownership, and improve social equity, to be funded and implemented. These changes will gradually enable more and more people to enjoy life with the freedom to not have to use, or own, or park, a car.

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A. Appendix

A.1 Value of car ownership statistical appendix

This statistical appendix was authored by Joanna Moody, with some help from Marisa Papagelis and Liza Farr. The appendix includes information on data collection, survey and experimental design, analytical approach, expanded results, and referneces. You can find the full appendix here: https://github.com/jcmoody6/car-value.

A.2 Parking policies and car use R code

Please find the full R code for section 3 here: https://github.com/lfarr1347/MasteresThesisRCode.

A.3 Full survey

MIT Masters Thesis Parking Policy Survey

Start of Block: Introduction & Informed Consent

Q1 Thank you for being willing to participate in this study!

The results from this survey will be used as part of a Massachusetts Institute of Technology (MIT) Masters in City Planning thesis. This thesis explores how local-level public officials are using parking policy. The conclusion of the thesis will include recommendations for how policymakers can best use parking policy as a mechanism to reduce car ownership and car use. Once complete, all officials that were invited to complete this survey will be sent an electronic copy of the finished thesis with an executive summary.

Procedure This survey should take about 10 minutes to complete. The survey is best viewed on a larger-screen device such as a tablet or personal computer.

Risks/Discomforts Risks are minimal for involvement in this study. However, you may feel emotionally uneasy when asked to pass judgment on certain questions.

Benefits and Participation Participation in this research study is completely voluntary. Through your participation, researchers will learn more about how parking policy can be used at the local level to accomplish public goals. You have the right to refuse to participate in this study or to withdraw at any time. If you desire to withdraw, please close your internet browser.

Confidentiality This survey does not ask you for any information that can be used to identify you. All data obtained from participants will be kept strictly confidential and will only be reported in an aggregate format (as combined results), never as individual responses. The data collected will be stored in the HIPPA-compliant, Qualtrics-secure database until it has been deleted by the primary investigator. No one other than the primary investigators listed below will have access to the data, unless additional permissions are received.

Questions about the Research or about your Rights as Research Participants? If you have questions regarding this study, you may contact the primary investigators, Liza Farr (lfarr@mit.edu; 785-760-0179) or Joanna Moody (jcmoody@mit.edu; 434-409-5679). If you have questions you do not feel comfortable asking the researcher listed above, you may contact MIT's Committee on the Use of Humans as Experimental Subjects (COUHES) via email at couhes@mit.edu or securely through the web at https://couhes.mit.edu/contact-us.

Consent I have read and understood the above consent form and desire of my own free will to participate in this study.

- ○ Yes (1)
- ○ No (2)

Skip To: End of Survey If I have read and understood the above consent form and desire of my own free will to participate i... = No

End of Block: Introduction & Informed Consent

Start of Block: Location

Q3 What City, Town, or Village do you work for? Please provide the city and state.

State (1)

City (2)

▼ Illinois (1) ... West Virginia ~ Shepherdstown (207)

Q28 The City, Town or Village that you work for will be referred to as "City" in this survey moving forward.

Q29 What proportion of your work is focused on parking? This could include working on: The zoning code as it relates to parking Employer parking On-street parking Public off-street parking Street projects that result in the removal of parking, like bus lanes, bike lanes, or loading zones

	0 10 20 30 40 50 60 70 80 90 100
Proportion of work focused on parking (%) ()	

End of Block: Location

Start of Block: Block 3

Q8 When it comes to transportation planning and policy generally, which of the following, if any, are formal goals for your City and/or personal goals regarding your work? Select all that apply.

	Formal City Goal (1)	Personal Goal (2)
Reduce car ownership (1)	☐	☐
Reduce car use (2)	☐	☐
Reduce car dependence (3)	☐	☐
Reduce traffic congestion (4)	☐	☐
Improve safety (5)	☐	☐
Reduce GHG emissions (6)	☐	☐
Increase use of non-car alternatives (e.g. public transit, biking, walking) (7)	☐	☐
Improve connectivity and accessibility (i.e. making it easier for people to get around) (8)	☐	☐
Improve economic vitality (9)	☐	☐
Improve social equity (10)	☐	☐
Improve public health (11)	☐	☐
Other (12)	☐	☐
⊗ None of the above (13)	☐	☐

Q6 How would your City government perceive a reduction in car ownership in your city?

- ○ Positively (1)
- ○ Neutral (2)
- ○ Negatively (3)

Q7 Regarding parking and use of the curb, which of the following, if any, are formal goals for your City and/or personal goals?

	Formal City Goal (1)	Personal Goal (2)
Reduce car ownership (1)	☐	☐
Reduce car use (2)	☐	☐
Reduce car dependence (3)	☐	☐
Reduce traffic congestion (4)	☐	☐
Improve driver experience (5)	☐	☐
Increase safety (6)	☐	☐
Implement efficient use of space (7)	☐	☐
Improve social equity (8)	☐	☐
Improve economic vitality (9)	☐	☐
Reduce stormwater runoff (10)	☐	☐
Improve aesthetics (11)	☐	☐
Generate parking revenue (12)	☐	☐
Generate tax revenue (13)	☐	☐
Make space for alternative modes like bus lanes and bike lanes (14)	☐	☐

Make space for commercial and passenger loading (15)	☐	☐
Make more space for public or business uses, like parklets or streeteries (16)	☐	☐
Other (17)	☐	☐
⊗ None of the above (18)	☐	☐

Q9 How much effort does your City put towards incentivizing alternative modes of transportation (such as improving transit service, building bike paths, etc.)?

Consider things like staff time, budget, and political capital expended for this purpose.

- ○ Significant effort (1)
- ○ Good effort (2)
- ○ Moderate effort (3)
- ○ Little effort (4)
- ○ No effort (5)

Q10
How much effort does your City put towards disincentivizing owning or using a car (such as removing traffic lanes or parking, traffic calming, pricing for parking or driving)?

Consider things like staff time, budget, and political capital expended for this purpose.

- ○ Significant effort (1)
- ○ Good effort (2)
- ○ Moderate effort (3)
- ○ Little effort (4)
- ○ No effort (5)

End of Block: Block 3

Start of Block: Block 4

Q15 For each of the following parking policy mechanisms, please indicate whether your City has deployed the mechanism over the past two years and/or is actively studying or considering it in the near future. Select all that apply.

	Policies deployed in past two years (1)	Policies considering for future (2)
Decrease required parking through the zoning code (1)	☐	☐
Increase required parking through the zoning code (2)	☐	☐
Require employers to charge for, or increase the price of, employee parking (3)	☐	☐
Remove on-street parking (4)	☐	☐
Remove public off-street parking (5)	☐	☐
Convert on-street parking spaces from free to paid (6)	☐	☐
Raise the cost of on-street parking (7)	☐	☐
Raise the cost of off-street parking (8)	☐	☐
Dynamic pricing for on-street parking (9)	☐	☐
Increase price of residential parking permits (10)	☐	☐
Reduce number of residential parking permits allocated (11)	☐	☐
Other (12)	☐	☐
⊗ None of the above (13)	☐	☐

Q11 Has your City permanently removed public parking spaces or prevented the construction of private parking spaces in the past two years? If yes, approximately how many parking spaces have been removed/prevented?

- ○ No (1)
- ○ Yes: (2) _____
- ○ Not Sure (3)

Q13 Has your City converted any free parking spaces into paid parking spaces in the last two years? If yes, approximately how many spaces were converted into paid spaces?

- ○ No (1)
- ○ Yes: (2) _____
- ○ Not Sure (3)

Q14 Has your City increased the price of paid parking spaces in the last two years? If yes, by approximately how much did the price increase (in $)?

- ○ No (1)
- ○ Yes: (2) _____
- ○ Not Sure (3)

Q16 Does your City and/or State have any laws regulating the commute benefits that employers must offer?

- ☐ Yes: City has laws (1)
- ☐ Yes: State has laws (2)
- ☐ ⊗ No (3)
- ☐ ⊗ Not Sure (4)

Q17 Does your City work voluntarily (not required by law) with employers on transportation demand management (TDM) or commute trip reduction (CTR)?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)

End of Block: Block 4

Start of Block: Block 5

Q18 Has your City done a curbside management or parking study in the last 7 years?

- ○ Yes (1)
- ○ No (2)
- ○ Not Sure (3)

Q19 Does your City have a stated framework or set of priorities that guide your decision-making for use of the curb?

- ○ Yes (1)
- ○ No (2)
- ○ Not Sure (3)

Q20 Imagine that your City is conducting a street re-design or considering a zoning revision/exemption that may reduce the parking supply. Under this scenario, how would you rank the following potential impacts in terms of priority for consideration (with 1 = highest priority)?

_____ Car travel time or traffic congestion (1)
_____ Parking availability (2)
_____ Nearby residents' concerns (3)
_____ Nearby businesses' concerns (4)
_____ Commercial loading (5)
_____ Passenger loading (6)
_____ ADA compliance (7)
_____ Public transit service (8)
_____ Non-motorized transport (biking and walking) safety and convenience (9)
_____ Social equity (10)
_____ Parking revenue (11)
_____ Other tax revenue (12)
_____ Other (13)
_____ None of the above (14)

Q21 When your City is re-designing a street, do you generally try to avoid removing parking?

- ○ Yes (1)
- ○ No (2)
- ○ Not sure (3)

Q22 Do you feel your City is able to engage all the stakeholders impacted by a project that removes parking?

- ○ Yes (1)
- ○ Mostly (2)
- ○ No (3)
- ○ Not sure (4)

End of Block: Block 5

Start of Block: Block 6

Q25 Please indicate how each stakeholder group perceives efforts to remove parking.

	Very negatively (1)	Somewhat negatively (2)	Neutral (3)	Somewhat positively (4)	Very positively (5)
Nearby neighborhood residents (1)	○	○	○	○	○
Nearby business community (2)	○	○	○	○	○
Users of alternative modes, like cyclists, pedestrians, and transit riders (3)	○	○	○	○	○
The general public of the city as a whole (4)	○	○	○	○	○
Local elected officials (5)	○	○	○	○	○

Q26 Please indicate the top 3 barriers your City faces in implementing projects that reduce the parking supply or increase the cost of parking.

- [ ] Limited funding to implement parking projects (1)
- [ ] Neighborhood opposition (2)
- [ ] Business opposition (3)
- [ ] Interdepartmental coordination (4)
- [ ] Difficulty attracting needed human resources (5)
- [ ] Not enough support from elected officials (6)
- [ ] Fiscal need for parking revenue (7)
- [ ] Low priority compared to other projects (8)
- [ ] Not enough support from agency leadership (9)
- [ ] Lack of data on parking (10)
- [ ] Lack of empirical evidence on benefits of replacing parking with other uses (11)
- [ ] Other (12) _____
- [ ] None of the above (13)

Q23 What argument do you generally use to convince stakeholders to support a project that includes some parking removal?

_____

_____

_____

_____

_____

Q24 What data do you use in your decision-making process about a parking project or policy?

_____

_____

_____

_____

_____

End of Block: Block 6