

Policy Entrepreneurs, Windows, and Cycles: Exploring Policy Change through Bicycle
Infrastructure at the Municipal Level

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Policy Entrepreneurs, Windows, and Cycles: Exploring Policy Change through Bicycle
Infrastructure at the Municipal Level

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SUMMARY

Although bicycling has been the subject of increasing academic attention, particularly in the areas of mode choice, benefit analyses, and discussions of policies/treatments, much less attention has been devoted to actually studying how communities have made decisions about whether and what they'll implement in regards to bicycle infrastructure. "Policy entrepreneurs" are theorized as actors centrally responsible for either creating an opportunity or capitalizing on an opportunity to pair a public problem with a policy solution. A survey instrument solicited directly the participation of the 200 most populous municipalities within the United States. Using a variety of analytical tools (and merged data sources) as well as a novel matching methodology for the selection of case studies, it was possible to identify interesting and broadly informative relationships, which were explored further via the case study comparison. 20 case interviews were conducted across 6 case study cities as a complement to the survey project. Individual policy entrepreneurs and their role or qualities were not significant quantitatively or qualitatively, despite being regularly present. However, having a network of supportive actors (including strong champions/policy entrepreneurs) played a critical role in making projects happen and at larger scales. Advocates and planners may be more successful by being attuned to these networks and political contexts and taking advantage of open "windows" of engagement. Alternatively, these windows can be opened 'manually' through grant applications, developing relationships, hosting trainings or speakers, and more. Lastly, city population was also associated with implementation, suggesting underlying factors to be explored in the future.

CHAPTER 1

THE STORY

Every other year *Bicycling Magazine*, the most widely distributed specialty publication focusing on bicycling, releases its “top 50” list (a list of the 50 best cities for bicycling in the United States). This list represents the result of their best efforts to capture the quality and quantity of bicycle infrastructure in a city, the popularity of bicycling in the city, and other bicycle-supportive features of a city. While the order of the list invariably causes some amount of consternation among the public (over which cities are where on the rankings, or which cities are absent), it is often covered in turn by other broader media outlets, making its annual release a point of some public attention and serving (at least temporarily) as the most visible national ranking of city bicycle policies.

One of *Bicycling Magazine*’s sources for information is another major policy evaluation system, the League of American Bicyclists’ Bicycle Friendly Community (BFC) program. A national advocacy organization, the League developed the BFC program to recognize cities for their efforts to be more “bicycle friendly”, a broad term for the presence of bicycle-supportive policies, projects, and programs across five areas identified by the League as priorities: engineering, encouragement, education, enforcement, and evaluation (the so-called “Five E’s”). This recognition program awards different levels of “bike friendly” status to communities (as well as businesses and universities): bronze, silver, gold, platinum, and diamond. Cities are thus afforded an accessible way to benchmark themselves against other cities, to assess their progress, and

to be publicly recognized for their efforts. The BFC program and top 50 list, along with BikeScore (a feature of walkscore.com), are just a few among many such ranking systems.

These rankings and recognitions provide an interesting comparison between cities on the basis of how supportive and accommodating they are of bicycling as an activity for transportation and recreation. The existence of the rankings themselves also highlights an interesting reality about the nature of policy adoption at the local level. At the risk of pointing out the obvious, policies are not adopted uniformly in terms of content or when (or even if) they are adopted. Different jurisdictions select different features or priorities, commit different resources, or consider different proposals, which is why rankings and recognitions like those discussed before lead eventually to some very interesting questions about policy change: Why have some cities adopted ambitious and innovative infrastructure, programs, and policies, while other cities have resisted this policy change? What possible explanations are there for these differences, and can they be explored systematically to improve our understanding of local policy change? Is this unique to bicycle-related policies, or can we expect these findings to provide meaningful explanations in other policy areas?

If the story of Davis, California is any indication, it may be possible not only to explore these questions but also to do so through the lens of a well-established policy change framework. Davis, perhaps more than any other city in the United States, is a model for bicycle-supportive policies. With a commute mode share of around 18% (and previously

as high as 25%), Davis approaches the levels of bicycling that characterize western European cities like Amsterdam, Copenhagen, and Muenster, which are widely cited as the models for effective bicycle policy (U.S. Census Bureau 2014). In his extensive case study of Davis, Ralph Buehler (2008) explored the process by which Davis reached the highest bicycle mode share in the United States and identified this innovation as the result of efforts by a few central figures during a particular window of opportunity.

According to Buehler, during the late 1950s and early 1960s the University of California at Davis was in the process of a major transition from a local specialized research campus into an autonomous campus of the University of California system. The first chancellor of the University, Emil Mrak, led the school to emphasize bicycling in their campus planning, with a car-free campus core and dedicated bicycle infrastructure. Bicycling became widely popular among the campus community (though it was not immediately incorporated into the community at large); in the mid 1960s two UC Davis professors began to put together meetings and letters to encourage the city to follow suit and support bicycling (apparently informed by a recent trip to the Netherlands). Through their efforts to build public support and political influence, they led Davis to step forward into the role of innovator, developing their own standards for bicycle infrastructure and pursuing ambitious implementation. The result of these efforts was the highest rate of bicycling in the United States, and infrastructure that would not make it onto the agenda of other cities for more than three decades.

Influential individuals had led the charge for change toward bicycling; absent these individuals, innovation and implementation (and the popularity of bicycling) fell in the period following. Buehler characterizes the experience of Davis as a story about the importance of public support, coalition building, and the leadership of motivated individuals (Buehler 2008). The story of Davis is not the only one of influential actors taking it upon themselves to pursue policy change – in fact, it appears that this story may be a common one, occurring at the local, state, and national level (Mapes 2009, Wray 2008). Though there are other factors referenced in these stories of substantial policy change, the heavy emphasis on the role of individual actors or small groups of actors in pursuing policy change by leveraging networks and resources, building public support, and facilitating implementation suggests that any systematic exploration of the causes of difference in policy across cities must provide for this central causal influence of particular actors. Fortunately, there is not only a well-developed concept suited for application here (the “Policy Entrepreneur”), but a body of policy change theory constructed around the causal influence of these actors including a theory which we can use to develop a more systematic exploration of the variation in bicycle policy across the United States.

CHAPTER 2

ISSUE AND PURPOSE

To say that a lot of attention is paid to mode and route choice is probably a bit of an understatement, if the volume of published work is any indication. We have good reason to believe that safety (Buehler and Pucher 2011), perceived safety (Akar and Clifton 2009, Heinen et al 2011), distance (Broach et al 2012, Cervero and Duncan 2003), traffic volume (Broach et al 2012, Providelo and Sanches 2011), traffic speed (Providelo and Sanches 2011), topography (Cervero and Duncan 2003), and current weather (Flynn et al 2012, Sears et al 2012, Heinen et al 2011) are all significant influences on cycling behavior. Because of these factors (particularly safety and traffic conditions), the provision of dedicated facilities is a major encourager of bicycling (Akar and Clifton 2009, Buehler and Pucher 2011, Broach et al 2012, Heinen et al 2010, Krizek et al 2009, Monsere et al 2012). Given that the goal of much current research is to support the efforts of communities to better encourage and foster bicycling, it's not surprising that so much work focuses on developing a better understanding of what factors influence the decision to bicycle. In fact, this work is fairly critical to the selection of optimal infrastructure, programs, and policies, and has to-date provided a wealth of data that, when considered together, provides some very useful information about bicycling behavior.

While studies of mode and route choice can reveal a lot about behavior, and the importance of the built environment, these studies don't provide us with a good understanding of how a city actually triggers a shift in policies toward supporting

bicycling. While planners and engineers have touted widely the characteristics of bicycle-friendly environments (low traffic volumes and speeds, high perceived safety, etc.) as the reason to invest in cycletracks, buffered bike lanes, and other protected and/or separated infrastructure, it's not clear why some cities have taken these steps and others have not. A few studies have discussed the factors that might facilitate or limit the adoption of bicycle-friendly policies and projects (Cole et al 2010, Cradock et al 2009, De Zeeuw and Flusche 2011), but there have been no focused efforts to explore any particular hypotheses regarding policy change (Khayesi and Amekudzi 2011), nor has there been much discussion of how theories of the policy process might provide value to the goal of growing bicycling.

Despite this, a substantial body of potentially applicable theory does exist, providing an opportunity to explore a question with practical value to advocates, officials, and planners pursuing the growth of bicycling, and theoretical value to academics and researchers looking for areas of public policy to test prominent hypotheses or develop and improve perspectives (Weber 2014). Though this new direction could offer a multitude of possible projects, I begin by testing in particular one prominent policy change framework, the so-called "Multiple Streams Framework" (MSF) developed and expounded by Kingdon and Zahariadis, among others. The MSF provides a theoretical basis for the study of bicycle infrastructure policy change across municipalities that is particularly appealing for its attention to an issue that is often mentioned offhand as a critical factor in the shift of city bicycle policies: the influence of leadership.

Through the concept of “Policy Entrepreneurs”, the MSF provides a causal proposition about the role and influence of leadership that can be explored and tested both quantitatively and qualitatively. The MSF introduces a model of policy change built around the metaphor of action as the confluence of three otherwise relatively independent “streams”: problems, solutions, and politics. Policy entrepreneurs are theorized as the parties centrally responsible for either creating such a confluence opportunity or capitalizing on an opportunity to pair a public problem with a policy solution. This perspective appears to parallel the qualitative narratives of policy change in cities like Davis, Portland, and New York; this project explores whether the MSF can indeed accurately and consistently explain these policy changes. In addition, this project represents another in a small line of local government-focused applications of MSF (Ridde 2009, Liu et al 2010), which supports the development of MSF as a theoretical perspective not only by application to new areas, but also through the use of quantitative analysis (and the associated opportunity for findings that challenge or support the theory).

2.1 Background

Nationally, bicycling levels in the United States are at their highest ever. While only around 1% of trips are taken by bicycle, this number represents a doubling since 2001 (Pucher et al 2011). Cities of all sizes have seen increases in their bicycle mode share (the share of commute trips undertaken by bicycle), in particular places like Portland, Oregon (above 7% mode share), San Francisco (4.4%), and Washington, DC (3.9%)(League of American Bicyclists 2015). However, while some cities have seen significant growth in bicycling, other cities have seen very little. Cities like Phoenix, Arizona, and Santa Ana

and Riverside, California have even seen a decline in bicycling between 2000 and 2014 (League of American Bicyclists 2015). Despite early perceptions that bicycling was popular where climate supported it, research on mode share in cities like Portland and Minneapolis has disproven this claim (Buehler and Pucher 2011). At the same time, increasing focus on the benefits associated with bicycling, particularly health (de Hartog et al 2010, Gotschi and Mills 2008), cost (Rastogi 2011) and environment (Gotschi and Mills 2008, Rastogi 2011) has helped make a strong case for infrastructure investments, to say nothing of the dialogue around economic development and shifting generational transportation preferences. The net takeaway from these studies has been that the benefits of bicycling heavily outweigh the costs of projects to support bicycling (Cavill et al 2008).

A question thus arises: why this variation in mode shares? If bicycling offers more benefits to users than the costs associated with the behavior, and more benefit to the public as a whole than the development of policies and projects to support it (Gotschi 2011), wouldn't we reasonably expect bicycling to grow more or less equally? A large body of research has explored this question, and drawn a variety of conclusions.

Although demographic and attitude differences are associated with cycling behavior in some cases (Heinen et al 2011b, Heinen and Handy 2012), a strong consensus has developed that bicycling is heavily dependent on physical infrastructure that provides safer and more pleasant bicycling (Akar and Clifton 2009, Buehler and Pucher 2011, Broach et al 2012, Heinen et al 2010, Krizek et al 2009). Other factors identified as potentially important include sprawl and gas prices (Beuhler and Pucher 2011), traffic

volume (Broach et al 2012, Winters et al 2010), perceived safety (Roskowski 2013, Winters et al 2010), and traffic speed (Rietveld and Daniel 2004). The common takeaway from these studies is the importance of conditions that are generally the result of policy and planning decisions. Put another way, policies are largely responsible for bicycle mode share and the variation across cities (Page 2005). Comparing American cities to cities in the Netherlands and Denmark, where levels of bicycling are much higher (26% in the Netherlands and 18% in Denmark), further supports the claim that policy and planning are fundamental to the popularity (and safety) of bicycling (Buehler and Pucher 2012b).

The suite of policies that support bicycling is expansive, including not just dedicated facilities, parking, and traffic calming, but also coordination with other modes, education, laws and enforcement, encouragement, and indirect policy measures to manage demand for driving (Nielsen et al 2013). Although bicycling levels have increased across the country, levels of bicycling still vary widely from city to city, and again, evidence strongly suggests that policies are the reason why (Page 2005). Municipalities not only directly influence travel behavior with policies and projects, but often these policies may alter the performance of other policies (Rietveld and Daniel 2004). For these reasons, general models of bicycling mode and route choice have been careful to consider the role of policies, such as bicycle infrastructure, transit access, land-use, or density (Rietveld and Daniel 2004, Meyer and Miller 2001).

If this understanding of the relationship between policies and behavior is accurate, then the question of variation turns from the causes of mode share to the causes of adoption of bicycle policies, programs, and projects. Since there's good reason to believe that variation in bicycle policy decision-making is likely not explained by strict reference to rational analysis of costs and benefits (Weber 2014), there must be meaningful differences between the cities that have developed bicycle projects/policies, and those which have not (or at least differences associated with the scale or type of their respective projects/policies). Little research has explored these differences, but there are a few good starting points: Firstly, there is consensus that bicycling is a fundamentally local activity, making the primary scale of decision-making the municipal level (Handy and McCann 2010). While other levels of government are influential, including Metropolitan Planning Organizations (MPO) (York et al 2011), and the federal government (Newhall 2013), local governments are responsible for the large majority of planning and policy decisions (York et al 2011). Arguments have been made that policies and projects are directly tied to the influence of advocacy organizations (Wray 2008), strong local leadership (Handy and McCann 2010, Cole et al 2010), and the coordination and cooperation of multiple actors (Pucher et al 2011, Buehler 2008). A working understanding of what factors have been responsible for facilitating the selection and implementation of bicycle policies and projects is an important gap in our collective knowledge, and a question which could provide useful lessons not only to the governance, planning, and mode-specific research which inform this project, but also to the practical efforts of communities to pursue "bicycle friendliness" and develop conditions conducive to dramatic increases in bicycling.

2.2 The Institutional Context

Though much less developed and expansive than the work on mode choice, there does exist some discussion about the institutional context within which choices about bicycle projects and policies are made. This context is critical for developing a practical understanding of the decision-making process, and for appropriately applying a theoretical perspective to a particular area of a complex policy subsystem. For example, there may be many ways in which policy decisions around something like bicycling are made in a manner consistent with (or even as part of) decisions made around transportation more broadly (including decisions made as part of formal or informal processes). At the same time, there may be unique qualities about the context around these specific decisions that could alter the potential for certain choices to be considered or selected. In the broadest sense, institutions (in the form of rules, norms, and other structures) play a role in framing and guiding choice (McGinnis 2011). Although a thorough institutional analysis is well beyond the scope of this project (and could likely require multiple studies), it's important to broadly assess this context before presuming to apply a general framework to this new area. In this case, our focus will be on prominent formal and informal arrangements and practices, as evidenced by the literature.

A fundamental realization that must direct any discussion of bicycling is that, as a behavior, it is inherently local. Because of this, bicycle projects and programs are primarily implemented at the local level (Handy and McCann 2010). While MPOs are involved in bicycle planning (as with other planning decisions and activities), less

involvement occurs than at the local level, and less still occurs at the level of state DOTs (York et al 2011). Though some states offer funding support for bicycle projects the level of funding varies widely from state to state (York et al 2011), despite otherwise similar organizational structure, missions, and priorities (Neshkova and Guo 2011)¹. It appears also that while MPOs have been granted more power by federal legislation (Dovalina and Timmons 2008), MPO support for bicycling policies is a result of local government and community support (Handy and McCann 2010).

On the national level, federal funding for bicycling has increased dramatically since ISTEA (the Intermodal Surface Transportation Efficiency Act of 1991), with the level of funding in 2009 (\$1.2 billion) 200 times that of 1990 (\$6 million)(PBIC 2010), despite overall declines in transportation funding (Schank and Rudnick-Thorpe 2011). This increase in federal funding has supported increased commuting rates in cities that have received federal funding for projects and programs (Newhall 2013). It has also been provided through federal funding authorizations that have notably altered federal priorities (Litman 2013), with a greater focus on local choice (Lewis and McGhee 2001), public involvement (Meyer and Miller 2001), access (Litman 2013), and multimodality (Jaynes et al 2012). However, the level of federal funding for bicycling is still less than 1% of the overall federal transportation budget (Page 2005), and the influence of the

¹ Since support from higher levels of government can be an important factor in local policy change and success (Buehler 2011), there may be some value to also exploring state and regional variations in the future.

federal government on local policy priorities and implementation has declined over time (Miller 2011). In addition, the federal government is still committed to automobile-focused policies that limit the effectiveness of competing policies to support transit, bicycling, or walking (Buehler 2011). Though this influences local policy efforts, local governments do maintain the ability to reject this mixed prioritization, consider alternative policies, or select innovative or experimental options. All of this serves to reinforce the critical and central role that local governments play in making choices about bicycle policy, and to validate a research focus on the municipal level.

In general, transportation decision-making is characterized as highly path dependent (Hysing 2009, Low and Astle 2009, Bertolini 2007), in part because of the reinforcing nature of infrastructure (building infrastructure for one mode leads to that mode growing and requiring more infrastructure in turn), and because of organizational resistance to policy change (Low and Astle 2009). Due to the extensive specialization and training of planners and engineers, as well as natural resistance in organizations to the pressures of public mood and external shocks, most transportation policy change is incremental. The broader transportation subsystem is generally characterized as a closed or contested subsystem, meaning that change is generally small and instrumental, rather than substantial (Howlett et al 2014). Howlett attributes this to the insulation of the subsystem from other fields and the community at large. Nonetheless, the difference in policies among municipal governments in the United States highlights that even in the face of this path dependence, policy change does occur, and with enough variation that there is value in exploring it.

The involvement of different scales of government (and their associated agencies) is not unique to bicycling (although bicycling might be considered as inherently more local than many other modes). However, there are some important differences between bicycling and other modes of transportation: for example, the presence of very active and potentially influential advocacy organizations. These groups exist at a variety of scales, and serve a diversity of different purposes that support a shared goal of encouraging bicycling (Wray 2008). While it's not unusual for national-level interest groups to be involved in the policy process (Hecló 1978), and this is becoming truer for transportation (Vigar 2006), bicycle advocacy groups also exist at the local level across the U.S. (Wray 2008). Their involvement in local issue networks (to borrow the language of Hecló) has been considered by some to be potentially essential to the development of political support and momentum for major policy change (Handy and McCann 2010). In at least some cases, these organizations actually go beyond political advocacy and provide a range of programming and services to support bicycling in their communities, particularly education and encouragement (Wray 2008), as well as data collection (Buehler and Pucher 2012a). Although the role of these advocacy organizations in policy change is still unclear, and evidence on their influence is mixed (Gaffron 2003), there are compelling reasons to explore their involvement further (Pucher et al 2011).

So far, two defining features of bicycling have been identified: (1) the importance of the local scale, and (2) the presence and role of non-governmental actors. A third feature of interest should also be considered, particularly in light of the frequent discussion of it

across much of the literature: the role of the elected official. Compelling narratives have been constructed around the importance of the bicycle advocate-official (Wray 2008, Mapes 2009, Birk 2010), a figure capable of bringing together resources and support and leveraging both to make sizable changes possible in a very short amount of time.

Leadership is an oft-mentioned component in qualitative assessments of process success (Cole et al 2010, Evenson et al 2012), supporting the concept of the elected official as a “policy entrepreneur” who actually serves to pair the needs of a community with the benefits of bicycling by taking advantage of conditions conducive to the pairing (and often developing those conditions)(Buehler 2008, Weber 2014). The form that leadership takes can vary widely: some accomplish tasks through coalition building (Anne Paulsen of Massachusetts), others through strong central commitments (Jerry Abramson of Louisville)(Wray 2008). The effectiveness of leadership may or may not rely upon cooperative efforts, but there are cases where that cooperation appears to have been central to progress. Though little work to date has explored this issue in bicycling, strong arguments have been made that coordination of multiple actors (including non-governmental organizations, government agencies, and private corporations) is required for success in project selection and implementation (Pucher et al 2011, Gaffron 2003). Regardless of the details of their strategies, the influence of particular actors (or groups of actors) as leaders is identified as responsible for the success of many community’s efforts to implement policies, projects, and programs.

2.3 Why Multiple Streams?

Reviewing the issue context around a particular policy area often suggests a range of potential directions for any set of research questions. There are numerous competing explanations for policy change that could be considered or at least recognized as potentially applicable to this study, each offering something unique and likely valuable; however, each comes with its own particular limitations, in the end supporting our selection of the multiple streams framework.

Punctuated Equilibrium Theory (PET) shares many of the same assumptions of individual choice as the MSF, including bounded rationality and serial processing, arguing that because of these individual traits policy change in the aggregate is predominantly incremental (small changes to otherwise consistent policies) with these periods of consistency punctuated at points by dramatic policy change, before reaching a new equilibrium (Jones 2003, True et al 2007). While PET does match the general consistency of budget allocations for transportation modes year over year (Low and Astle 2009), it provides a limited causal explanation for this phenomenon, attributing it merely to the level of individual attention to issues. This fails to explain why some changes make it onto agendas and appear to have high saliency and attention, but do not become adopted, and lacks the ability to distinguish between interest, support, and concern. Instead, PET appears to be predominantly a useful descriptive model of change over time, rather than a predictive theory or framework. Since the MSF incorporates a similar descriptive model and the same assumptions, but offers more falsifiable propositions, it appears to be a superior option.

The Institutional Analysis and Development Framework (IAD) suggests that institutions (rules, norms, structures) act to direct the behavior of individuals across policy arenas by providing incentives and disincentives to action. Through this exploration of the role of institutions in causing path dependence and resistance to change it offers potential conditions for policy change to occur. Curtis and Low (2012) propose that policy change can be tied to networks of actors mobilizing to pursue change, or leaders pursuing agenda change, provided an appealing alternative policy is available and the existing policy can be challenged sufficiently. In the case that these conditions are met, institutions may be altered to then preserve the new reality. Interestingly, their proposed policy change process actually provides some support for the MSF, as it suggests both the importance of the policy window and the role of policy entrepreneurs. Although the IAD approach could offer different contributions, and likely a valuable alternative perspective, as currently developed it offers less in the way of causal mechanisms and propositions about relationships than the MSF does. Perhaps future developments to the IAD will make it a viable alternative explanation for policy change, and warrant a return to my research questions through an alternative lens.

The Advocacy Coalition Framework (ACF) offers a very interesting focus on the coordination and collaboration of interest groups and other actors. The ACF focus on policy subsystems as the birthplace of policy change is an intriguing idea that has particular merit for a closed/contested subsystem such as transportation, and meshes with the potential influence of advocacy efforts in the subsystem discussed previously.

However, the ACF's conception of policy change as the result of competing advocacy coalitions which develop around shared belief systems is too narrow to capture the role of particular individuals or partnerships of opportunity or self-interest. Though belief structures are an intriguing piece of the policy puzzle, it's not clear that beliefs alone account for changes in the alignment of actors in political networks (Nohrstedt 2005). In addition, the influence of external (and internal) shocks in the ACF is conceived of as being a direct causal mechanism, but is not developed or operationalized at nearly the level of the MSF or PET, making it unclear that the ACF would be a superior model for major policy change.

Although each of these prominent perspectives offers a unique and informative approach (due to their focus on specific potential components of policy change), they fail to provide for a central causal role played by individuals or small networks of actors willing to leverage a diversity of resources and employ an array of tactics in order to manipulate choice. Given that the limited exploration of bicycle policy adoption has almost uniformly referenced the influence of particular individuals, this is an essential component. Perhaps more importantly, however, is the sense that the contributions of many of the other perspectives might actually provide parallel and not competing claims. For example, the MSF proposes an explanation of the process of policy change, but does not address the process of policy stability, other than implying policy stability as the result of either failed attempts at policy change or the absence of opportunities for policy change. However, the IAD might offer a useful language for exploring policy stability in greater detail. In the case of the transportation policy subsystem, problem solving at the

local level may be iterative and cyclical, meaning issues are only partially addressed and may arise again quickly (since policies are often implemented as projects, pieces of a larger eventual system). Many of the public issues arising in the transportation subsystem(s) may also qualify as “wicked problems”, further complicating the idea of problem “solving” (Rittel and Webber 1973). This could imply that policy entrepreneurs cannot just push for one win, and may in fact have to act in the role over the longer-term. If this behavior is observed here, it may suggest a future development to the MSF that may incorporate the lessons of other approaches (by expanding the MSF’s assumption of incrementalism in the absence of policy change to become less linear and more cyclical). While this is question cannot be fully explored in the limited space here, it does suggest the importance of an awareness of multiple theoretical perspectives when bringing an established theoretical framework into a new context.

CHAPTER 3

THEORY

Developed in the 1980s by John Kingdon (Kingdon 1995) and originally referred to as the “garbage can model”, after the work of Cohen, March, and Olsen (1972), the Multiple Streams Framework represents an attempt to make sense of the complexity of policy change by employing a practical metaphor and an alternative model of individual choice that expects, rather than ignores, uncertainty and ambiguity. Simon and March’s depiction of the policy process as a “garbage can”, where countless different policies are mixed around and then selected from, introduced the idea that the selection of policy was not a process of rational comparison of an exhaustive list of alternatives on the basis of particular agreed-upon metrics. They suggested that instead, a limited number of policy options are considered for reasons that are not always publicly clear, making the process somewhat like reaching into a garbage can and grabbing whatever is close at hand.

Kingdon expanded this idea by converting the metaphor of the garbage can into a new metaphor: three independent streams, representing public problems, policy solutions, and the political context, joining together when circumstances are conducive to provide a window of opportunity for policy change. To capitalize on this window, particularly influential individuals (termed “policy entrepreneurs” by Kingdon) are needed to bring together the resources, information, and appropriate framing for a problem/solution pairing to become accepted onto the policy agenda and implemented as a policy change.

Though Kingdon originally focused his framework entirely on the question of agenda setting (basically the list of actual ideas being considered by the government) at the federal level (Kingdon 1995), others following in his footsteps have found the MSF applicable to decision-making itself (alternative selection)(Zahariadis 2003) and useful at multiple different scales, and across unique contexts (Zahariadis 2003, Guldbrandsson and Fossum 2009, Travis and Zahariadis 2002, Henstra 2010, Ridde 2009, Liu et al 2010).

Multiple streams approaches the question of policy change by challenging the previously common assumption that actors make choices through a strictly rational assessment of the full suite of options available to them. The MSF is built upon a challenge of this assumption of strict rationality, replacing it with a particular model of “bounded rationality” which views choice as being limited by the availability of information and the capacity of the actor for considering multiple options and issues simultaneously (Simon 1979). This view of choice better accounts for realistic conditions of limited cognitive resources, incomplete information, and ambiguity². As public challenges have

² This view of rationality also better reflects some of the criticisms made of the “predict and provide” view of transportation planning. While some have held on to the Rational Planning Model, which argues that planning decisions should aspire to following a process of comparing all possible alternatives on the basis of pre-selected objectives, critiques of this approach have built up over the last two decades (Bertolini 2007, Hysing 2009, Kane and Mistro 2003, Khisty and Arslan 2005, Talvitie 1997, Willson 2001). Although many of these critiques recommend a process that is more open and inclusive of a diversity of stakeholders than the process Kingdon identifies, they share the same model of choice.

become increasingly “wicked” (a term coined by Rittel and Webber (1973) to represent problems that lack clear definitions or stopping points) and politicized, this model of choice has become more widely adopted. What’s especially important about the MSF application of bounded rationality is that it extends this boundedness not only to individuals, but also to the decisions of organizations (such as governments)(Zahariadis 2003).

Though other theories have also accepted the practical limitations on choice that individual actors experience, the MSF emphasis on the limitations impacting organization choice is an important element. At the individual level, these limitations on our ability to make choices forces us to make decisions in a more or less serial fashion, considering first one item, then another, then another. At the organizational level this serial processing becomes aggregated, allowing for parallel processing of decisions (Zahariadis 2003). However, since smaller bodies (such as chambers, councils, offices, agencies, committees, or executives) generally make final determinations, this parallel processing produces streams of problems and solutions, not all of which will be selected or addressed (and which are no longer ordered temporally). In other words, the combination of serial and parallel processing produces a separation of problems and solutions as different actors and organizations focus their attentions in different places. However, as conditions change to facilitate connections being made by those with policy-making authority, problems and solutions may have the opportunity to be connected effectively. Alternatively, absent such connections, policy change will be very slow and path dependent (Curtis and Low 2012). Kingdon expressly identifies the evolution of policy

outside of these periods of accelerated change as incremental, and uses the assumption of incrementalism as the backdrop against which to develop a concept of policy change via coupling of streams.

The mixture of incomplete comprehension and limitations on time, energy, motivation, and other decision-making resources discussed above is what Zaharadis (2003) calls a state of “ambiguity”. Ambiguity is a carefully selected word, not merely suggesting elements of uncertainty influencing choice, but also suggesting the presence of potentially conflicting, varying, and shifting preferences (Zahariadis). Instead of presuming neatly ordered preferences that are well-articulated and understood, the multiple streams model of decision-making highlights the appearance of choices that represent the complexity of competing desires, claims, and priorities and the impact that those elements have on choice at both the individual and organizational level.

As noted previously, the MSF is constructed around the metaphor of three independent streams that are brought together to facilitate policy change. Although the actual independence of these streams (in terms of the actors participating in the activities of the stream) has been challenged (Robinson and Eller 2010), the idea that problems and solutions might exist independently at various points during the policy process seems plausible on the basis of the rise and fall of particular policy proposals attached to different issues at different points in time (Zahariadis 2003). For example, bicycle infrastructure rose to prominence as a policy proposal in the 1970s, attached to the issues of oil prices and insecurity, but generally fell off the agenda until the 1990s and 2000s,

now attached to issues of public health, environment, and the economy (Mapes 2009).

So, despite challenges to the assumption of independence of the streams, the concept of separate streams continues to have merit enough for the assumption to survive.

3.1 The Problem Stream

The problem stream is comprised of actors, indicators, and events associated with the identification, exploration, and understanding of public issues. The number of these issues present at any given point in time may be so great as to be beyond the scope not only of solution, but also even of inventory. Many issues are constant, accepted almost as part of the fabric of existence, a constant element of the world. However, these conditions can rise to prominence as a problem through changes in public values, a redefinition or new understanding of the problem, new evidence or information, or the comparison of a condition to other issues (Kingdon 1995).

Problems may rise to prominence for a number of different reasons. It may be as simple as the identification of a new issue through its development or our sudden awareness (as occurred with the ozone layer), or public exposure to a previously less salient issue during a crisis or other event (the 2014 Ebola outbreaks). On the other hand, an issue might rise to prominence through routine monitoring or special study (climate change), or financial constraints (the Great Recession). The unique circumstances associated with an issue rising to prominence may be varied, allowing for a range of paths for something to go from being an issue, to a problem in need of a solution. At the same time, a problem in need of a solution may still fail to lead to resolution, as many problems continue because

of the lack of a viable solution, the disappearance of public attention or support, or the perception that the problem is either resolved or has become less urgent (Kingdon 1995).

Though the streams are considered independent, many actors may exist in or across multiple streams. Nonetheless, it's possible to imagine the roles of actors who are primarily rooted in the problem stream. These are elected officials who enter office seeking the resolution of a problem in their community, or citizens and residents concerned with an issue facing them. Participants in the problem stream may be non-government interest groups concerned with environmental issues, struggling school systems, campaign finance reform, or net neutrality (among any number of other issues). They may be academic, public, or private researchers studying an issue, or representatives of impacted populations. Regardless of the specifics of their particular circumstances, what they have in common is an interest in a public policy problem.

Transportation policy solutions are often associated with an array of different issues, especially as an increased awareness has developed among planners, officials, and engineers about the relationship between transportation and the environment, public health, and the economy (Bertolini 2007). As these issues (and others) rise and fall in the problem stream they influence the sense of need, urgency, or opportunity for associated solutions. For this reason, policy entrepreneurs seeking implementation of particular transportation policies must pay close attention to fluctuations and shifts in the problem stream. The economic downturn associated with the mid to late 2000s (often called the "Great Recession") has served as a focusing event, drawing attention to issues associated

with banking and finance regulation, but also potentially creating a resistance to more costly purchases (such as large homes and automobiles), or otherwise altering consumer behavior (which could contribute to a shift in policy priorities). On the other hand, some problems are simply redefined over time, such as quality of life. While in the past it may have been associated with the Consumer Price Index or other measures of affordability of cities, the term now often refers to the “livability” of a city, including the presence of particular amenities or lifestyle qualities. Issues can also earn their turn in the stream through shifts in indicators, such as rising rates of obesity, asthma, or cardiac illness.

Each of the aforementioned problems is a viable candidate for association with one or more policy solutions given the right political context, policy pairing, window of opportunity, and an actor to make the connections. They are also examples of some of the problems that policy entrepreneurs might seek to attach to bicycling (the policy solution) in order to implement more bicycle-supportive local policies. Importantly, they are also not the only issues that have been used to advocate for bicycling, nor the same issues that have helped facilitate bicycle policies in the past (Mapes 2009, Wray 2008).

3.2 The Solution Stream

The solution stream is similar in concept to the problem stream, but occupied with answers rather than issues. In the solution stream countless ideas are possible, each capable of being broken down or combined with other ideas as needed to potentially suit a problem in need of solving. Actors in the solution stream can be drawn from the public, private, or nonprofit sector, distinguished by their work in a policy subsystem focused

around a particular potential solution rather than a policy problem. Regardless of shifts in the problem and politics streams, members of the solution stream hold consistently to their particular selected solution in the hopes of attaching it to the right problem³. It can sometimes be simplest to consider the solution stream as full of advocates, each attached to one or a few particular solutions (Kingdon 1995).

Ideas themselves are the most fundamental content of the solution stream, and can on their own sometimes trigger movement. However, ideas are vulnerable, and they can wait for a long time to be adopted (if ever), as they may be resisted or ignored by the general public. Ideas may also not be sufficiently valuable, offering a reasonable answer to a problem either not worth solving or not a high enough priority, leaving the solution to wander on in search of a new problem to solve. An idea must also be acceptable to the public, offering not just a solution but specifically a solution that is appealing in light of the public's values and priorities. Absent this "value acceptability" (Kingdon), an idea may sink back into the stream. Alternatively, an idea may not be technically feasible, garnering interest but not yet ready for implementation, waiting for future developments to afford it another chance. In this way ideas can rise and fall in the stream, to be revisited or altered if needed or possible, or perhaps sinking permanently with the adoption of a more technically or politically viable alternative.

³ Again, problems are not always well defined, or their definitions may be fluid or open to manipulation, particularly if the issue is difficult to understand in a traditional or simple way (see previous mentions of wicked problems). This means actors in the solution stream may, if they are effective PEs, actually manipulate existing problems to attach their solution to them, rather than simply waiting for the right problem.

Since problems are often interconnected, solutions likewise can be interconnected. For example, decisions about transportation policy have implications for a wide array of modes (aviation, freight, transit, passenger vehicles, bicycles, pedestrians). However, policy communities may not always reflect these interconnections; rather, some policy communities (such as transportation) can become highly fragmented, leading them to fail to generate a shared paradigm for progress or discussion (Kingdon 1995). The absence of this shared paradigm can hinder their ability to implement a suite of solutions, or to capitalize on shared opportunities (instead often competing with each other to become attached to a particular problem). This fragmentation in transportation is particularly obvious when considering the unique divisions of agencies and organizations at particular scales. For example, the organizational separation of federal transportation agencies: While the US Department of Transportation (USDOT) oversees national transportation issues, there are major branches responsible for transit (the FTA), highways (FHWA), safety (NHTSA), aviation (FAA), and so on. At the same time, transportation policy recommendations are generated at the national level by advocacy organizations specializing in one or more modes. This fragmentation can lead to competing visions for the same policy solution, and disputes over the appropriate applications, designs, and scales for particular solutions, which in turn hinder the implementation of any one vision.

Although the larger solution stream might contain any number of potential solutions, it can be more useful to focus on the concept of a particular proposed solution, the actors advocating on its behalf, and the development of that idea as a solution over time. For

this particular research project, the focus is on the potential efforts of actors to implement bicycle-supportive local policies (with particular attention to separated and protected bicycle infrastructure). In this case, the solution has been present for quite a long time (the bicycle having been a popular mode of transportation for more than a century, and dedicated infrastructure being only slightly younger), but it has changed noticeably during that time. For example, John Forester, a prominent policy entrepreneur associated with bicycling, was responsible not only for much early engineering guidance in the United States (Forester 1994), but was also a former leader of a major national advocacy group (Mapes 2009). His efforts to combat separated bike infrastructure (out of a desire to protect a practice known as “vehicular cycling”) are considered at least partially responsible for the direction that transportation policy took with regard to bicycles until the 2000s, when changing conditions led to a shift in how bicycle infrastructure is proposed as a policy solution. This redefinition toward encouraging new cyclists allows for bicycling to be attached to new or different policy problems, and to include new or different actors as policy entrepreneurs.

3.3 The Politics Stream

Whereas the problem and solution streams contain particular items (problems and solutions) that can be used to give specificity to the abstraction of the stream metaphor itself, the politics stream is more abstract by nature. This is because the politics stream consists of things like public mood, elections and changes in administration, ideological shifts and dominance, and the pressures of interest groups on public policy (Kingdon 1995). The sum of these interacting elements is the value-charged context within which

problems and solutions are considered, addressed, or ignored. At the heart of this stream is Kingdon's assumption about the limitations on individual actors or organizations to address all issues and consider all solutions: because of this, actors must look to other places to help them prioritize problems and assess the viability of solutions. These assessments are at the core of the behavior of the politics stream.

Much of the political context captured in this third stream is a matter of the perspective of the general population. What Kingdon calls "the public mood" represents the idea that at any given time, it may be possible to assess and identify commonly shared viewpoints across a particular public. While the public mood may not always be very specific (for example, the public mood might be as specific as "desire to respond with military force to an act of terrorism" or as broad as "concern about the economic future of the country"), it is suggested that these shared viewpoints can be, and are, identified (particularly by elected officials) by reference to media, communication with the public, and interaction with other policy actors. While necessarily broad as a concept, the idea of public mood captures the idea that while value disputes may be prevalent around many issues, conditions can arise which allow for shared perspectives to develop (perhaps temporarily). These shared perspectives offer the clearest guidance for policy-makers, and are lower-risk than more contentious issues, making the public mood a very strong signal that a "window of opportunity" might be open.

In addition to public mood, a supportive political context might develop through a shift in administration and authority in the form of new administrative leadership or upheaval

after an election cycle. While public mood may at times be easy to assess, the significant shift in priorities represented by a bevy of newly elected officials can often be taken as a sign of the public's desire for particular priorities. In addition, shifts in administrative leadership may allow for shifts in the political context as well by allowing for new or changing problem definition, the consideration of alternative potential solutions, or the resolution of internal turf battles. While elections and appointments can represent these ideological shifts, they can also simply represent the introduction of new priorities or new opportunities, or the conclusion of past priorities or opportunities, simply by virtue of the attention of individual political actors.

Though interest groups have been identified as potential actors involved in the problem and/or solution streams (perhaps as advocates for a particular solution, or parties drawing attention to an issue of concern), they can also exercise significant influence in the politics stream by putting pressure on actors with decision-making authority. This is particularly the case when interest groups act in union with other groups, demonstrating not only their shared perspective as a potential indicator of public support and priority, but also their willingness to leverage significant political resources to bring attention to an issue or solution.

Political context, including interest group pressures, public mood, and so forth, are a much larger element of transportation policy decisions than was appreciated for quite some time. Transportation policy issues are, despite claims to the contrary, not value-neutral. Instead, values are “inescapable”, in Wach's words (2004), making the

politicization of transportation and the associated public problems inevitable (and in fact necessary). Disputes over transportation priorities are a great example of the politics stream in operation. Public mood is often most visible in the priorities of agencies tasked with transportation policies, such as state DOTs and local government offices, both of which often demonstrate ingrained automobile priorities (Evenson et al 2011, De Zeeuw and Flusche 2011, Handy and McCann 2010). It can also be visible in challenges over implementation, including public feelings of their space being threatened (Vreugdenhill and Williams 2013)⁴.

Public mood can be a major influence on adoption, but interest group pressures can also have significant implications for transportation projects, both in terms of supporting and/or opposing bicycle policy (De Zeeuw and Flusche 2011). The increasing exposure of national interest groups such as the League of American Bicyclists and People for Bikes has implications for the public perception of bicycling as a policy solution. Particularly interesting is the influence of interest groups not only by advocating to officials and by providing some match funding to local projects, but also by funding the travel of administrators and officials to other cities to experience these policies in action (as People for Bikes does with their Green Lane project). Of course, political context can also simply change with the appointment of new officials or administrators who are

⁴ This is a good example of how a shift in policy solution may improve viability, as there appears to be evidence that while dedicating some amount of existing roadway space to bicyclists may build opposition, providing separated facilities may actually be more appealing to both bicyclists and motorists (Monsere et al 2012).

motivated to act as PEs already, and thus suddenly introduce a more conducive context by virtue of their particular position (as was the case in Rep. Jim Oberstar's leadership of the House Transportation Committee, and in a more local example, when Earl Blumenauer was appointed to Transportation Commissioner for the City of Portland (Wray 2008)).

3.4 Windows

Although the three streams are important elements of Kingdon's theoretical perspective, it is the concepts of windows and policy entrepreneurs that are of particular interest to this project, and warrant the most attention. In Kingdon's framework, windows represent the particular circumstances necessary for the problem, politics, and solution stream to be joined (though a window does not necessarily imply that the streams have been joined)(1995). Zahariadis has challenged this assumption, arguing that a window can benefit the joining effort, but is not always necessary (Zahariadis 2003). Though there is some ongoing debate about whether the window should be conceptualized as a necessary condition or a facilitative condition, we can proceed forward for the time being with a general discussion of the idea as follows. Windows represent particular opportunities for action that may arise predictably or unpredictably. For example, a window might open as part of the regular return of a federal authorization to the national agenda (as with national transportation funding bills such as ISTEA, TEA-21, SAFETA-LU, and MAP-21), or with the recurring opportunity for local renewal of a local tax measure (as happens in counties across the United States). On the other hand, a window might be far less predictable, tied to an external "focusing event" (Zahariadis 2003), such as the collapse

of a bridge due to under-funded maintenance priorities, or the death of a local citizen due to unsafe infrastructure conditions or dangerous behavior.

Some have argued that it may actually be possible to create a window, through the efforts of particular actors to generate sufficient public attention and afford an opportunity for action. For example, substantial local investments in transit funding (which often represents a major policy change) may be made possible through special one-off tax referenda created through the efforts of local policy entrepreneurs to provide an opportunity for action (Werbel and Haas 2001, Haas and Estrada 2011). The results of these referenda (many of which end in failure) seem to support the claim by MSF proponents that true windows are more often tied to unpredictable circumstances, rather than the efforts of entrepreneurs to open a window, but that these “manual” windows are nonetheless possible.

Importantly, windows are not limited to opening in any one particular stream. A window could open inside the problem stream, through the sudden identification of an issue, or the precipitous rise to urgency of an issue. Alternatively, an issue might find its way through circumstance into the public view (for example, the death of a child might suddenly draw attention to the issue of safe routes for children to get to school). Windows can also open in the solution stream, through the development of a novel new solution or the combination of previous ideas into a more technically viable or publicly acceptable option. A window can also open from the politics stream, through growing public support for a particular proposed solution, increasing pressure from interest groups (or the

banding together of multiple interest groups), or a change in elected or appointed officials. It's also possible for a window to open simply due to spillover from an adjacent area.

The breadth of possible ways for a window to open can make it difficult for policy entrepreneurs to capitalize on any given opportunity, as windows may shrink and close as quickly as they have opened. This may occur due to failed attempts at progress or issues within the policy process (Mannheimer et al 2007), or simply due to timing issues (Geva-May 2004). Though windows offer an opportunity for action, they still require the correct actions from policy entrepreneurs to effectively couple the distinct streams together; a window by itself will not produce change (Ridde 2009, Zahariadis 2003). This is perhaps not surprising given the many barriers to policy change, particular in terms of implementing bicycle (or pedestrian) projects. Bicycle projects have to overcome lack of interest, omission during planning processes, inadequate data, biased evaluation frameworks, perceptions, coordination challenges, funding, and more (Cole et al 2010).

In the case of bicycle policy, the following events appear to have been examples of windows: (1) major federal transportation policy shifts (for example, the changes triggered by ISTEA and supported by subsequent funding authorizations); (2) the ongoing effort by interest groups (such as national and local bicycle advocacy organizations) to incorporate the public health community and environmental interest groups as allies and partners (Dobson and Gilroy 2009); (3) spikes in public concern about climate change and public health, and (4) the redefinition of bicycling as a policy

solution (around separated and protected facilities to encourage bicycling, rather than shared facilities to empower existing bicyclists). It may be difficult to assess how influential any of these opportunities has been, or how open or closed the windows were (or still are). This is a strong argument in favor of encouraging participants within the actual policy community to identify whether these circumstances are present, and if so, how they may have affected the process.

Windows, as a concept, are not unique to the multiple streams perspective. The idea of focusing events, external shocks, and other perturbations and opportunities as being directly related to policy change is represented in perspectives such as the PET, the ACF, and the IAD. Many of these perspectives also include mention of the potential for influential actors within the policy process. The MSF, however, gives these actors a central role in the causal mechanisms of policy change, and explores in greater detail the functions and characteristics of these actors.

3.5 Policy Entrepreneurs

Policy entrepreneurs (henceforth ‘PEs’) are individuals or small groups that are willing to leverage their resources to advocate for particular policy proposals (Kingdon 1995). Although this definition seems to apply to many interest groups, PEs are distinguished by their efforts to seek significant shifts in policy by manipulating problem definitions, shaping public debate, and developing networks to support their efforts (Mintrom 1997). Kingdon depicts the PE as an “agenda manager”, acting to influence the public agenda by effectively combining particular problems, solutions and contests. In the words of

Schneider and Teske (1992), PEs “use rhetoric, the manipulation of public policy goals, and the distribution of selective incentives to identify and mobilize a winning coalition”. Importantly, PEs are not limited to particular institutional roles: they may be elected officials (though not all officials are PEs (Mintrom 1997)), interest group advocates, bureaucrats, or other leaders.

PE motivations are not always clear, or consistent; some actors may fill the role to solve a problem (i.e. obesity) or implement a preferred solution (i.e. bicycling), while others may see opportunities for career benefits or simply personal satisfaction (Kingdon 1995). Regardless of the diversity in their motivations, effective PEs are often distinguished by particular traits: social acuity, team building, leading by example, and the ability to influence problem definition (Mintrom and Norman 2009, Christopolous and Ingold 2011). Basically, PEs need to have the skills and resources to bring together three streams, which means being able to effectively manipulate all three streams (Oborn et al 2011). Much of this is tied to building networks or coalitions of other actors (Mintrom and Norman 2009, Oborn et al 2011). In order for PEs to be effectively active in the problem and solution stream they need to have a claim to be heard (usually meaning some expertise, position, or other publicly recognized claim), the ability to effectively negotiate, and persistence (Guldbrandsson and Fossum 2009).

Framing is a major element, with actors generating and leveraging information in different ways to influence the decision-making process (Bickerstaff and Walker 2005). Frames (also called “policy images” by Kingdon) can play off of shared cultural

experiences and visions for the future to strategically direct the dialogue around an issue and proposal. Zahariadis sees this action as the key to effective coupling, as PEs attempt to win a battle over policy images (2003). A good example of this might be the use of particular phrases that call on social and cultural cues to create the desired public reaction, as in the phrase “war on cars”, which has been used by news media and other actors to describe policy proposals containing traffic calming, bicycle and pedestrian infrastructure, or other non-motorized investments. The phrase acts to frame the dialogue around such policy proposals by characterizing them as threats, rather than opportunities, taking advantage of things like risk aversion to influence behavior (Kingdon 1995). This process of framing can lead to some perspectives and stakeholders being excluded, and particular goals being prioritized. Given the MSF assumptions about how decisions are structured by experience, ambiguous or unclear preferences, and not by an exhaustive search for alternatives, it is logical that the most effective strategy for policy change is to provide the appropriate politicization to trigger change (Hysing 2009).

Although this framing behavior suggests that PEs can develop and trigger action independently of particular circumstances, I noted earlier that this appears to be fairly rare, as PEs cannot independently control the entire flow of policy change (Crow 2010). Instead, PEs rely heavily on the appearance of windows (as discussed earlier) to facilitate their efforts (Guldbrandsson and Fossum 2009). In this way, PEs are often depicted as being very opportunistic, building necessary networks and relationships to leverage in the case of a particular opportunity for action (Christopoulos and Ingold 2011). These opportunities provide important support for the efforts of a PE to direct the policy

community toward a particular problem and solution combination (Henstra 2010). As discussed before, these windows of opportunity can take many shapes, so it's particularly important for PEs to prepare the process as much as possible, and be ready to act quickly in the case of a window (Geva-May 2004).

In addition to framing, PEs rely heavily on their ability to build networks of support for their efforts, which both preserve and reinforce their efforts to manipulate frames, and also provide the resources (social and political capital, and perhaps financial capital as well) needed to couple the streams. Borrowing the language from an extensive literature on networks, the concept refers to groups of otherwise autonomous organizations or actors which work together to accomplish a shared goal (Provan and Kenis 2007).

Networks are built upon systems of trust and reciprocity, making persistence and social acuity particularly important for network development activity by PEs. A network can support a particular public view of an issue through the visible involvement of key actors (other officials, interest group leaders, or public figures), and improve the ability of the paired problem and solution to defend against opposing coalitions or definitions (Geva-May 2004). Of course, just bringing other actors together isn't enough; those network participants have to have power of their own (Weir et al 2008). That said, the existence of a network can allow for flexibility (Agranoff and McGuire 1999), though it does not guarantee policy success (Agranoff and McGuire 2001). Because of this, network management is a valuable component of successful PE behavior (Mintrom and Norman 2009).

These behaviors are strategies that support the effective coupling of the independent streams, and it is the ability of a PE to succeed in these behaviors that determines their success at implementing desired policy changes. This means that PEs are not equally effective, or that the presence of a PE will ensure policy change; instead, it means that PEs can in fact be more or less likely to succeed (Mintrom 1997, Zahariadis 2003, Christopoulous and Ingold 2011). This claim has been supported by previous studies, which have shown that while PEs are broadly associated with policy consideration and approval (Mintrom 1997, Mintrom 2000, Mintrom and Vergari 1998), PE activities and qualities (particularly persistence, access, framing strategies, and social acuity, among others) are a stronger predictor of policy change (Mintrom 1997, Zahariadis 2003, Zahariadis 2008)

The concept of the policy entrepreneur matches up well with depictions of policy change in transportation, which often note the important role that officials and interest groups play in bringing ideas to the public's attention and then pairing them to existing problems (Marsden et al 2012, Pucher et al 2011). While references to leadership do not always suggest the specific attributes and activities of the policy entrepreneur, the language of "champions" who built a network of support to pursue action is clearly suggesting PE-like activities (Meyer et al 2005, Hysing 2009).

The previously mentioned discussion of Davis notes the critical roles played by Chancellor Mrak and Frank and Eve Child (Buehler 2008); the story is similar in places like Portland, Oregon, where Earl Blumenauer gave Mia Birk the authority and support

needed for major local change to occur (Mapes 2009), and in Louisville, where long-time Mayor Jerry Abramson pushed hard for a major bicycle infrastructure vision (Wray 2008). Gaffron's (2003) study of UK bicycle policies found that the presence of a local committed champion was one of the strongest positive influences on bicycle plans and priorities. These examples are not sufficient to properly assess the accuracy of the MSF, or to reject the MSF and develop an alternative model of policy change. Rather, they perfectly embody the sorts of case narratives that draw attention to the MSF as a viable explanatory perspective for the adoption of bicycle policy actions across the United States.

It's important, given the prevalence of the concept and its use here, to distinguish between policy entrepreneurs and the concept of networks before moving on. Networks are defined in a multitude of ways, but can be broadly characterized as social structures that permit interorganizational exchange, cooperation, and joint production (Agranoff and McGuire 1999). They are maintained by collective-self interest (Imperial 2005), rather than the formal establishment of hierarchical arrays (Meier and O'Toole 2003). Networks are often contrasted with markets or hierarchies (Huxham 2003), which rely on contracts or authority, rather than trust and reciprocity. A network may include multiple policy entrepreneurs, but it could also include no such actors. At the same time, multiple policy entrepreneurs could exist in a space, but absent cooperative coordination they would not constitute a network.

CHAPTER 4

RESEARCH QUESTIONS AND HYPOTHESES

Although bicycling has been the subject of increasing academic attention, particularly in the areas of mode choice factors, benefit analyses of bicycling, and discussions of policies/treatments, much less attention has been devoted to actually studying how communities have made decisions about what policies to adopt, what projects to implement, and what planning to pursue. Is a community better served focusing on building community support, or finding a dedicated influential public figure (the so-called “grassroots vs. grasstops” debate)? Are some cities simply more contextually conducive to implementation and action, or is it a matter of taking advantage of particular opportunities? At the end of the day, is it all just a matter of how much money a community has to spend, or are there ways that bicycling becomes a funding priority? Considering the central role that local governments play in dictating outcomes, this gap in the research represents a critical opportunity to provide meaningful lessons to communities on what will best equip them to be successful at pursuing policy change, and to further our understanding of how policy change occurs at the local level.

Before exploring my research questions and the associated hypotheses further, it’s important to note a couple small diversions I’m making from the traditional MSF application. First, while not entirely uncommon in the literature (Ridde 2009, Liu et al 2010, Henstra 2010), local applications of the MSF require the extension of the MSF

assumptions to potentially different venues. For example, the problem stream may operate slightly differently at different scales: Liu and colleagues (2010) suggest on the basis of their findings that problem indicators and major focusing events are a smaller influence on local policy change than are budgetary considerations and public feedback on policy (which is different from similar national level findings). There may also be reason to believe that solution qualities are more or less important at different scales. It appears that value acceptability and compatibility of the proposed solution with other policies are important at the local level, with technical feasibility and future constraints slightly less so (Liu et al 2010). Although there may be valid criticisms of the use of the MSF at the local level, a municipal study offers methodological, analytical, and theoretical opportunities that are too appealing to pass up.

Second, this project explores decision-making in a broader sense than that originally employed by Kingdon. While Kingdon focused exclusively on agenda setting, transportation policy decisions are often reliant upon a unique process of decision-making which focuses predominantly on planning (a form of agenda-setting) and implementation. Since the barriers to implementation are particularly interesting and changes in policy demonstrated through changes in project implementation suggest a true confluence of streams (Exworthy and Powell 2004), implementation is a valuable component of the decision-making process to study. At the same time, agenda setting is an easier accomplishment, allowing for more opportunities to observe success. For these reasons I focus on both planning (i.e. consideration) and policies, exploring the presence of policy change in agendas and in implementation.

With these asides out of the way, I can dive into the two guiding research questions behind this work. First, why is there such variation in bicycle policies across municipal governments in the United States? This question invariably leads to an associated question: are there factors consistently responsible for this variation? As noted earlier, there may be many possible explanations for this variation, and there are an array of policy change theories (to say nothing of theories of planning, political science, sociology, and other fields which may offer potential explanations) which could be tested. While there are many compelling reasons to begin with a multiple streams approach (as discussed previously), perhaps the most compelling of all reasons is that it matches so well with the experiences of cities documented in both academic (Buehler 2008, Marsden et al 2012, Hysing 2009, Gaffron 2003) and grey (Mapes 2009, Wray 2008, Birk 2010) literature. It's clear from these studies and stories that to understand change with respect to bicycle policy, it's important to be prepared to talk about the role of champions and entrepreneurs as central factors responsible for success or absent in failure.

The first two hypotheses developed from my research questions address the question of whether policy entrepreneurs are in fact significantly associated with either agenda setting or implementation, or whether policy change is merely tied to particular qualities of the local context. H1 and H2 explore not only the presence of PEs, but also their particular qualities and activities, to assess whether PEs can be more or less influential and what aspects of their activity (if any) are tied to success. In both cases, the presence

of opportunities for action (windows) is also incorporated. Windows can be operationalized by identifying whether (1) a problem is well-defined, (2) a viable solution is present, and (3) a conducive political climate exists (along with an occasion for action)(Guldbrandsson and Fossum 2009)⁵.

H1: Agenda Setting - *The public consideration of investment in bicycling as an encouraged mode of transportation (by local governments) is a result of the presence and particular activities (“qualities”) of “Policy Entrepreneurs” and the presence of particular opportunities for action (“windows”), rather than the particular qualities of the local context (such as neighboring governments, local values, and fiscal conditions).*

H2: Decision-Making - *The implementation of investments in bicycling as an encouraged mode of transportation (by local governments) is a result of the presence and particular activities (“qualities”) of “Policy Entrepreneurs” and the presence of particular opportunities for action (“windows”), rather than the particular qualities of the local context (such as neighboring governments, local values, and fiscal conditions).*

⁵ Tests of my survey questions found it very difficult to assess whether a problem is or was well defined. Many problems may be present and part of the discussion, some well defined and others less so. From a survey perspective, there was no immediately effective way to include this aspect, so the final operationalization discussed later focused on components 2 and 3 (though the case interviews attempted to better explore problem definition).

Though the emphasis of my hypotheses is on testing the role of PEs and windows, it's important to control for other elements cited in the literature, including local institutional context and geographic location, among other variables (Marsden et al 2012). There are compelling claims that cities look to regional peers and cities with similar problems and political context/culture, so a region variable was included, as well as demographic and political variables to capture a range of attributes, qualities, and conditions.

Consideration and implementation are important basic steps, and indicative of a minimum standard of policy change and agenda presence. However, the heart of differences in municipal bicycle policy action is the extent of implementation undertaken by that community. As such, PEs and windows of opportunity are expected not only to be associated with that minimum consideration and implementation, but also with increased levels of implementation.

H3: Variation in Policy Action – *The level of implementation of bicycle infrastructure is a result of the presence and qualities of “Policy Entrepreneurs” and the presence of particular opportunities for action (“windows”), rather than the particular qualities of the local context (such as neighboring governments, local values, and fiscal conditions).*

Although H1-H3 explore the question of whether PE impacts vary with PE traits or activities, this study also affords an interesting opportunity to assess whether PEs are more or less effective by virtue of their institutional role. For example, are elected officials more or less impactful on policy change than an otherwise similar actor in an

administrative or interest group position? Alternatively, are the official roles less important than how the individual operates across the streams? Perhaps the key is not particularly their role, but what qualities they display in their work (and which may serve as the important tools of coupling and policy change).

***H4: Variation in Effectiveness** – Elected officials who play the role of “Policy Entrepreneur” have a greater impact on both public consideration and selection of prioritization of bicycling as a mode of transportation than do other actors who play a similar role (specifically interest group advocates and agency staff); Interest group advocates playing a similar role have a lesser impact than elected officials, but a greater impact than agency or department staff playing that role.*

The fifth and sixth hypotheses require the depth of exploration provided by the qualitative component. Hypothesis five proposes that in cases of successful bicycle infrastructure implementation (specifically cases where the city has demonstrated a clear shift towards implementing these facilities), there will be evidence that the problem, solution, and politics streams were coupled. Specifically, there will be an understanding of the problem(s) being addressed and how bicycle infrastructure will function as a solution, and a supportive local political context within which the problem and solution coupling are viable. There will also be individuals that were responsible for facilitating the merging of these streams.

***H5: Coupling of the Streams** – In order for a “window” of opportunity to support a shift in infrastructure implementation the streams must be effectively coupled. Coupling is a shared conception of the problem and bicycle infrastructure as a solution, along with a supportive local political context, and one or more entrepreneurial individuals to facilitate this coupling.*

Finally, a sixth hypothesis is included to begin to explore a question I believe may be an important next step in understanding local policy change. As policy change in many issue areas, including transportation, is not comprehensive but rather still occurs in phases and stages (as a larger plan is implemented over time), it may be interesting to begin to consider the role that PEs play not only in spurring one-time policy change, but also in building networks of actors and resources that continue to support the policy change in future plans and projects. This hypothesis is inspired by discussions of collaboration and collaborative advantage (Hajer and Kesselring 1999, Huxham 2003), which may warrant future exploration in the context of entrepreneurial behavior and policy change. The previous distinction between PEs and networks is important here, as identifying a network means identifying the cooperative and reciprocal coordination of multiple actors (and absent a hierarchical structure governing them). The telltale involvement of both staff and citizens (who otherwise lack a structure for cooperation) in planning decisions over time may be a strong indicator of the presence of a network.

H6: Post-Entrepreneurial Activity – *Networks established by policy entrepreneurs act to preserve the long-term consideration and implementation of the policy change after policy change occurs.*

Though these hypotheses are a limited number of the possible questions that could be posed, they should offer a substantial step forward in building upon the MSF, improving our understanding of policy change, and providing a theoretical basis for future study of transportation policy change (particularly the growing adoption of bicycling as a priority).

CHAPTER 5

METHODS AND RESULTS

In order to explore something as complicated as policy change effectively, particularly when studying a policy area that has received relatively little attention to date, it's important to employ a methodology that offers the best opportunity for a comprehensive and open ended exploration of the issue, while also bounding the study sufficiently to provide a useful selection of conclusions and directions for future work. This is all a longer way of saying that the benefits of a mixed methods approach were very clear for a case such as this. By offering both a quantitative and qualitative element, this project is able to apply an existing theory and test its applicability, as well as explore the issue in greater depth to identify theoretical improvements or alternative recommendations where necessary. Epistemologically, a mixed methods study allows for a mixture of generalizability in findings (in line with a more traditional model of science as falsifier or verifier), as well as enhanced validity in its claims (as recommended by a more Interpretivist model of science). Combining these two qualities together is a superior option to simply accepting the limitations of a purely qualitative or quantitative project.

5.1 Epistemological grounding for mixed methods

The challenges to the traditional positivist model of science and the neo-positivist tradition of social sciences that has followed are well documented and widely known (Fischer 1998). Nonetheless, in their focus on the use of empirical study and the search

for generalizability, these models of science provide a practically useful paradigm for the evaluation of questions of correlation, and should not be dismissed entirely (Lowry 2010). Instead, a qualitative component may be introduced to allow for the consideration of alternative forms of knowledge, and to better support efforts at understanding causal mechanisms (and thus improve the validity of any claims). By rejecting the limited neo-positivist perspective on valid knowledge claims, a broader array of content can be considered and more meaningful analysis of complex practical conditions can be conducted (with the potential for normative commentary and the consideration of values that would be otherwise excluded). At the same time, a total rejection of these long-standing empiricist traditions of science would fail to reflect the value of associated standards of rigor and consistency in conducting research.

As such, a pragmatic, post-positivist epistemology is adopted here, which focuses on the importance of practical reason (aka experiential knowledge). By relying on the perspectives of practitioners to reveal knowledge through the lens of their experiences, this project can better capture the actual functions of process rather than a purported “objective” reality as represented through pure sampling and aggregation. Further, it allows for a more earnest assessment of the practices of decision-making, seeking to understand policy change as it occurs in practice, rather than as it is expected or intended to occur. Others have demonstrated the reality of transportation decision-making as being highly political, with values as relevant to choice (if not more so) as technical analysis (Meyer and Miller 2001). With this reality in mind, a heavy emphasis on exploration and experimentation was selected as the proper procedure to suit this pragmatic approach.

While efforts were made to develop generalizable conclusions on the basis of empirical evidence (in line with the neo-positivist tradition), there were efforts to develop a practical understanding through discourse and interaction with research subjects (in the form of semi-structured interviews with a diversity of local actors) and critical reflection on important context and meaning.

Despite the significant philosophical and epistemological advantages of subjective assessments (especially when confirmed inter-subjectively), my reliance upon them in both the quantitative and qualitative components of the project will require some amount of caution. Subjective assessments are filtered through the unique lens of experience of each respondent, as well as a local context, and the resulting assessments may be skewed as a result. For example, individuals with less exposure to best practice facilities as seen in cities like Amsterdam or Copenhagen, or with a personal leaning toward trails or vehicular cycling practices, may be more likely to rate the implementation level of their city higher than they might otherwise. Or the inverse, that a city with a view to what they have yet to accomplish may undervalue the extent of their implementation to-date. I intended to mitigate these effects by reference to objective measures (i.e. mileage), but as noted later these measures can also vary widely from person to person. In the end, I believe that the attempt to inter-subjectively confirm these assessments offers a better way to leverage the value of experiential knowledge with a stronger filter against bias.

Although qualitative and quantitative projects seek to accomplish two seemingly contradictory tasks (generalization and specification), the ideal of merging these

components together into an effective mixed-methodology is common. The project thus becomes a matter of melding the interpretations called for by a qualitative project with the efforts at generalization that are called for by a quantitative project. Put another way, the task is to collect data and to situate it into an interpretive framework that gives the relationships meaning (Fischer 1998). The MSF does of course come with its own epistemological “baggage” of sorts, in that it makes particular assumptions about the fundamental nature of choice, ambiguity, and uncertainty (as noted previously). It will be important to consider these assumptions and explore them as components of the qualitative project.

This project is fundamentally asking three types of questions: (1) *how* do policy changes occur, (2) *who/what* is the cause of these changes, and (3) *why*? Since methodological approaches vary in how well suited they are to particular types of questions, identifying the types of questions being asked helps to select the right tools for this project (Yin 2009). A survey offers the ability to generate evidence that can support claims about how and who/what questions, but lacks the ability to effectively explore why questions in the depth that proper scientific understanding requires. Case study research, on the other hand, offers the opportunity to delve further into both how and why questions (Yin 2009). By combining the two tools it should be possible to conduct a more complete analysis and generate useful knowledge (useful meaning both generalizable, the hallmark of success for quantitative research, and accurate, the hallmark of success for qualitative research). It's for these reasons that a mixed methodology offered the ideal tool for approaching the research questions posed next.

Although the survey and case study methods are discussed in greater detail as seemingly separate projects below, the two instruments were designed to generate meaningful evidence together. Serial mixed methods, where either the qualitative or quantitative method informs the other, offer the opportunity to use the results of one method to inform and improve the other method. There are benefits to either leading with the qualitative method (the flexibility of the method allows for great exploration of the issue early on in the process), or leading with the quantitative method (improved theoretical grounding and guidance for interview practice and content). Since my interest is in developing a superior explanatory model and understanding, it makes sense to utilize a so-called “explanatory sequential design”, where a quantitative approach is used in some way to establish preliminary findings and relationships which support the superior selection of qualitative cases, methods, etc. (Creswell and Plano Clark 2011). In addition to allowing for the superior selection of cases, this sequential approach made it possible to tweak the interview design and hypotheses based on the survey results, and will provide a post-positivist anchor to a more interpretivist case analysis and approach (helping to ensure that the process is conducted in a theoretically-grounded and rigorous manner). As noted, I began with a quantitative (survey) research instrument that was provided (per details below) to a sample, and generated results that in turn provided a stronger rationale for the selection of final case study cities and questions. In this way the two methods are able to improve the accuracy of each other, and provide for a stronger final product.

5.2 Quantitative Methods

Data collection for the quantitative portion of this mixed methods study involved the presentation of an electronic survey to a pair of identified contacts (one from the local municipal government and one representing a knowledgeable advocate) from each of the 200 most populous municipalities within the United States (per 2012 Census Data). This was selected as the study population for a number of reasons: Firstly, it offered a sufficient population size to reach a statistically meaningful sample size while still allowing for a limited response rate. Secondly, it offered a diverse array of municipalities, ranging from cities that exist at the core of major metropolitan areas (cities like New York City or Los Angeles) to cities that are suburban (San Bernadino or North Las Vegas) or actually a unique secondary or tertiary urban core in a metro area (St. Paul or Tacoma). Thirdly, most of these cities are sufficiently populous to conduct their own transportation planning and implementation work (rather than passing/sharing that responsibility to a county or regional agency), making them actually the site of decision-making. Such metropolitan communities are also far more likely to make bicycle investments (Cradock et al 2009, Evenson et al 2011), which is important for reaching a statistically meaningful number of cities that have adopted the policy change (though it also skews my sample toward observations with the policy change). The full list of cities included is available as an appendix⁶.

⁶ Additional project materials can be made available upon request

First-round contacts for each survey were identified through an email request to the city office of engineering, planning, and/or public works for a knowledgeable contact within their local government; email and phone call follow-ups were then conducted as needed to secure a preliminary contact. Once this contact was verified, they were offered the opportunity to participate in the survey. At the end of the survey they were asked to recommend other individuals in their community who may represent knowledgeable perspectives on the issue as well, including other government staff, elected officials, or non-governmental actors (such as advocates or private citizens). The goal of this snowball sample was to reach a sufficient number of individuals for each city (optimally at least 3) to fill gaps in any survey responses, and to ensure that the information about a city is at least potentially confirmed or supported, and not limited by availability of information for any one individual.

The survey remained open for almost two months, to allow sufficient opportunity for individuals to respond and provide additional contacts. Completed responses were regularly harvested for new snowball participants, who were asked to participate in turn. The content of the survey focused on identifying possible policy entrepreneurs, assessing the presence and substance of any potential windows of opportunity, and asking participants to describe the level and nature of their city's investments, support, and consideration of bicycle infrastructure and other policies⁷.

⁷ A complete copy of the survey instrument is included as an appendix

The selection of dependent variable measures to include for this project was an important task, and one that required careful reflection. The full range of bicycle policies, projects, and programs that a community can select to employ is quite large; in addition to policy actions intended to directly encourage bicycling (such as improved infrastructure or incentives), policies to discourage automobile use are also highly influential to bicycling (Buehler 2011). However, given the somewhat exploratory nature of this project and the broad array of possible policy actions, I've focused on the implementation of infrastructure in each dependent variable. A challenge remains in that infrastructure improvements are nuanced policy actions: the addition of a new segment of shared lane markings along one road is not the same thing as adding a dozen miles of protected bike lanes. There are a spectrum of different infrastructure and programming treatments to select from, some more effective or accessible than others, and with different purposes.

For this reason, the primary dependent variable will be the artificial "level of implementation" ordinal variable, developed by reference to respondent assessments of action taken in their community (respondents were asked to rate their city's scale of bicycle infrastructure implementation on a 1 to 7 Likert scale, where 1 is no consideration and 7 is substantial implementation). Though this variable will be reliant upon the perspectives of respondents for its accuracy, it's important to appreciate local actors' assessments for their potential to capture a more complex local reality and the nuances that are not visible in more objective metrics such as mileage, density, or best practice implementation. Additionally, this metric allows cities to capture the range of their facility types in a physical context that may be quite relevant to assessing the quality of

their infrastructure network. For example, a broad network of shared lane markings and traffic calming could represent a high level of implementation in a dense residential population, but in a space dominated by high-volume arterials the same facilities would not have the same effectiveness.

In order to also provide for a consistent comparison, a limited number of more readily available and consistently quantified output measures will be employed. These include measures of bicycle infrastructure built within the last ten years, both independently and adjusted for city scale (total land area). While the level of nuance in these other measures is low, they offer a consistent and measurable variable that each actor can easily identify. In addition, they offer an excellent starting point for the consideration of alternative measures to be employed in future projects. Additionally, a suite of independent variables were included to represent essential demographic and theoretical attributes; a full list of variables included in the final working data set are included below as Table 1 and Table 2.

Table 2 displays the full selection of independent variables included herein. The survey instrument provided responses to important theory-driven independent variables such as level of influence of local advocacy groups, the presence of a “window of opportunity”⁸,

⁸ As noted earlier, tests of my survey questions found that it very difficult to assess whether a problem was well-defined. From a survey perspective, there was no effective way to include this, though the case interviews attempted to better explore it. As such, the window variable in my models contained the two remaining components: whether a

the presence of a PE, and the net level of local support for bicycle infrastructure. I also collected responses around PE role (elected official, advocate, or administrator/staff) and PE attributes (social acuity, network management, expertise, opportunism, connectedness, persistence). Finally, the type(s) of problems being discussed in the community that have been attached to bicycling or bicycle projects (including congestion, cost of living, air quality, economic development, economic competitiveness, etc.).

Table 1. Dependent Variables⁹

Dependent Variable	Variable Type	Variable Name	Source
Level of bicycle infrastructure implementation	Ordinal	implementlevel	Survey
Consideration of bicyele projects by city	Dichotomous	considered	Survey
Implementation of bicycle projects by city	Dichotomous	implemented	Survey
Consideration of protected/separated projects by city	Dichotomous	considerprotected	Survey
Implementation of protected/separated projects by city	Dichotomous	implemprotected	Survey
Miles of shared infrastructure built in last 10 years	Continuous	milesshared	Survey
Miles of separated infrastructure built in last 10 years	Continuous	milesdedicated	Survey

supportive political context was present (based on a dummy variable of local political support score), and whether the city had considered and discussed bicycle infrastructure as a solution option (a dummy variable for consideration). An ordinal window score of 0-2 was then converted into the window variable utilized here, a dummy variable for an open window (1) or lack of a window (0).

⁹ Variables with a strike through them indicate those where data was collected but issues with the data led to its exclusion from the study.

Table 2. Independent Variables

Independent Variable	Variable Type	Variable Name	Source
City Population	Continuous	city_pop	2012 Census Bureau
City land area	Continuous	city_size	Census Bureau
Population Density	Continuous	pop_density	Census Bureau
Percentage of population between 20 & 24 years of age	Continuous	perc_ya	Census Bureau
Median age	Continuous	med_age	2013 ACS estimates
Percentage of population that is white	Continuous	perc_white	2010 Census Estimates
Median income (2009-13 average)	Continuous	income	2014 Census Estimates
City tax revenue per capita	Continuous	taxes_capita	Tausanovitch (2014)
City expenditures per capita	Continuous	expenditures_capita	Tausanovitch (2014)
Census region	Categorical	region_political	Census Bureau
Level of influence of local advocacy group	Ordinal	advoimpact	Survey
City “ideology” score	Continuous	Ideology_pos	Tausanovitch (2014)
Policy entrepreneur presence	Dichotomous	pe	Survey
Window open (city has considered infrastructure, and political environment is supportive)	Dichotomous	window	Survey
Coupled streams (window is open and a policy entrepreneur is present)	Dichotomous	coupled	Survey
Level of support (how much support does the city have for bicycle infrastructure from staff, etc?)	Ordinal	netsupport	Survey
Level of supportive for infrastructure is net positive	Dichotomous	possupport	Survey
Problem shopping: bicycle projects have been discussed as possible solutions to air quality	Dichotomous	airquality	Survey
Problem shopping: congestion	Dichotomous	congestion	Survey

Table 2 (Continued)

Problem shopping: cost of living	Dichotomous	costliving	Survey
Problem shopping: economic competitiveness	Dichotomous	econcompete	Survey
Problem shopping: economic development	Dichotomous	econdev	Survey
Problem shopping: energy use	Dichotomous	energyuse	Survey
Problem shopping: livability	Dichotomous	livability	Survey
Problem shopping: public health	Dichotomous	publichealth	Survey
Policy Entrepreneur (PE) displays: persistence	Dichotomous	pe_persist	Survey
PE displays: social acuity	Dichotomous	pe_savvy	Survey
PE displays: network management/team building	Dichotomous	pe_collab	Survey
PE displays: expertise	Dichotomous	pe_expert	Survey
PE displays: opportunism	Dichotomous	pe_opport	Survey
PE displays: connectedness	Dichotomous	pe_connect	Survey
PE is/was an: elected official	Dichotomous	peofficial	Survey
PE is/was an: administrator	Dichotomous	pegov	Survey
PE is/was an: interest group representative	Dichotomous	peadvocate	Survey

The survey responses were supplemented with data collected about the cities from the Census Bureau, specifically the American Community Survey (ACS), as well as data sourced from a study of municipal policy and ideology (generously made available by Tausanovitch and Warshaw (2014)). Census data was incorporated as eight different independent variables. Measures of city scale used include 2012 city population (used since early phases of respondent contact collection began in late 2013), city land area in square miles, and population density (which was not used in any final models due to the specific and opposing relationships observed when replacing it with city size and city population). Age was included as two different variables, median age and the percentage of the population between ages 20 and 24. Median age was intended as a general measure of the city's age, while the 20-24 age bracket was selected as an attempt to capture the college-age population of a city (which has been found in other studies to be potentially associated with bicycling rates). Percentage of city population that is white was also included, since some studies have found a correlation between being white and rates of bicycling (which might also impact infrastructure implementation). Three measures of wealth were used as independent variables: median income (a 2009-2013 average, since some cities in the sample have seen major changes in median income between 2008 and 2014), city tax revenue per capita, and city expenditures per capita (the latter two drawn from the 2007 Census of Governments via Tausanovitch and Warshaw (2014)). Census region was also included as a way to test for potential proximity or geographic correlation effects.

Figure 1 below describes the fully specified model to be used for testing hypotheses 1-4, including the complete suite of independent variables utilized for my purposes. For each test result in the results section, the dependent variable is clearly specified. Appendix 1 includes a more complete breakdown of the various model iterations (including fully and partially specified models) used to test each hypothesis, as well as the variation in the model necessitated by the method utilized (per the variable type of the dependent variable).

$$\begin{aligned}
 DV = & \beta_0 + \beta_1(\text{window}) + \beta_2(\text{pe}) + \beta_3(\text{citypop}) + \beta_4(\text{citysize}) + \beta_5(\text{percwhite}) \\
 & + \beta_6(\text{medage}) + \beta_7(\text{netsupport}) + \beta_8(\text{regionpolitical}) \\
 & + \beta_9(\text{expenditurescapita}) + \beta_{10}(\text{ideology}) + \beta_{11}(\text{peadvocate}) \\
 & + \beta_{12}(\text{peofficial}) + \beta_{13}(\text{congestion}) + \beta_{14}(\text{airquality}) \\
 & + \beta_{15}(\text{costliving}) + \beta_{16}(\text{econcompete}) + \beta_{17}(\text{econdev}) \\
 & + \beta_{18}(\text{energyuse}) + \beta_{19}(\text{livability}) + \beta_{20}(\text{jobaccess}) \\
 & + \beta_{21}(\text{advoimpact})
 \end{aligned}$$

Figure 1. Complete general model specification

Since my dependent variables are of different types (ordinal, dichotomous, continuous), a mixture of slightly varied analytical tools was used to test each of the quantitative hypotheses. Primary among the dependent (outcome) variables is the measure of policy implementation, an ordinal measure that requires the use of some form of ordered logistic regression. Ordered logistic regression is a well-established tool for multivariate analysis of non-ordinal independent variables and an ordinal-level dependent variable (Winship and Mare 1984), built upon a clever solution to the problem of ordinal variables: ordinal level variables are a useful way to capture qualitative data without attempting to overly simplify them by converting them into a continuous variable or a dichotomous variable

(McCullagh 1980). However, the practice of using linear models to study ordinal dependent variables has been widely criticized for the limitations of linear models to capture ceilings and floors on variables, or the fact that most real-world data do not extend beyond a bounded maximum or minimum, particularly so for the phenomena being captured by ordinal variables (Winship and Mare 1984). Instead, ordered logit (and probit) operates by assuming instead that the ordinal variable is the limited observation of an underlying and unobserved continuous variable with upper and lower bounds (McKelvey and Zavoina 1975), making it possible to more accurately conduct tests with ordinal level dependent variables¹⁰. Another way to conceive of the ordered logistic regression is as a model of nonlinear probability, but the idea is roughly the same. The dependent variable is broken up along interval groups (termed ‘cuts’), and the model reports the influence of the independent variables on the dependent variable as an attempt to estimate the underlying proposed continuous quality of the dependent variable.

The other dependent variables (consideration and implementation of general bicycle infrastructure or protected/separated infrastructure) are dichotomous, allowing for the use of more traditional logistic regression. Logistic regression utilizes the same basic concept underlying regression from a straight line, but with variation to account for the expected shape of the line based on the dependent variable. In the case of logistic regression, the

¹⁰ It also assumes proportionality of odds (that the distance between the levels of the ordinal variable can be treated as equivalent), though in cases of the violation of the proportion of odds assumption a generalized ordered logistic regression could be used instead (Williams 2006).

expected shape is not linear but instead logarithmic (having a clear minimum and maximum with a changing marginal curve approaching both the minimum and maximum). This shape is a good approximation for dichotomous variables, and the use of logistic regression for these purposes is well established (Gelman and Hill 2007).

5.3 Quantitative Results

After two months, the survey generated 195 total individual responses across 136 unique cities. Multiple observations were merged as described previously to create city-level observations; 46 cities had multiple responses, with the vast majority having two responses but a few having three or even four. The variation among these responses actually highlighted issues with the infrastructure mileage variables, as discussed below. The tables below feature my descriptive statistics after aggregating and cleaning the data my dependent variables (Table 7) and independent variables (Tables 3-6). The cities included in the final sample are of course larger (as I sampled based on population), but included a large quantity of the sorts of medium-to-large cities that make up much of the urbanized area in the United States. The cities ranged widely in ethnic make-up, percentage of population that is aged 20-24, median income, and tax revenue and expenditures per capita. Notably, the large standard deviation on city population is due to the major population outlier of New York City (along with Los Angeles); similarly large ranges exist for city size and income, as well as the taxes per capita and expenditures per capita values (due to the DC outlier). The cities also represented each of the census bureau regions, though a large majority came from either the West or South regions, together accounting for well over half of all the cities included.

Table 3. Descriptive Statistics - Demographics

Demographics	N	mean	sd	min	max
city_pop	136	454720.4	833498.50	128119	8336697
city_size	136	132.9167	179.4689	14.8	1704.7
perc_white	136	47.44485	18.4348	7.8	86.8
med_age	136	34.34044	3.072443	26.4	44.6
perc_ya	136	8.461765	2.486737	3.1	22.4
income	136	53030.43	16424.15	26325	108302
region_political	136	2.860294	1.554791	1	6
taxes_capita	136	989.7877	879.8913	369.4546	8628.871
expenditurescapita	136	2108.014	1530.381	553.5317	14053.33
ideology_pos	136	0.8237081	.3099604	.0003542	1.536511
mode_share	136	0.009625	0.0122468	0	0.083

Conducting some basic scatterplots and histograms revealed that many of my variables have natural positive skew, an important consideration for any linear regressions that might have been conducted (though again, there are red flags for these continuous dependent variables). There are also some outlier cases: New York City (population and density) and Washington, DC (expenditures per capita). Any analyses using these variables will likely need to exclude these cases or be aware of the way that they may skew the results. In this case, I'll opt to remove DC and NYC from the sample for all hypothesis testing, as comparative models show that the inclusion of the two cases does have notable impacts on the model results. This also draws attention to one of the challenges of my selected sample: because I sampled at one end of a particular variable (city population), skew is to be expected across many variables, and any extrapolations or generalizations to the larger population of municipal governments will be limited to similarly sized cities (generally those having more than 125,000 residents). Beyond these concerns, my distributions of demographic variables (median age, income, etc.) are

reasonably normal, suggesting that my sample itself is not particularly skewed in terms of these characteristics.

The local context of these communities is generally supportive (see Table 4), with 70% of cities reporting a supportive political context and the average “support score” across all cities a 10.36 out of 15 (9 represents a broadly neutral environment across elected officials, administrators, and agency staff). The standard deviation for support score highlights that support score is reasonably spread out, with cities falling along the spectrum and not just clustering around the mean (not surprising, given the range). The average in each of these components was above neutral, with elected official political support higher than support from administrators or agency staff by a small amount. The value of this general local support will reappear as a major point in the case study comparisons, and further support the hypothesis that the breadth and intensity of local support is an important factor associated with high rates of the dependent variables (as discussed below).

Table 4. Descriptive Statistics – Local Context

Local Context	N	mean	sd	min	max
coupled	136	0.5882353	0.4939724	0	1
window	136	0.7058824	0.4573296	0	1
netsupport	136	1.757353	1.551565	0	6
supportscore	135	10.36296	2.234757	3	15
politicalsupport	136	3.845588	1.067213	1	5
officialsupport	135	3.259259	0.9381067	1	5
agencysupport	135	3.451852	0.9978972	1	5

In terms of the problem stream, bicycling seems to have been discussed most often as a livability and public health policy action, with a slight majority of cities also attaching it to concerns around air quality, congestion, and economic development. Interestingly, energy use, job access, and cost of living were not nearly as common.

Table 5. Descriptive Statistics – Problem Discussions

Problem Stream	N	mean	sd	min	max
airquality	132	0.5681818	0.4972164	0	1
congestion	132	0.5606061	0.498204	0	1
costliving	132	0.2424242	0.4301821	0	1
econcompete	132	0.469697	0.5009821	0	1
econdev	132	0.5151515	0.5016743	0	1
energyuse	132	0.2272727	0.4206667	0	1
jobaccess	132	0.3257576	0.4704426	0	1
livability	132	0.9090909	0.288575	0	1
publichealth	132	0.8257576	0.3807628	0	1

Policy entrepreneurs were identified in 86% of all cities. Of these 123 identified policy entrepreneurs, 37.4% were elected officials and 30.9% were agency staff. Interest group advocates were only identified as 15.4% of these PEs, and unaffiliated citizens were a tiny 1.6%. Despite this, advocacy organizations were considered as influential, with respondents characterizing them on average as somewhat influential. No particular PE character traits stood out, however, with persistence, personal investment, collaboration, expertise, and political savvy all present in 40-50% of cases. Interestingly, patience (one of the major traits emphasized in previous work on PEs) was only associated with 29% of PEs, the least common trait.

Table 6. Descriptive Statistics – Policy Entrepreneur Variables

Policy Entrepreneurs	N	mean	sd	min	max
pe	132	0.8560606	0.3523655	0	1
perole	123	1.894309	1.054366	0	4
pe_collab	136	0.5147059	0.5016313	0	1
pe_invested	136	0.5220588	0.5013598	0	1
pe_expert	136	0.4558824	0.4998911	0	1
pe_opport	136	0.3455882	0.4773178	0	1
pe_patient	136	0.2941176	0.4573296	0	1
pe_persist	136	0.5	0.5018484	0	1
pe_savvy	136	0.4264706	0.4963922	0	1
pe_connect	136	0.3382353	0.4748581	0	1
advoimpact	113	5.548673	1.349545	1	7

Among the dependent variables, there are some immediately obvious trends (see Table 7 below). The entire sample of cities reported that they had at least considered bicycle infrastructure, and 95% had implemented some sort of facilities. 82% had considered protected facilities, and 59% reported that they had implemented some of these facilities. Additionally, the average implementation level that respondents reported was over 5 (“some implementation”). Taken together, this suggests one of three things: either (1) the vast majority of cities in the country have, as of 2016, had bicycle infrastructure on their agenda and taken some action in terms of implementing facilities, (2) the sample includes a disproportionate number of policy action cases, or (3) these subjective assessments are artificially inflated.

Given that respondents were aware of the research purpose when deciding to participate, it’s quite possible that cities who felt they had not considered or taken action with regards to bicycle infrastructure were less likely to participate in the survey than cities that had

taken action. It's also possible that respondents' assessments were skewed in some way; perhaps by their familiarity or experience with certain types of facilities, their access or involvement in particular local conversations, or subjective benchmarking relative to other communities or their own local plans/context. Possible evidence of each of these factors came up in the case study interviews that followed, but more prominent was the sense that a large majority of communities were indeed aware of bicycle infrastructure as a policy option, had considered or implemented some facilities, and were slowly expanding their network.

Table 7. Dependent Variables

Dependent Variables	N	mean	sd	min	max
considered	136	1	0	1	1
considerprotected	136	0.8235294	0.3826294	0	1
implemented	136	0.9558824	0.2061156	0	1
implemprotected	136	0.5882353	0.4939724	0	1
implementlevel	136	5.169118	1.314056	2	7
milesdedicated	135	44.12852	74.13743	0	435
milesshared	135	39.50074	48.90236	0	230.1

Given the suite of dependent variables available to us, I have the ability to look at a number of different measures of policy action (including dummy variables for consideration and implementation, continuous variables for miles of infrastructure, and ordinal variables for perceived level of implementation). Importantly for all of these dependent variables, a thorough test of multicollinearity (see Appendix 1) reveals that outside of the obvious cases to avoid (“coupled” as a variable is built from “window”, and taxes and expenditures per capita are obviously correlated since a city’s expenditures

are mostly a function of their tax revenue), multicollinearity is not significantly violated by my variables.

The continuous dependent variables (miles of dedicated or shared infrastructure) run into some notable issues, however. During data cleaning it became obvious that despite the seeming objectivity of measures of infrastructure, there was significant dissension between respondents on how much infrastructure had been built within the last ten years. Specifically, where two or more respondents existed for any given city the average range between their estimates for infrastructure was 36.4 miles for dedicated infrastructure and 40.9 miles for shared infrastructure. For shared infrastructure this range was almost an entire standard deviation, leading to concerns that any conclusions drawn from use of these dependent variables will be precariously built upon problematic data. It's possible that the wording of the question necessitated too much interpretation, or that that data is simply incomplete or unknown in many cases, but either way that range is great enough to throw any conclusions on the basis of that dependent variable into question. These issues and concerns about heteroskedasticity and normality would need to be addressed if using a linear regression; because of this the possibility of using these sorts of continuous dependent variables will be revisited at another time. Fortunately, my dichotomous and ordinal dependent variables are not subject to the same restrictions or issues (though they may cause some problems, there are as yet no widely accepted ways to identify or correct heteroskedasticity in logistic regressions, so I proceed though with a note of caution).

My primary hypothesis tests quickly reveal some interesting findings with implications for MSF. I begin with the most basic dependent variables (consideration and implementation binaries, Tables 8-10) and then move on to the dependent variable of greatest interest, implementation level (Table 11). 100% of the survey cities had considered bicycle infrastructure in some form, so that dependent variable was removed from my testing. General implementation faces a similar challenge, since the vast majority of my sample (95%) reported some sort of infrastructure already implemented. As such, the findings associated with the implementation dependent variable (Table 8) must be reviewed with some caution. I begin, as with all of my models to follow, with a model containing only the two most basic theoretical variables, and then introducing demographic variables in two batches to see whether they notably change the effect of any other variables¹¹.

¹¹ Note: there was insufficient variation in the dependent and independent variables to include the policy entrepreneur attribute or role variables in these tests (they perfectly predicted the dependent variable). An even larger sample could address this issue in the future.

Table 8. Implementation of Bicycle Infrastructure

VARIABLES	(1)	(2)	(3)
LR chi² (10) = 31.55		Prob>chi² =0.00	Pseudo R² =.65
window	0.0355	-1.523	-2.398
	(0.899)	(1.171)	(1.802)
pe	1.213	1.154	-0.268
	(0.910)	(1.196)	(2.324)
city_pop		3.58e-05*	7.89e-05*
		(1.96e-05)	(4.53e-05)
city_size		-0.00236	-0.00685
		(0.00440)	(0.0203)
perc_white		-0.0257	-0.0170
		(0.0293)	(0.0548)
med_age		-0.226	-0.404
		(0.152)	(0.269)
netsupport		1.412**	2.734**
		(0.636)	(1.276)
region_political			-1.483
			(1.125)
expenditures_capita			0.00308
			(0.00225)
ideology_pos			-1.360
			(4.720)
Constant	2.058**	4.824	6.194
	(0.926)	(5.762)	(9.790)
* p<0.05; ** p<0.01; *** p<0.10			

While the only two significant independent variables in any of the models being the level of net positive support from local officials and staff and city population is interesting, it's mostly going to serve as a supplementary finding for the other regressions. That said, as net support increases the log-odds that a city has implemented bicycle infrastructure also increases (a relationship strongly associated at the .05 level). Though the limited amount of non-implementation cities in the sample makes these outcomes less generalizable than the other tests, this finding is generally in accordance with the takeaways to follow from other tests. In the more limited model specifications a city with a larger population is also more likely to have implemented infrastructure, a relationship with some theoretical implications. On that note, neither the window variable nor the presence of a policy entrepreneur was significant in any of these models.

Tables 9 and 10 test the protected infrastructure dependent variables. Protected and separated infrastructure currently occupies the position of best practice for facilitating bicycling as a behavior and is an area of great attention and interest in the research and advocacy communities. It's also far less common in my sample for cities to have either considered or implemented these projects, so the tests have more variation in the dependent variable to work with, and represent a policy change that has had less time for diffusion and adoption than other facility types.

In the case of consideration of this infrastructure (Table 9), I found that even as I expanded the model specification to include pe role and problem shopping and a full suite of demographic variables, the presence of a policy entrepreneur was one of the two

strongest predictors of whether a city had considered protected infrastructure, demonstrating a strongly positive relationship with consideration. The odds of a city with a policy entrepreneur having considered protected infrastructure were a staggering 135 times larger than the odds for a city without one. As substantial an impact and notable a relationship as that is, it's equally curious that while the impact of the local advocacy organization on considered was indeed significant, the relationship was actually negative, suggesting that the odds of considering protected infrastructure are worse for a city with a more influential advocacy organization. I ran the same tests replacing the advocacy impact variable with a dummy to stand in for only those advocacy organizations deemed as most influential (scoring a 4 or higher out of 7), and the relationship was still negative (though only significant at the .10 level). This is a very unintuitive outcome, to say the least. Population was once again on the cusp of significance, as each additional person living in a city corresponded to an .00001 increase in the odds of a city have considered protected infrastructure, all other variables being constant. In the final model (#5), job access (+), cost of living (-), and economic competitiveness (+) as problem areas attached to bicycle projects were also associated at the .10 level. This suggests that problem shopping could indeed influence what types of policy proposals make it onto local agendas and are considered.

Table 9. Consideration of Protected Infrastructure

VARIABLES	(1)	(2)	(3)	(4)	(5)
LR chi² (21) = 46.11		Prob>chi² = 0.0012		Pseudo R² = 0.5145	
window	0.531 (0.486)	0.758 (0.799)	0.356 (0.890)	0.577 (0.927)	0.877 (1.293)
pe	1.537*** (0.550)	2.281** (0.961)	2.193** (1.010)	3.130** (1.237)	4.910** (2.070)
city_pop		9.06e-06** (4.44e-06)	6.54e-06 (4.78e-06)	7.20e-06 (4.95e-06)	1.12e-05* (6.24e-06)
city_size		0.00190 (0.00481)	0.00545 (0.00804)	0.00447 (0.00777)	0.00377 (0.0105)
perc_white		-0.549 (1.822)	0.724 (2.105)	0.333 (2.177)	1.078 (4.016)
med_age		-0.195** (0.0987)	-0.207* (0.110)	-0.205* (0.115)	-0.189 (0.206)
netsupport		0.0273 (0.260)	0.0633 (0.277)	-0.0297 (0.285)	-0.0129 (0.423)
advoimpact		-0.496* (0.286)	-0.607** (0.290)	-0.637** (0.316)	-1.202** (0.484)
region_political			-0.132 (0.254)	-0.149 (0.252)	-0.324 (0.309)
expenditures_capita			-0.000200 (0.000403)	-0.000126 (0.000404)	0.000192 (0.000505)
ideology_pos			-3.700** (1.583)	-4.266** (1.770)	-4.296* (2.246)
peadvocate				-1.545* (0.886)	-0.561 (1.193)
peofficial				-0.446 (1.348)	-1.128 (1.953)
congestion					-0.541 (1.129)
airquality					2.358 (1.453)
costliving					-3.155* (1.772)
econcompete					3.154* (1.665)
econdev					1.246 (1.024)
energyuse					-0.797 (1.402)
livability					-1.089 (2.316)

Table 9 (Continued)

jobaccess					2.676*
					(1.590)
Constant	-0.0983	6.683*	11.79**	12.47**	10.70
	(0.560)	(3.560)	(4.700)	(5.019)	(7.240)
Observations	130	108	108	108	105
<i>* p<0.05; ** p<0.01; *** p<0.10</i>					

Curiously, most of the relationships identified previously (in relationship to consideration of protected infrastructure) did not present themselves again when testing the implementation of protected infrastructure. Implementation of protected infrastructure to-date (Table 10) replaces the seeming role of policy entrepreneurs with a significant relationship between the dependent and the presence of a “window of opportunity”¹². The odds of having implemented protected infrastructure for a city with an open window (or at least significant local support) were 3.63 times those of a city without a window, all other things being constant.

City population is strongly significant, building further support for the claim that larger cities are acting as the leaders in these facilities. As population increases here the effect on odds is slightly smaller than for consideration (odds ratio = 1.000004 rather than 1.000011), which seems reasonable given that it’s easier for projects to make it on the agenda than to be implemented.

¹² Again, this variable is a construct made from the politicalsupport variable, where window is a yes if they recorded a 4 or 5 out of 5 (i.e. somewhat or highly supportive) on level of support from local elected officials, and a no if otherwise.

Table 10. Implementation of Protected Infrastructure

VARIABLE	(1)	(2)	(3)	(4)	(5)
		Prob>chi ² = 0.0004		Pseudo R ² = 0.2898	
LR chi² (21) = 49.5					
window	1.641*** (0.420)	1.571*** (0.556)	1.402** (0.601)	1.386** (0.604)	1.290** (0.650)
pe	1.126** (0.569)	0.938 (0.607)	0.631 (0.663)	0.653 (0.700)	0.458 (0.814)
city_pop		4.50e-06*** (1.63e-06)	4.01e-06*** (1.54e-06)	3.92e-06** (1.55e-06)	3.68e-06** (1.61e-06)
city_size		-0.00112 (0.00193)	-0.000730 (0.00145)	-0.000682 (0.00146)	-0.00110 (0.00159)
perc_white		-0.0411 (1.306)	0.686 (1.391)	0.576 (1.411)	0.281 (1.628)
med_age		-0.115 (0.0742)	-0.128 (0.0789)	-0.124 (0.0794)	-0.0978 (0.0903)
netsupport		0.123 (0.165)	0.134 (0.172)	0.135 (0.173)	0.0907 (0.188)
advodummy			-0.0329 (0.523)	0.0289 (0.551)	-0.0511 (0.590)
region_political			-0.294* (0.157)	-0.291* (0.158)	-0.331* (0.174)
expenditures_capita			0.000109 (0.000272)	0.000136 (0.000274)	0.000119 (0.000284)
ideology_pos			-1.517 (1.052)	-1.451 (1.060)	-1.348 (1.120)
peadvocate				-0.158 (0.540)	-0.0968 (0.583)
peofficial				0.373 (0.762)	0.159 (0.815)
congestion					0.252 (0.546)
airquality					0.322 (0.571)
costliving					0.0986 (0.668)
econcompete					0.462 (0.644)
econdev					0.207 (0.510)
energyuse					-0.133 (0.706)

Table 10 (Continued)

livability					-0.0171 (0.917)
jobaccess					0.525 (0.580)
Constant	-1.816*** (0.619)	0.908 (2.387)	3.417 (3.000)	3.199 (3.023)	2.264 (3.403)
Observations	130	130	130	130	126
<i>* p<0.05; ** p<0.01; *** p<0.10</i>					

In this case, population is not directly leading to consideration or implementation, but is providing the conditions within which a city is apparently more likely to be pursuing these projects, regardless of the city's per capita budget or other factors (though census region is close to a significant factor). Since some of the factors I might otherwise propose are underlying this are already included in this model (expenditures, city conservatism, issue priorities), this introduces an area for further attention moving forward.

Despite the interesting relationships presenting themselves in the previous tests, protected and separated infrastructure represent a narrower scope, and don't fully address the primary research questions posed. To do so, I turn to my ordered logistic regression with implementation level as the dependent variable (Table 11). In these model iterations I found that while the presence of a policy entrepreneur was not significantly associated with level of implementation, the presence of a window was once again very strongly associated with the dependent implementation variable. For cities with an open window, the odds of having a high level of implementation (7 out of 7) versus the other levels of implementation are 12 times greater than for cities without an open window. Holding all

other values at their mean, the predicted probability that a city would have a high level of implementation (greater than 4 out of 7) is only .54 when a window is not open.

However, when a window is open the probability rises to .91. This suggests that while a window is not necessary or sufficient with regard to implementation level (even in the absence of a window, with the other values at their mean cities would be predicted to have higher levels of implementation a majority of the time), it is a major facilitating factor to have that particular local support.

City population was also significantly associated once again (up to the .01 level), though this time it was joined by city size as well (at the .05), with the percentage of the population that's white and the ideology score of the city being somewhat significant (at the .10). City population continued to have a positive impact on the outcome variable, but with a slightly smaller effect than the other tests. With other variables at their mean, a shift in city from 100,000 to 200,000 produced higher predicted probabilities for an implementation score of 5 or greater, and a shift to 500,000 would make the predicted probability of a high level of implementation over .90 (roughly the same opportunity presented by an open window). City size, however, had a smaller but significant negative impact on a city's level of implementation. It's possible that as a city is physically larger it includes a larger infrastructure network and thus the expectations for a high quality bicycle infrastructure network are physically larger as well (making it in some ways harder to meet a similar level of quality or network density as a smaller city).

Table 11. Implementation Level

VARIABLE	(1)	(2)	(3)	(4)	(5)
		Prob>chi² = 0.000		Pseudo R² = 0.2090	
	LR chi² (21) = 24.18				
window	2.473*** (0.419)	2.508*** (0.474)	2.301*** (0.484)	2.305*** (0.487)	2.530*** (0.539)
pe	1.030** (0.484)	0.984* (0.521)	0.761 (0.521)	0.774 (0.544)	0.502 (0.592)
city_pop		1.82e-06*** (4.98e-07)	1.49e-06*** (4.76e-07)	1.51e-06*** (4.86e-07)	1.57e-06*** (4.82e-07)
city_size		-0.00353** (0.00171)	-0.00241* (0.00137)	-0.00243* (0.00138)	-0.00293** (0.00144)
perc_white		1.56 (1.02)	2.20** (1.06)	2.22** (1.07)	2.06* (1.22)
med_age		0.0523 (0.0610)	0.0418 (0.0617)	0.0399 (0.0622)	0.0501 (0.0729)
advodummy		0.110 (0.396)	0.0827 (0.401)	0.0941 (0.414)	0.236 (0.445)
possupport		0.0642 (0.427)	0.129 (0.430)	0.124 (0.436)	-0.104 (0.462)
region_political			-0.170 (0.116)	-0.170 (0.116)	-0.147 (0.127)
expenditures_capita			-0.000171 (0.000181)	-0.000175 (0.000183)	-0.000196 (0.000187)
ideology_pos			-1.464** (0.741)	-1.484** (0.747)	-1.417* (0.792)
peadvocate				-0.0219 (0.407)	-0.146 (0.454)
peofficial				-0.152 (0.532)	-0.228 (0.596)
congestion					-0.188 (0.435)
airquality					0.719 (0.438)
costliving					0.667 (0.518)
econcompete					-0.274 (0.479)
econdev					0.243 (0.377)
energyuse					-0.00719 (0.496)

Table 11 (continued)

livability					0.220 (0.653)
jobaccess					-0.0978 (0.423)
Constant cut1	-0.826 (0.541)	1.739 (2.027)	-0.745 (2.289)	-0.826 (2.315)	-0.618 (2.691)
Constant cut2	0.314 (0.498)	3.006 (2.022)	0.543 (2.276)	0.461 (2.302)	0.985 (2.676)
Constant cut3	0.989** (0.504)	3.727* (2.030)	1.266 (2.281)	1.184 (2.307)	1.801 (2.683)
Constant cut4	3.001*** (0.575)	5.931*** (2.077)	3.537 (2.314)	3.453 (2.340)	4.225 (2.720)
Constant cut5	4.999*** (0.640)	8.150*** (2.130)	5.854** (2.343)	5.773** (2.367)	6.619** (2.745)
N =	130	130	130	130	126
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.10$					

Expanding this model to replace PE presence with the PE attributes doesn't lead to any substantial changes, with window, city population, and city size remaining the significant predictor variables. Interestingly, replacing the city size and city population variables with the population density variable has a notable impact on the model, as population density is not remotely significant (suggesting that sheer scale of a city is far more important than the interaction effect presented by density), but the ideology score becomes very significant. Since city size and city population are having competing influences, it's not surprising that combining the two into one variable loses the potential explanatory impact of both. Simplifying this model (which includes population density) by removing the entrepreneur attributes and problem topics (neither of which had any impact in that model) changes nothing, with the window and ideology score being the two sole factors of any significance. This suggests that city population and/or size are capturing underlying factors that, when removed, manifest themselves in ideology. This could mean that ideology and city size and/or population are directly related, have a common underlying phenomenon, or other possible explanations that may warrant further exploration in the future. Either way, ideology score is potentially another piece of this explanatory puzzle.

The complexity of these findings, with some relationships reappearing and others showing up only in certain specifications or in relation to particular dependent variables, cements the value of a mixed methods project. While a more in depth discussion of the potential implications and lessons learned from the quantitative methods is called for, first I employed those findings to inform a set of comparative case studies. These

interviews allowed for the exploration of relationships identified previously, as well as research questions that cannot be effectively explored through a survey instrument. Most pressing in the face of the quantitative results are the following questions: (1) are policy entrepreneurs important outside of the agenda setting process; (2) what do windows look like in practice, and how do they become converted into action; and (3) how is city size potentially playing a part in these policy considerations?

5.4 Qualitative Methods

As noted previously, a qualitative component provides the opportunity to generate more valid claims and a better understanding of my research area. Interview questioning of direct process participants allows their experience and expertise to color my analysis, rather than relying too heavily on the structure imposed upon data by my expectations, hypotheses, and models. Though the suite of qualitative methods available are expansive, a case study approach will allow for comparison of observations in a manner similar to the quantitative analysis, and interviews represent a critical source of information (especially given the pragmatist epistemology underlying this project).

The case study component consisted of six case study cities, each explored by conducting a series of semi-structured interviews with local individuals with direct experience and expertise regarding the local policy change process and the consideration or implementation (if present) of bicycle projects. To ensure that individual experience, bias, and other potentially problematic subjective aspects didn't distort the case comparisons an inter-subjective confirmation process was used. A minimum of three

perspectives was required per city to enable an effective “triangulation” process using their narratives and responses. The contact list utilized for the survey outreach was used to identify primary contacts, with additional contacts sourced via respondent reference (aka snowballing) to generate a minimum of three contacts per city, with a fourth present based upon strong recommendation in Springfield and Fresno.

One of the advantages of a serial mixed methods approach is being able to use quantitative data to inform the selection of case pairs, rather than relying on a blind or biased pairing of cases (Creswell and Plano Clark 2011). Case study research is often critiqued for its overreliance on researcher preference for particular case observations, often falling prey to the appeal of convenience, familiarity, or extraordinary cases, rather than selecting theoretically defensible and informative pairs. To that end, I elected to utilize the bundle of city-level data to identify pairs of cities that are similar across a suite of independent variables but with maximum difference in the dependent variable.

Fortunately, an analytical package to accomplish this was recently developed by Nielsen (2015). While a few previous mixed methods projects have utilized Propensity Score Matching (PSM), PSM generates a scalar based on the covariates of the model variables that may lead to similar cities in terms of the aggregate covariate space but noticeable difference in any given control variable. While the option selected for our purposes also generates spread in any given control variable, the resulting pairs should be closer in this regard than alternative matching techniques (Nielsen 2015).

The superior option at this point was utilizing Mahalanobis Matching. This matching process pairs using Mahalanobis Distance, a measure of geometric distance between two points in space across multiple dimensions, while also being able to incorporate the level of “spread” between the dependent variable for each observation as a way to select “similar but different” cases. In this way it’s possible to maximize the dependent variable difference while also minimizing the difference in the control variables to generate a list of cities with a “pair” that is different in terms of implementation but more broadly similar otherwise. Utilizing Nielsen’s Mahalanobis Matching software package for R Studio, ten matches were generated based on the ten independent variables considered most impactful based on their presence at significant or close to significant in the quantitative models discussed earlier. This includes: implementation level (as the treatment variable), and income, median age, population, city size, percentage of population that is white, ideology score, window presence, policy entrepreneur presence, expenditures per capita, and net support score.

Table 12 displays the ten strongest matches generated, including the measure of distance between the case cities and their treatment spread with regard to level of implementation. Mahalanobis Matching allows for a variety of choices to be made in the selection and generation of matches, including the selection of weights, the specification of spread, and the inclusion of variables. Though the survey results provided a clear basis for the selection of variables, I elected to exclude any weighting (though it may have been valid to weight according to significance or effect size) in order to generate variable-neutral case pairings. However, since treatment spread is the measure of separation for the cases,

the resulting case pairs were less likely to include pairs of more populous cities (since large cities had a lower likelihood of having a low treatment score). Though this is not a serious flaw, future uses of this matching process to generate case pairs may want to carefully weigh the impact of maximizing treatment spread, compared to selecting a more moderate different in outcome variables.

Table 12. Matched City Options

Mahalanobis Distance	Fresno	Joliet	Treatment Spread
3.42	Fresno	Joliet	5
3.44	Fresno	Townville ¹³	5
5.19	Amarillo	Fresno	5
6.33	Townville	Tampa	5
8.23	Joliet	Tampa	5
8.77	Dayton	Springfield	5
8.94	Joliet	Long Beach	5
9.12	Philadelphia	Springfield	5
10.14	Irvine	Joliet	5
10.16	Long Beach	Townville	5

As displayed above, many of the generated case pairs contained the same cities (Fresno, Tampa, Joliet were paired a number of times). It's possible that this was due to their position as otherwise reasonably average cities (in this sample) with more extreme implementation level scores (either a 2 or 7 out of 7, to be precise). However, since each case city could only be used once, I selected the best (in terms of Mahalanobis Distance)

¹³Per the request of our case study participants, this case city will be referred to by a pseudonym. The remaining case city participants agreed to have their city publicly included in the project.

pairs that contained two cities not yet already selected in a pair. Table 13 displays the 3 resulting sets of case pairs, as well as the Mahalanobis Distance and the treatment spread (with each city having a score from 1 to 7 on a Likert scale) for those pairs.

Table 13. Case Study Cities

Fresno	Joliet	Mahalanobis Distance	Treatment Spread
Joliet, IL	Fresno, CA	3.42	5
Townville	Tampa, FL	6.33	5
Dayton, OH	Springfield, MA	8.77	5

Table 14 meanwhile displays the suite of variables included in the match generation and each city’s value for those variables. As expected, the case pairs are not exactly identical, and in some cases vary fairly widely, but the matching method tells us that the cities are in similar positions across the bundle of variables. Despite this general matching, as more information is gathered in the future it is possible using these matching techniques to weight particular variables in the matching process. For example, if population, ideology, and local support continue to display a significant role in bicycle infrastructure at the local level it may warrant giving these variables more weight in future case pairings. Fortunately this sample of cities included a number of recommended pairings (as shown in Table 12), indicating that we can potentially draw conclusions not only from direct comparison of case pairs but also some amount of cross-comparison with other cities as well. This should help to illuminate better the role of different factors and inform future efforts to replicate or improve this process. A bit of extra validation for these city comparisons comes courtesy of variables not included in the matching: the bicycle mode share numbers for the six cities suggest that the high implementation score cities also

have higher mode shares than the low implementation score cities (1.3% average vs. 0.13% average), and much higher levels of facility mileage reported (180 miles average for the high implementation cities vs. 2.8 miles average for the low implementation cities).

Table 14. Matched City Variables

City	Fresno	Joliet	Tampa	Townville	Dayton	Springfield
Implementation Level	7	2	7	2	7	2
Population	505882	148268	347645	201867	141359	153552
Size (sq.miles)	112	62.1	113.4	105.4	55.7	31.9
Median Age (years)	30	33.1	33.5	34.6	34.4	32.7
Percent White	30%	53%	46.3%	40%	50.5%	36.7%
Ideology score¹⁴	0.995	1.08	.838	1.10	.754	.482
Window	0	0	1	0	1	0
Income	42015	61744	43242	38633	28456	34311
Expenditures per capita	\$1,286	\$1,435	\$1,844	\$1,437	\$1,312	\$3,296
Net support	0	1	3	0	4	3
PE	1	1	1	1	1	1

Participants for the interviews were identified through a small snowball sampling method, beginning from the survey participant who completed the survey on behalf of that city. This individual ensured that the perspectives gathered through the case interviews would also have a direct grounding in the same information and perspective as the survey data, though with the opportunity to substantially improve upon the depth,

¹⁴ Ideology score is structured as follows: a score of 0 indicates a city that is totally liberal across the different policies inventoried by Tausanovitch and Warshaw (2014) while a score of 2 is totally conservative, and 1 is neutral.

detail, and accuracy of the experience for each city. Since bicycle projects/policies can be considered through the formal planning process or as an independent transportation or recreation infrastructure proposal, it was important to identify multiple actors with the ability to speak to if, how, and when their city had considered and/or implemented bicycle facilities. After participating in the interview, participants were asked to identify other parties knowledgeable about local decision-making, or who were involved in the process. A specific effort was made to engage a staff perspective, a regional perspective, and a non-government perspective (such as local interest group actors or active members of the public). As the case interviews revealed, each party has a distinctly unique perspective on decisions made based on their role, and in some cases participants also had widely varying levels of expertise, experience, and frankness. The range of perspectives facilitates generating a broader view of the local policy process.

Interviews ranged from 22 to 86 minutes, and were organized around a series of structured interview questions informed by the MSF and the research hypotheses (the full interview instrument is included as Appendix 3). Interviews were conducted over the phone¹⁵ due to the significant physical separation of the case cities, and to reduce variation in the research process. Respondents were encouraged to elaborate and explore potentially useful or important diversions from these questions, with the emphasis placed on empowering the participant to identify critical information, rather than allowing the

¹⁵ A mobile application, TapeACall, was used to record interview conversations and proved quite effective in ease of use and quality of resulting audio.

researcher to fully direct the conversation (in line with the suggestions of Seidman (2006)). The goal was to draw out major themes and recurring elements of the respondent's statements, and verify them with the respondent to confirm their accuracy (Seidman 2006). This interview-based case study research process can be vulnerable to criticism, but given the strong theoretical grounding and clear propositions, I am confident in the ability of this interview method to generate valid research findings.

Interview responses were review via the interview audio; note documents were then created to record individual question responses (and themes) and common themes and answers across respondents. Individual response notes were then combined into a shared city note document to allow perspectives to be directly compared, contrasted, and combined as appropriate. Contents of these note documents were organized by response category (in terms of the major topics discussed), and the resulting reports are similarly structured around these core areas, though the order and connection of them varies to allow for a more natural depiction of the history/experience for each case city.

The results of all interviews in a city were used to compile these general "triangulated" case history reports (an attempt to bring together the experiences of multiple actors to produce an inter-subjectively accurate description of the policy change history and experience of their community). These draft case reports were then improved by having respondents review them and provide edits and changes to the report, thus ensuring that their local experience and knowledge truly direct the study, rather than the reports being merely the interpretations of the researcher. These reports can then be compared and

contrasted to provide for the development of more generalizable case study conclusions, and comparison to my hypotheses. In multiple case studies such as this, organization of information becomes especially important, so having a consistent approach is a necessary element of the qualitative methodology. In addition to ensuring a consistent approach to developing the case city reports, this organization also supports the comparison of cases to my hypotheses and each other.

Using interviews as the sole form of data collection for cases comes with risks, and given far more time and a less ambitious research project it may be desirable to include other documents and sources of information (such as ordinances, planning documents, news records, etc). These materials would be relevant to creating a more thorough case study, but were simply outside the bounds of what was feasible for a comparison with 6 cities in a mixed methods approach. Additionally, the mixture of elites and non-elites in my interviews as well as their high levels of familiarity with the topic at hand should mitigate any concern that essential historical or contextual information is missing from the case studies.

5.5 Qualitative Results

As stated, each report that follows was created by combining the responses and feedback of the full suite of interview respondents together into a cohesive and accurate historical narrative. These documents are abbreviated overviews emphasizing notable events, actors, influences, context, and other aspects of the story of bicycle infrastructure consideration and implementation in each of the case communities. Importantly, these

reports should be free of any unfair or inaccurate characterizations through the process of mutual review. However, value assessments, critical judgments, and subjective feelings are valid information for these purposes, as they represent important pragmatic content. Balancing the desire to be accurate and complete with the limitations of time and individual knowledge was a challenge, and it's of course possible that even with the experience and expertise of the interview respondents that some pieces of information are missing or not completely accurate. While fewer case cities would have allowed even greater confidence through additional interviewees per city, it would have come at the cost of greater generalizability and cross-case comparison. Given the diversity of respondents included and a thorough approach to interviewing, participant review, and editing, I am confident that the reports that follow are sufficiently accurate to support their use for comparison to my hypotheses, and my participants expressed a similar confidence.

To preserve the anonymity of these respondents, the case cities are referred to by a number designation rather than the name of the city. Additionally, identifying details that might threaten the anonymity of respondents (such as names, locations, specific dates, or highly unique details) have also been excluded. Any information important to understanding the unique context or circumstances has been included, and once again, interview respondents had an opportunity to review these materials before they were finalized and gave final approval of the reports.

5.5.1 Case Study Report – Fresno, CA

Fresno has been considering or implementing bicycle infrastructure in some form for at least two decades, with an active advocacy community in the area led by a small group of residents that have generally been successful at making it onto the local agenda. Their early and ongoing success at contributing to local agenda setting appears to be a result of expertise, persistence, and a willingness to pursue and even create opportunities. Though not directly tied to the efforts of these advocates, the city's existing infrastructure network owes much to a city ordinance directing that all development projects provide infrastructure alongside their property (including the provision of sufficient space for bike lanes). The late 90s also saw the formation of a formal advocacy group representing the area.

While Fresno began implementing on-street facilities in the late 90s, the 2000s saw a slight expansion in planning and retrofitting as part of the city's first Bike Master Plan. Additionally, the county began preparations for the possible renewal of a local half-cent sales tax dedicated to transportation investments. Citizen advocates, led by one in particular, succeeded in expanding the opportunity for bicycle projects in the scope of this potential funding source by securing bicycle projects a dedicated set aside as well as clarified language that would ensure trail projects were viable options. When the sales tax measure was passed (in the latter half of the decade) it provided a significant influx of funding for bicycle projects that also opened up additional funding opportunities by creating a pot of funding to serve as local match for federal grants through the Congestion Mitigation and Air Quality (CMAQ) and Transportation Enhancements (TE)

programs, among others. Accessing this sales tax revenue also required that communities have a bicycle master plan, an opportunity that coincided with similar efforts of a staff engineer and the local bicycle advisory committee. Importantly, the city was beginning to face the realities of the national economic recession at the same time, making the opportunity to access additional funding a vital priority for the city.

In the late 2000s Fresno hired the aforementioned staff engineer, who quickly expressed a significant commitment to bicycle and pedestrian infrastructure improvements. In addition to championing the city's application as a Bicycle Friendly Community, this engineer had a substantial impact on the city's bicycle infrastructure network thanks to a willingness to push projects past city leadership in unconventional and contentious ways. By using the community's consent calendar and practice of green lighting regular city business, the engineer implemented a variety of projects within the city. While widely praised by the bicycling community, these projects (especially a series of road diet projects) generated serious resistance from the public, culminating with public criticism of a bike master plan update for its inclusion of road diets and a \$2 billion "visioning" list of potential projects. In the face of these criticisms shifts in the composition and attitudes of city council followed, and the staff engineer left the position and a charged political environment behind in the early to mid 2010s.

Despite the sizable gains realized by the somewhat unilateral action of this engineer, the resulting dynamic appears to have stalled out other efforts to build out projects or generate support for a more ambitious vision. Current local concerns over air quality and

economic vibrancy have provided the impetus for projects and public and political support at times, and the city is generally active in planning and implementing. However, local officials continue to struggle with balancing proposals for more ambitious and contentious infrastructure (such as road diets) with the community's general attitude towards bicycling and preference for driving given the convenience (thanks to an expansive roadway network) and the sprawling structure of the city. Perhaps because of the popularity of recreational bicycling in the city and surrounding areas, the general public characterizes bicycling as a behavior of convenience and relaxation and thus a lower priority than transportation investments. Opportunities to secure funding have been the most impactful in terms of generating political support for bicycle infrastructure projects, and the state's continued attachment of sustainability considerations (such as active transportation) to transportation funding has been a noticeable boon to supporters of bicycle projects in the area. Nonetheless, funding remains one of the few major barriers to more comprehensive policy action in this area, especially in the face of a post-recession reality.

While the city's current bicycle infrastructure network is sizable in sheer mileage, it is broadly characterized as disconnected due to the manner in which new facilities are constructed (relying predominantly upon developers). In time these gaps will be filled, but the older parts of the city remain a sizable political challenge, as adding infrastructure would require sacrificing on-street parking, a direction which the community has expressed it is unwilling to support. The challenges of funding, political support, and the existing physical structure of the city combine to make Fresno a sort of incomplete

success story. It may be in transition, but whether that transition is toward more aggressive bicycle infrastructure implementation is not entirely clear. The city's bicycle advisory committee has higher levels of engagement than ever before, but at the same time the level of implementation by the city in the five years has been generally stagnant, if not slightly declining compared to its previous peak. This seems to be attributable to a mixture of staffing changes, political realities, and the "low hanging fruit" effect (whereby a community's first efforts are more fruitful as they accumulate the easier wins available, but then face the more difficult decisions of prioritization that may follow). Right of way challenges are pervasive as well, with some segments of the city roadway network likely impossible to retrofit for bicycle accommodation without acquiring more right of way (which is widely considered a non-starter).

It appears that city staff are increasingly open to a diversity of projects, in part due to the state and national support for these projects and improvements in guidance and training opportunities. However, the major barriers remain political or community support and funding; so long as those barriers remain the city will continue to see its network built out in an incremental manner as development continues its path around the city. It's possible that much of the backlash to past projects is subsiding, but it's unclear whether future projects requiring sacrifices for the sake of bicycle accommodation would gain traction locally. As such, the city is in a period of regrouping as staff, citizens, and officials consider how to approach the next level of projects, which may require hard construction, right of way takes, parking restrictions, inter-agency agreements, etc. In the meantime, Fresno continues to see continual expansion of its network thanks to the aforementioned

hard working local ordinance and the general interest of citizens and officials in the idea of bicycle infrastructure.

5.5.2 Case Study Report – Joliet, IL

Bicycle infrastructure in Joliet consists exclusively of a network of off-street multi-use trails developed and maintained by a regional trail organization. Though the trail organization has its own revenue sources and is broadly responsible for the entire network, it has a strong collaborative relationship with communities like Joliet. Joliet has at various times provided capital, preservation of network gaps, and is planning to play a larger role in future efforts to connect the trail network to the city core. Nonetheless, the regional trail organization is responsible for the vast majority of bicycle infrastructure in the area, and has taken the lead on planning for bicycle infrastructure as well. The trail network they manage is fairly large, and expands at a reasonably steady rate annually thanks to their efforts and the contributions of other partners (such as Joliet).

Joliet has a history as a blue-collar, working class community with narrower roads and an old grid pattern in many places (in addition to areas of a usual suburban development pattern). These narrow streets are cited as a challenge for adding on-street facilities in Joliet. In the mid 90s to early 2000s the city experienced its largest period of trail network expansion, fueled by an influx of revenue, city interest in quality of life projects, and new subdivision construction requirements. The city's major contribution to this endeavor was the creation of a requirement on all housing developers to put in asphalt multi-use trails along major arterial roads in lieu of typical sidewalks. The trail

organization and other partners effectively leveraged the opportunity presented by the aforementioned revenue and new housing construction for a number of years, but eventually funding levels returned to normal (and the housing boom slowed) and excitement around trail projects subsided. Trails seem to have been the only bicycle infrastructure to gain traction in part because of a community interest in recreational facilities (and greenways in particular), compared to a lack of interest or even disinterest in active transportation.

Though the city currently has no on-street facilities, planning has been conducted to select roadway corridors and appropriate facilities to connect the city's downtown core to the regional trail network. This was inspired by a number of factors, most immediately the need for an update to the city's outdated downtown plan (which had last been updated in the early 1990s) and growing interest in downtown from citizens, advocates, and planners. With the addition or expansion of higher education institutions in the area the downtown core has become the focus of more attention as a way to generate economic activity (and appeal to a younger population). Previous to these proposed improvements, Joliet has relied on existing neighborhood streets (as well as trails developed through its housing constructions requirements) to provide connections to the trail network. Though some streets in the city are effective slow-speed neighborhood connections naturally, and may not require much in the way of infrastructure, no specific efforts to date have specifically assessed whether and where this is the case. At the same time as the city begins to consider on-street facilities for the first time, changes at the state level (e.g. bicycle accommodations must be incorporated into local plans) are also putting pressure

on city and county organizations to do more around bicycle facilities, which may be starting to influence organizational culture in transportation departments across the state. Still, changes are slow to spread across large organizations like state DOTs, and those organizations often maintain important roadways and other infrastructure connections (such as bridges or tunnels) that may serve as major gaps in a bicycle infrastructure network without active support and partnership from the state.

Much of the absence of on-street bicycle infrastructure implementation in Joliet is attributable to a general lack of local interest and support for said facilities. Officials aren't necessarily opposed to bicycle infrastructure, but by and large view these projects as a luxury for communities with bigger budgets. Funding is a major challenge for Joliet, and if additional revenue were present again they would likely repeat their decision to build more facilities. However, if a bicycle project has to compete with another city program or project for funding, it will likely lose out. To that end local partners have been increasing their grant-seeking efforts. The political environment in Joliet is perhaps best described as a willingness to consider or possibly support projects, but not be proactive. Though the city's housing construction requirement helps to capture facility expansion through policy, the lack of a local policy influencing resurfacing or restriping (such as a Complete Streets Policy) and a shared local vision for bicycle infrastructure are important steps that have not yet made it onto the agenda for Joliet.

Aside from the trail organization, any local advocacy efforts are very limited, and there are no particularly active citizens or other voices to express desire for bicycle projects.

What limited interest currently exists for these facilities is solely directed to the regional trail organization, a dynamic which has been effective in the past (at supporting the growth of this network) but may be preventing Joliet from seriously considering any alternative facility types or locations. Residents continue to be broadly supportive of the concept of quality of life and amenities, especially in the face of a post-recession re-focusing on the downtown core of the city, manifested primarily in incremental additions to the trail network.

5.5.3 Case Study Report – Tampa, FL

As one of the many post-war boom cities of the mid twentieth century, Tampa has a long history of automobile-focused transportation decision-making. During its period of largest growth the city and surrounding unincorporated areas struggled to provide sufficient infrastructure to support the private development going on, and a practice of engineering for speed and automobile level of service became the norm across the area. An appealing climate has led to a history of recreational cycling in the region, which also has had reoccurring issues with fatality rates and associated concerns about the safety of bicycling for any purpose in the area. Organized advocacy efforts have been less prevalent in the region, though a number of individual citizens have played a role in the history of bicycle accommodations in the area. Some individuals built relationships with city officials that enabled them to introduce the merits of bicycle facilities; others collected detailed data and records on safety issues. Many of these individuals worked together through the region's bicycle advisory committee, a collaborative space within

which a variety of parties could work to generate shared goals, plan more effectively, and implement projects.

Previous to the late 2000s, the area's Metropolitan Planning Organization (MPO) took the lead on planning for bicycle facilities, incorporating proposed facilities into long-range regional plans throughout the 2000s. While the city did implement some projects before and during this decade, the focus had been predominantly on trail facilities for recreational purposes (along with some shared lane markings). Pressure from the area's active bicycle advisory committee had met significant resistance from local staff, with an ongoing standoff between the parties. The late 2000s marked a major shift in the city's attitude and approach to these facilities, however, and a change in staff and elected leadership at the city coincided with a regional plan update to provide an opportunity for the city to change its approach dramatically. A new Mayor entered office with a vision for an invigorated urban core and a growing city fueled by making it more appealing to younger generations and employers. Bicycle projects were a major component of this vision, providing the political commitment necessary to move forward more ambitious or novel projects. At the same time, new staff leadership collaborated with regional partners to develop a list of jointly prioritized bicycle projects in major core areas of the city that would be programmed for funding over time.

Fueled by the confluence of supportive staff and officials and with the former disputes managed, the MPO began to develop a list of projects which the city could implement incrementally using the funds available to them (including traditional formula funds and

federal grants). Most of the implementation to-date has focused on downtown and other core parts of the city, but a pair of separated on-street facilities is underway as well as part of the recent interest from the city in incorporating bicycle facilities into the existing roadway system. A bike share program and green painted lane demonstrate a growing willingness to use more novel approaches, though the lack of best practice bicycle facilities in major guidance documents (such as the Manual of Uniform Traffic Control Devices, or MUTCD) has made these efforts more difficult than they might otherwise be. State and county partners are also beginning to align their goals with local and regional parties thanks to strong messages being sent by the federal department of transportation (along with slowly improving guidance materials and practices). Still, changes at the state DOT take time, and although the DOT funds safety studies and programs the overwhelming focus on automobile and truck transportation has led to limited investment in experimenting with or understanding the use of modifications like protected infrastructure or road diets.

Despite the noticeable increases in support for bicycle projects, the level of interest and support for projects at the local level waxes and wanes due to the multitude of claims on elected officials' attention. The Mayor has continued to be a public advocate for bicycle facilities, even in the face of public resistance to projects, but the city has limited resources with which to make progress regardless of the support of current local leadership. City staff leadership has continued to be supportive as well, and the efforts that began in the late 2000s have yielded the additional implementation seen in the last few years. Nonetheless, funding remains a major barrier for the community; increased

awareness of the need for protected or separated facilities comes with higher price tags and efforts to generate additional local revenue for transportation have been unsuccessful. Projects have been prioritized to receive funding in many cases, but there are other issues facing the community as well so implementation continues in an incremental manner.

5.5.4 Case Study Report - Townville

The first discussions around bicycle infrastructure in Townville began about a decade ago as a result of interest from local citizens who had encountered facilities in other communities. These citizen advocates (many of whom are members of active local recreational bicycle clubs) have been involved in most of the city's occasional conversations around bicycle infrastructure. The recreational groups in which they participate have been vocal about their preferred projects in the area, but have not yet formed a shared vision or cohesive approach to advocacy. As a result, disagreements within the bicycling community have been common; this fracturing has greatly hampered the ability of advocates and local staff to cooperate in any meaningful way. Coupled with frustrations among local engineering staff toward advocates, the community lacks any earnest opportunity currently for collaborative engagement or progress. Some advocates accuse city staff of being directly in opposition to bicycling, while city staff see advocates as attached to projects lacking in validity or value from a transportation engineering perspective. The status of the relationship between these parties is at best one of mutual frustration, making planning and implementation a painful process for all. Additionally, no bike/ped coordinator or bicycle advisory committee exists at any organization in the region, making coordination or mediation more difficult.

Currently, bicycle infrastructure in Townville consists of a small multi-use trail segment as well as a limited amount of shared lane markings and signage. Planning efforts in the area are beginning to incorporate bicycling, and a county commissioner has led a charge to develop a bicycle master plan for the region. Though past implementation has been haphazard, these planning efforts offer some indication of a growing openness among elected officials and regional partners to make progress on bicycle infrastructure in the area. Public support may be providing some additional boost in the last year, as local, state, and national trends towards livability and urban development are becoming a component of city decision-making.

Nonetheless, Townville has a history as a community of extremes, with areas of great poverty and great wealth, racial separation, and ideological differences. Concerns around social equity have not yet become a component of local infrastructure discussions, though the issue is a common one for the area. Funding is a major challenge for the community, which has limited funds to program with and a substantial maintenance backlog. At the same time, as local support for bicycle projects grows it may provide additional opportunities to access external funding opportunities. Currently, local elected official support has come almost exclusively from one county commissioner, with other officials in the region displaying a general ambivalence towards bicycle infrastructure, neither stepping forward to support or oppose the idea. However the influence of the champion at the county commission has been visible, with the county taking the lead on the aforementioned bicycle master plan, as well as providing funding support and a vocal

presence in support of bicycle projects in the region. By facilitating relationships with parties across the county and leveraging those relationships effectively, the county has played an important role in the consideration of bicycle infrastructure in Townville.

If the longstanding misunderstandings and disputes between staff and citizen advocates can be resolved or managed, and as additional members of the public become engaged, additional progress on these projects may follow. Funding will remain a barrier, but as regional and state partners align with the local community on priorities further opportunities for planning and implementing will present themselves.

5.5.5 Case Study Report – Dayton, OH

Dayton was a booming industrial city in the 1960s-1980s, but like many other cities it lost much of its population during the latter portion of the last century and has been increasingly focused on appealing to and retaining younger populations, immigrants, professionals, and employers. The 70s and 80s also marked a period of early bicycle infrastructure expansion for the region, as parties began implementation of a trail network that took advantage of an existing flood control system. This system had created significant corridors of publicly owned land throughout the region, which could be developed to serve additional public uses. Over time the system would evolve into a substantial multi-use trail network, but attention to bicycle infrastructure faded from the attention of officials, the region, and the public for the most part over the decades to follow (though the trail system continued to steadily expand for the most part). Perhaps because of the success of their off-street projects, on-street facilities were widely ignored

by the city and other partners, leaving connections to the trail network largely absent until well into the 2000s.

During the development of the trail network the region had prepared a bikeways plan, which came about for a major update in the latter 2000s. In order to facilitate a more effective engagement with its member communities, the area's regional planning agency organized training workshops around the Complete Streets concept. At the same time a city commissioner returned from traveling to other cities with a sudden and intent enthusiasm for bicycle infrastructure projects, and empowered an equally enthusiastic planning staff person to get things done. Fueled by the knowledge gained during the workshops and with the leadership of motivated staff, Dayton developed a local policy to ensure that future transportation projects better provided for the diversity of users. Additionally, they completed a Bicycle Friendly Community (BFC) application, formed a bicycle advisory committee, and developed a community bike master plan.

This period of dramatic evolution was facilitated greatly by the combination of the local Complete Streets policy, enthusiastic staff and officials, as well as a growing local advocacy voice. Substantial gains were realized thanks to this confluence of factors, though immediate changes to the on-street network were focused on low-hanging fruit, specifically shared lane markings, a smattering of bike lanes, and an opportunistic approach to implementation through resurfacing and redesign projects. As these more accessible tasks were accomplished and the focus turned to steadily making progress on

implementation and execution, the enthusiasm and attention moving forward began to wane somewhat.

Despite the period of progress in the late 2000s and early 2010s, the last few years have seen a slight decline in implementation and interest in bicycle facilities (potentially tied to funding cycles of grant applications). Those projects planned as a part of the new policy and plans are only now beginning to reach the implementation pipeline, and the departure of the particular staff champion reduced projects back to one priority among many. However, current staff continues to move their incremental implementation, aided by bicyclists among internal staff and a supportive Mayor. The most significant recent addition to the city's bicycle facilities was a bikeshare program serving the interior of the city. The city is planning for its first on-street protected facilities to be built within the next five years, and the local advocacy community is returning to activity organized around a regional organization bringing together long-standing citizen advocates and new members of the bicycling community.

Though many signs indicate a continued growth of bicycle infrastructure in Dayton, and possibly even an uptick in expansion in the short term, many barriers to more rapid change remain. As always, funding is a major hurdle that constrains the selection and timeline for projects. Though the city has the resources to make progress, there are concerns about managing facilities and being able to tackle more costly protected facilities. The enthusiasm of city staff and regional partners to pursue outside funding sources has contributed significantly in the past, and will continue to provide a major

indication of the city's commitment to bicycle infrastructure. In addition to funding, the relative infancy of the renewed advocacy community has limited the development of public support and culture around bicycling in the past, and is expected to play a role moving forward. Finally, as the city tackles more innovative and ambitious projects the ability of different offices and organizations to work together will be tested, and it remains to be seen whether the full suite of parties (including the state Department of Transportation) can develop a shared vision for the city's bicycle network and execute it jointly.

5.5.6 Case Study Report – Springfield, MA

Springfield is slightly less wealthy than the average for its state, and has experienced economic hurdles the past few decades. As such, development is a priority issue for the city. However, given the realities of limited funding options and reduced city staff, the community has generally focused on providing what they consider more core functions of their departments. For these reasons, external funding opportunities are generally met with enthusiasm, and can be necessary to allow otherwise lower priority projects a chance at implementation. Lacking these opportunities, when the city has been faced with decisions about its priorities bicycle infrastructure has a history of not making the cut.

In the late 1990s Springfield considered its first bicycle infrastructure projects in the form of a pair of multi-use trail segments. However, the combination of anti-trail sentiments among the local community (and an organized effort to defeat the project) and tightening state budgets led to one of the two projects being scrapped in the early 2000s (the other

segment was completed and remains the city's only current trail facility). Another opportunity presented itself in the late 2000s, as a visiting consultant opened a dialogue within the city that included bicycling and walking; however, acting city leadership within the department responsible for transportation projects effectively quashed these discussions (a position this person was widely known for taking toward bicycle projects). In the early 2010s the regional planning agency secured a sizable grant that would allow them and the city to develop a bicycle and pedestrian master plan, hire a temporary bike/ped coordinator, and build a bicycle advisory committee. It would also provide funding support for the city to implement its first piece of on-street infrastructure, and hopefully influence the city to continue this work on its own afterward. Around the same time a downtown utility failure led to a sizable investment from the utility provider to the downtown development group (a portion of which would support a redevelopment plan and the addition of bicycle facilities in parts of downtown).

Though the city did indeed develop comprehensive plans and a bicycle advisory committee in tandem with the regional planning agency, the bike/ped coordinator position took longer than expected to establish and changed hands multiple times during its brief existence. And while the city's first on-street bike lane was implemented, it functions as a wide shoulder on a very limited segment of roadway, and is only accompanied by some shared lane markings currently across the entire city. In many ways, the city appears not to have fully realized the opportunity presented by this external funding. Still, it did lead to a Complete Streets policy, which in tandem with increasingly

stringent state requirements for the consideration of bicycle and pedestrian accommodations should generate additional infrastructure in the future.

Though air quality, safety, and development are all issues for Springfield and have been attached in public discussions to bicycle infrastructure (primarily by advocates in local nonprofits and community groups), these issues are often lacking the saliency or urgency needed to translate projects into priorities locally. Some of this may be attributable to the lack of a vocal public expressing their commitment to bicycle projects as a priority. As it is, officials in Springfield have been generally neutral toward the prospect of implementing bicycle infrastructure. City leadership is beginning to understand in concept the benefits of bicycle projects, but none have yet acted as a proponent for any facilities (the current Mayor appears to be more receptive than any predecessors).

Indeed the major actors responsible for what progress the city has seen to-date have been individual staff members at the city and the regional planning agency, though until the last couple years their efforts were widely outmatched by an opponent in city administrative leadership. However, they still managed to facilitate external grants, plan development, and the city's first on-street facilities. Their impact as effective action-oriented individuals made them valuable champions in their respective offices, and their focus on securing additional funding made their enthusiasm for bicycle infrastructure a fruitful opportunity for a city desperate to boost its ability to provide projects and services. They also appear to be well-positioned moving forward to support future efforts and implementation, though the temporary bike/ped coordinator position has since

concluded and staff capacity remains generally limited at the city. Funding is of course a constant challenge for the community as well, with influxes such as the external grant providing some of the few true opportunities for infrastructure progress.

The grant-funded bike/ped coordinator position introduced an advocacy presence to the community for the first time. Acting as a consultant for the city via the advocacy organization, the coordinator helped to introduce a lot of information and resources to the city planning and engineering departments, as well as other community organizations (aspiring to cultivate more advocates). The coordinator also conducted additional programming in the community attached to that position as well, including education, encouragement, events, and other tasks attached to the grant's scope and purpose. However, with the conclusion of this role advocacy in the community as an activity has fallen to the other community organizations in Springfield, for whom bicycling and walking are components but not a focus.

Though funding is indeed a very real hurdle to implementation, the city has also only recently started to recognize its ability to implement some projects as parts of already funded projects (such as restriping and resurfacing). Until recently, the lack of understanding of how and when to incorporate bicycle facilities into these other projects was hampering the ability of the city to otherwise check off even the low-hanging fruit projects. Though this understanding appears to be growing thanks to recent staff changes and ongoing education efforts, the lack of staff capacity and remaining knowledge/experience gaps continue to generate hurdles to implementation. As the state

continues to provide top-down guidance, leadership, and requirements it seems likely that these barriers will lessen, especially with requirements attached to funding and more stringently enforced. As they do, it's possible that the next opportunity for funding and implementation will be even more effectively utilized to see gains not only in planning and preparation but also in network implementation.

5.6 Case Comparison Results

5.6.1 Fresno and Joliet

In terms of the survey data, Fresno and Joliet are a mixture of similar and different (not unusual for a Mahalanobis pair). While Fresno is twice as large geographically and has more than three times the population, neither city reported a high level of political support for bicycle infrastructure and their levels of policy conservatism are very close and right around the middle of the spectrum. Their median ages and city expenditures per capita are also very close, and are, like all six of the case cities, fairly diverse in ethnicity (though Joliet does have the highest representation of white individuals among the case cities). Geographically, the two cities are in quite different regions, though both are tapped into networks of even larger cities.

Both cities had a small history of trail network expansion, but this is the extent of bicycle infrastructure in Joliet, whereas Fresno has built out a growing (though disconnected) network of on-street facilities and planned for a more extensive network that will include protected and separated facilities. Both cities have been aided by ordinances that require developments to provide facilities, but the cities themselves struggle to secure sufficient

funding to build out projects of their own. In line with this challenge, Fresno identified the availability of local tax measure funding dedicated to bicycle projects as a critical factor in their expanding network. Facilitated and influenced by local advocates, this funding represented one component of a major expansion in past years that has not had a mirror in Joliet (which has a regional advocacy presence, but no vocal local proponents).

Though both cities struggled with political support, Fresno reported a greater amount of agreement around issues facing the community and how bicycle projects might be a solution to these issues (whereas Joliet identified no such agreement as of yet). However, as both cities consider these infrastructure projects they're being fueled by concerns around economic competitiveness, with additional complementary issues. Both cities reported that their state Department of Transportation (DOT) has been recently showing a higher level of support for bicycle projects, and is starting to exert pressure on their communities to build bicycle facilities. In Fresno, strong policy entrepreneurs complemented this pressure; in addition to vocal citizens, city staff prioritized bicycle infrastructure for a time and helped to achieve a lot of "low hanging fruit" that remain unaddressed in Joliet.

Fresno has not reached the level of network implementation that they themselves aspire to, and was characterized as disconnected in many places, suggesting that the supposed high level of implementation they reported is not necessarily the same thing as having completed a citywide network. However, the differences between it and Joliet demonstrate the significant gulf that can exist between consideration and implementation.

Although Joliet has made ongoing progress on a trail network, the longstanding lack of connection to this trail system from the street network highlights the importance of citizen proponents, invested local officials, or interested staff. In the absence of any of these (at least until recently), the city has failed to take any action to build on-street facilities.

5.6.2 Tampa and Townville

Tampa and Townville are more closely aligned in size and population, as well as median age, ethnic makeup, and income. However, their levels of political and state support vary, and while Tampa is somewhat liberal Townville is slightly conservative. Both cities are in the same region, with somewhat similar climates and periods of population expansion in the past. They also both heavily prioritize their economic competitiveness. Funding is, as for all cities, a major barrier to action in both these cities, and neither has had the same sorts of funding opportunities as Fresno. While Fresno has a greater willingness to prioritize putting some of their programming funds towards bicycle projects (thanks to staff, citizen, and official support), it still faces a similar challenge as Townville in terms of having the funding they'd like.

The most important similarity between the two cities, however, is their history of division and conflict between local advocates and city staff (with regard to bicycle infrastructure). The late 90s and early 2000s saw enthusiasts in both communities put increasing pressure on staff and officials to provide better facilities and address serious safety concerns for bicyclists. The late 2000s saw a new Mayor elected in Tampa, who also introduced new

city leadership and a desire to broker a standoff between stakeholders around the issue of bicycle infrastructure. This led to the establishment of a regional project prioritization process, and incorporated regional resources and citizen entrepreneurship to trigger a period of infrastructure expansion that continues today. In Townville, however, this stalemate has continued and relationships between local enthusiasts and city staff remain openly hostile and unproductive. Disagreements between parties on the purpose of said projects (and thus disagreements on the appropriate types and locations of facilities) are common, and despite some support at the county level the lack of agreement over problems or appropriate solutions (coupled with a lack of local political support) further complicate the prospect of successful implementation.

These different experiences highlight the importance of network and relationship development, and emphasizes that not all advocacy is equally effective or appropriate. Though a change in city staff triggered a brokering in Tampa, the complexity of the disagreement in Townville highlights that all parties play a part in whether proposals become reality or not.

5.6.3 Dayton and Springfield

Dayton and Springfield are very similar in population, age, and income, and are the two smallest cities in terms of land area. They are also the two most conservative of the case cities, though they also have high levels of local support for bicycle infrastructure (especially Dayton). On the other side, Springfield spent almost three times as much per capita as Dayton, despite being only a slightly wealthier city (and both cities were the two

least wealthy of the six case cities). They also vary widely in their infrastructure implementation, with Dayton having an expansive regional trail network and growing on-street connections while Springfield has just begun implementing with a small on-street segment and others to follow.

Despite this variation, both of these case cities demonstrate the important role that policy entrepreneurs have to create opportunities for action. While some opportunities are exogenous events (such as the tax measure of Fresno or the election in Tampa), others may be created directly by a champion in the community (or in these cases, in the regional planning agency). In Fresno, a supportive regional planner used a plan update as an opportunity to conduct a training workshop and introduce staff across the region to the Complete Streets concept and empower local staff to take further action. In Dayton, another regional planner applied for a federal grant that provided support for a small project, a temporary staff person dedicated to bicycle and pedestrian projects, and other work. Both of these opportunities were also leveraged to create local bicycle advisory committees and bicycle master plans.

Some of the difference between the current statuses of implementation in these two cities can be attributed to the different timelines – Dayton has had more time since their “window”, and so some resulting projects have been built and additional support has been cultivated. However, the history of past opportunities for action in Springfield that have not triggered consistent or ongoing change are a reminder of the challenges of implementing policy changes that play out across extended periods of time (such as

transportation infrastructure). Springfield may be facing the hurdle of going beyond the first steps made possible by their grant (and thus requiring a limited commitment from local officials, staff, and other stakeholders) and into the challenging period of incremental expansion that characterizes many cities.

As always, funding remains the major challenge for both communities. While Dayton has more local support behind their initiatives, both cities are heavily focused on securing outside funding as a means to continue to make progress. As their respective state DOTs become more influential and supportive, this may provide both a greater amount of funding and also an important partner in implementation and network completion.

5.6.4 Major Case Themes

Tables 15 and 16 below compare the suite of case cities across the major theoretical concepts, hypothesis components, and other observations. Given the complexity of the context and history of each city it's difficult to reach any definite conclusions about what separates a high implementation case city from its paired low implementation city.

However, there are quite a few common themes that help to illuminate the differences between successful cases and those that have not yet seen the same implementation.

Firstly, on the matter of implementation level the distinction between “high” and “low” among the case cities is not always as clear or pronounced as the survey responses suggest. Of the 3 high implementation cities (Fresno, Tampa, and Dayton), two still had moderate levels of on-street infrastructure implementation compared to national leaders,

Table 15. Case Comparison (Part 1)

City	Fresno	Joliet	Tampa
Window:	<ul style="list-style-type: none"> Local sales tax measure that provided specific funding for bicycle projects and required certain planning actions 	<ul style="list-style-type: none"> Trail network built when region had revenue (late 90s) Recently, desire to compete is triggering discussions 	<ul style="list-style-type: none"> New Mayor and staff together created opportunity for action w/ the MPO (broke standoff between staff & advocates)
Coupling of streams:	<ul style="list-style-type: none"> Some problem(s) agreement Bicycling viewed by some as a solution Generally supportive political context 	<ul style="list-style-type: none"> No shared problem conception Bicycling not viewed as solution No support in political context 	<ul style="list-style-type: none"> Some agreement around problem (Mayor's lead) Bicycling viewed as part of solution Somewhat supportive
Problem Priorities:	<ul style="list-style-type: none"> Air quality Sustainability Economic competitiveness 	<ul style="list-style-type: none"> Economic competitiveness Attract/retain talent and employers 	<ul style="list-style-type: none"> Economic competitiveness Attract/retain talent and employers
Local support:	<ul style="list-style-type: none"> Officials are generally supportive, unless projects are contentious/compete with other projects Staff are supportive 	<ul style="list-style-type: none"> Very limited interest or support from local officials (viewed as a luxury) Staff are beginning to become interested 	<ul style="list-style-type: none"> Current Mayor provides important support Staff are very supportive
Policy Entrepreneur (s):	<ul style="list-style-type: none"> Citizen advocate City staff person 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Mayor City staff person Regional gov't staff person Citizen advocates
PE qualities:	<ul style="list-style-type: none"> Expertise, persistence, create opportunities 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Relationship building, expertise, vocal
Status/Level of consideration:	<ul style="list-style-type: none"> Bike master plan, protected/separated projects planned 	<ul style="list-style-type: none"> Recently begun considering Only trail planning to-date 	<ul style="list-style-type: none"> Have a guiding list for projects Plans for protected facilities
Status/level of implementation:	<ul style="list-style-type: none"> Steadily expanding network of facilities Large in scale but disconnected 	<ul style="list-style-type: none"> Regional trail network Disconnected No on-street facilities 	<ul style="list-style-type: none"> Medium but expanding network of on-street facilities Some innovative projects underway Bike share
City policy:	<ul style="list-style-type: none"> Developers required to provide bicycle facilities 	<ul style="list-style-type: none"> Housing developments required to build trails 	<ul style="list-style-type: none"> None
Role of funding:	<ul style="list-style-type: none"> Outside funding creates its own support Funding is viewed as biggest barrier to implementation 	<ul style="list-style-type: none"> Funding is viewed as major barrier to implementation If a bike project has to compete with another project for \$, it will fail 	<ul style="list-style-type: none"> Constrains the selection and timeline of projects Major barrier to protected projects
Other factors:	<ul style="list-style-type: none"> PE pushed too hard, damaged relationships Older parts of city are narrow and tough 	<ul style="list-style-type: none"> Older parts of city are narrow and tough. 	<ul style="list-style-type: none"> Parties looking for better guidance documents, etc.

Table 15 (Continued)

Advocacy:	<ul style="list-style-type: none">• Small group of active and organized residents	<ul style="list-style-type: none">• Regional advocacy org, limited local presence (no local voices)	<ul style="list-style-type: none">• Limited organized advocacy• Involved citizens
Network:	<ul style="list-style-type: none">• Yes• Bicycle advisory committee	<ul style="list-style-type: none">• Yes• Trail organization	<ul style="list-style-type: none">• Yes• Bicycle advisory committee
State/regional support:	<ul style="list-style-type: none">• Important support and signal from state DOT	<ul style="list-style-type: none">• State DOT starting to put pressure on for bike projects, but not totally bought in yet	<ul style="list-style-type: none">• MPO major influence• State DOT is not yet on board, but fed pressure is helping

Table 16. Case Comparison (Part 2)

City	Townville	Dayton	Springfield
Window:	<ul style="list-style-type: none"> No window, though the county commissioner has been trying 	<ul style="list-style-type: none"> Training workshops around a bikeways plan update Supportive city commissioner and interested staff 	<ul style="list-style-type: none"> City was interested, discussions were shelved (late 2000s) Recently, large grant to fund coordinator, plan, committee, and projects
Coupling of streams:	<ul style="list-style-type: none"> No shared problem conception Bicycle not viewed as solution No support in political context 	<ul style="list-style-type: none"> Some problem agreement Bicycling beginning to be seen as solution Increasing local support 	<ul style="list-style-type: none"> No shared problem conception Bicycle starting to be seen as solution No active support in political context
Problem Priorities:	<ul style="list-style-type: none"> Equity Economic competitiveness Livability 	<ul style="list-style-type: none"> Economic competitiveness Attract/retain talent and employers 	<ul style="list-style-type: none"> Public health Air quality Safety
Local support:	<ul style="list-style-type: none"> Ambivalence. Local staff seem almost opposed, at least resistant. 	<ul style="list-style-type: none"> Mayor and staff are supportive, as are many other partners. 	<ul style="list-style-type: none"> Officials are generally neutral (no mandate from public yet)
Policy Entrepreneur(s):	<ul style="list-style-type: none"> County commissioner 	<ul style="list-style-type: none"> Mayor (former city commissioner) City staff person 	<ul style="list-style-type: none"> Regional gov't staff person City staff person (opponent of bicycle projects)
PE qualities:	<ul style="list-style-type: none"> Relationship building, vocal, create opportunities 	<ul style="list-style-type: none"> Vocal, create opportunities 	<ul style="list-style-type: none"> Create opportunities, expertise, persistence
Status/Level of consideration:	<ul style="list-style-type: none"> Very little at the city County and MPO are starting to do planning 	<ul style="list-style-type: none"> Bike master plan Plans to tap into trail system 	<ul style="list-style-type: none"> Bike master plan
Status/level of implementation:	<ul style="list-style-type: none"> One multi-use trail segment A few shared lane markings 	<ul style="list-style-type: none"> Regional trail network On-street network is growing Opportunistic implementation Bike share 	<ul style="list-style-type: none"> One multi-use trail segment One on-street bike lane & some shared lane markings
City policy:	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Complete Streets Policy 	<ul style="list-style-type: none"> Complete Streets Policy
Role of funding:	<ul style="list-style-type: none"> Funding is viewed as major barrier to implementation External funding would help create its own support 	<ul style="list-style-type: none"> Constrains the selection and timeline of projects Outside funding creates its own support 	<ul style="list-style-type: none"> Funding is viewed as major barrier to implementation Outside funding creates its own support
Other factors:	<ul style="list-style-type: none"> Starting to see larger trends toward livability and urban development reach the city 	<ul style="list-style-type: none"> History of trail network, big resource to tap into 	<ul style="list-style-type: none"> Lack of understanding of how to implement projects within existing tasks (resurfacing, etc.)

Table 16 (Continued)

Advocacy:	<ul style="list-style-type: none"> • Disorganized citizen advocates (destructive dynamic with city staff) 	<ul style="list-style-type: none"> • Growing advocacy voice, rebirth of local advocacy org • Citizens involved. 	<ul style="list-style-type: none"> • State advocacy org, limited local presence • No involved citizens
Network:	<ul style="list-style-type: none"> • No 	<ul style="list-style-type: none"> • Yes • Bicycle advisory committee 	<ul style="list-style-type: none"> • Yes • Bicycle advisory committee
State/regional support:	<ul style="list-style-type: none"> • Regional support and county support have been important factors 	<ul style="list-style-type: none"> • MPO major influence • State has not yet joined in vision or priorities 	<ul style="list-style-type: none"> • State has provided pressure and resources to build bicycle projects

and all three characterized their network as disconnected and a small fraction of what they have planned. Many cities shared common types of implementation (“low-hanging fruit” projects, shared lane markings). Trail facilities were also a complicating factor, as multiple cities contained parts of regional trail networks that greatly boost their infrastructure inventory, but are not necessarily within or supported directly by those cities, and had varying levels of connectedness and mileage. The biggest difference was that the ‘success’ cities were actively building on-street infrastructure on a regular basis, either directly or through a policy¹⁶. Overall, the high implementation cities appeared to be well ahead of their pair cities in a variety of ways, with bike master plans, bike share, and protected facilities all either in existence or under development in the high implementation cities but only present in one of the low level implementation cities (which has a bike master plan, thanks to a window of opportunity and funding). While

¹⁶ Policies to assist the city in implementing (like Complete Streets or development ordinances) were present in four of the six cities. However, based on the impact they’ve had and comments from cities on the history of their policy effectiveness it appears that these policies can be stronger or weaker both directly (in terms of what they require and of whom) and as a result of the context (less development in older parts of cities, so development-based policies have less impact there).

the space separating many of the cities is not as large as the implementation scores would suggest, the status of conversations around bicycle infrastructure in the cities are split clearly by the implementation score.

One of the major areas of exploration for the case comparison was the concept of the window of opportunity, and this turned out to be a major theme in the case interviews. Interview respondents identified a significant and specific opportunity in five of the six case cities, and it led to progress in implementation or consideration in four of the six (the fifth is showing signs of potentially yielding fruit in the near future). Despite the shared impact of the window of opportunity, the causes were quite diverse: one was triggered by a planning document being regularly updated, another was created by the awarding of an external grant, a third by a local sales tax measure, a fourth by a training workshop, and the fifth by a change in elected leadership. Interestingly, four out of five of those windows were either created or leveraged by a policy entrepreneur. These PE's generated an opportunity by coordinating training, sourcing funding, or changing the conversation.

The identification of periods of opportunity as well as fluctuations in level of implementation over time highlights an important note about the role of time in case comparisons such as these. Table 17 displays a general comparative timeline for the six case cities, visualizing the common relationship between identified windows of opportunity and expanded implementation. This visualization also reveals, however, the importance of bounding and scales with regard to both historical questioning and the Multiple Streams Framework. For example, the case interview questions were oriented

toward consideration and implementation in the last ten years, but for some cities their consideration of on-street infrastructure began in the late 90s or early 2000s, and in two cities extensive off-street trail networks were being incrementally built since as far back as the late 1970s. I encouraged respondents to share these events and experiences as a supplement to the focus on the past decade, and the resulting extended timelines provide some important history with theoretical implications. These much longer timelines reveal the incremental and punctuated experience of bicycle infrastructure implementation at the municipal level, but also highlight that the focus of respondents on implementation did not always yield a consistent time frame.

Since respondents also varied widely in their history with a given city (some had been involved for decades, others for less than a year), the significance of recent or past events may also have varied. However, the inclusion of multiple respondents did help to provide a check on significant differences in individual familiarity or history with a city. The identification of policy entrepreneurs may have been tied to respondents' senses of the success of particular efforts or periods of time. For example, despite limited infrastructure implementation in the period following, respondents from Springfield identified a recent grant award as an important window of opportunity that they felt had triggered a change at the city level. This may indicate that respondents were biased towards characterizing their efforts as successful, or may be an honest insight into the future of implementation at the city.

Table 17. Case Timelines

	1990-95	1996-2000	2001-05	2006-10	2011-15	Present
Fresno	Window	Expansion	Incremental	Consideration	Unknown	Unknown
Joliet	Window	Expansion	Incremental	Consideration	Unknown	Unknown
Tampa	Expansion	Expansion	Incremental	Consideration	Unknown	Unknown
Townville	Consideration	Consideration	Consideration	Consideration	Consideration	Consideration
Dayton	Expansion	Expansion	Incremental	Consideration	Unknown	Unknown
Springfield	Window	Expansion	Incremental	Consideration	Unknown	Unknown
Key:	Window	Expansion	Incremental	Consideration	Unknown	

Individuals or organizations displaying the activities and characteristics of policy entrepreneurs were common, present in five of the six cities and common in multiples per city (four of the five had multiple PEs). Their roles also varied widely, with a mixture of citizen advocates, elected officials, city staff, and regional staff. These actors facilitated policy change in the three high implementation cities by creating opportunities and/or building relationships to make bicycle infrastructure appealing and feasible. Importantly, they did not do so alone. Multiple parties are involved in transportation decision-making for a municipality, either directly or indirectly. Projects must be planned, designed, and funded, requiring the support or willingness (as well as expertise) of engineers, planners, and elected officials. No one actor has enough influence, capacity, or expertise to change the game. While a lone elected official might be able to bring multiple municipal departments together under their vision for bicycle infrastructure, they lack the expertise needed to guide implementation. They also have limited timeframes due to their terms and the many claims on their attention; city staff members have a greater capacity for

supporting policy change over longer time scales. Every additional PE in a local network expanded the ability of that network to secure funding (which reduces barriers and builds support), develop plans, and execute those plans efficiently and effectively. In that vein, some of the biggest success stories were attributed to the combination of supportive staff and officials.

As noted previously, network is a structural concept, a way of talking about the arrangement (and relationship) of actors that has no specific requirements of the actors themselves. While a network could function as one policy entrepreneur, it may also be the result of a policy entrepreneur, or include multiple different policy entrepreneurs (Mintrom and Norman 2009, Zahariadis 2003). The concepts are not mutually exclusive, but in some of the cases observed here the alignment of multiple actors in an exchange arrangement built upon trust and reciprocity distinguishes them as networks of actors. Importantly, though, those actors may also be policy entrepreneurs, and given the movement of these actors into and out of the local policy arena over time there's reason to distinguish between the independent actors and the networks that they may tap into or be a part of.

In a proper network, even where there may be hierarchical relationships present (for example officials have oversight of city staff), how problems are being faced and solutions are presented is more interpersonal and not organized neatly within a hierarchical array (and definitely based on trust and reciprocity vs. the others). Multiple cooperative policy entrepreneurs (for example an official and a staff person) may qualify

as a network. Based on the case studies, merely having a network of actors will not necessarily trigger action (not all networks are equivalent), and the same appears to be true for policy entrepreneurs. However, where individual policy entrepreneurs may migrate from place to place or issue to issue, networks offer a more resilient force to preserve and support policy implementation.

Solitary PEs can still make a sizable difference, as the story of the staff person at Fresno conveys. Acting unilaterally, this individual left a significant mark on the bicycle infrastructure network in the city. However, by utilizing opportunities without building a network of actors the end result of this unilateral action was a strong backlash from local officials and an unwillingness to consider more ambitious projects due to an angry public. These relationship stories also came up in the difference between Tampa and Townville. Both cities had tense conflicts between local advocates and city staff over bicycle infrastructure decisions, and the introduction of new staff leadership (by a newly elected Mayor) in Tampa led to an agreement being brokered and a productive period following. As the story also suggests, time is a factor – some of the lower implementation cases indicated that they had recently begun considering bicycle infrastructure, and that perhaps with time more opportunities would arise. Persistence, for many PEs, was a valuable characteristic (especially for citizen advocates).

One place the network element of effective entrepreneurship showed up was in the role played by bicycle advisory committees. Networks are not always clearly delineated (like a Bicycle Advisory Committee usually is), and simply because a formal arrangement

exists does not mean it qualifies as a network (it may in fact be a hierarchical array). However, the central involvement of citizens, nonprofit representatives, and staff at different scales of government strongly suggest that these groups rely on non-hierarchical arrangements to exist and function. 4 out of the 6 cities have a bicycle advisory committee, and they were noted as important arrangements that supported implementation in their cities. They provided a way to bring parties together and maintain coordination, and were noted as important to the ongoing implementation efforts of their communities and a major vehicle for collecting public input and engagement. The only other network of this sort that seemed to occur was the informal network of Joliet, which was managed by the trail group and relied on the collaborative dynamic cultivated over decades by that group, rather than a mandate from the community or leadership from enthused citizens.

The difference between having multiple PEs and having a facilitative network plays out in the history of bicycle projects in Fresno. The combination of strong citizen advocates and an enthusiastic staff professional helped trigger significant short-term progress, but the erosion of the trust of local officials by those PEs has required ongoing repairs and an effective draw-down in the ambition of citizens and staff around many project types. In contrast, the ongoing relationship between staff, advocates, and officials in Dayton has helped them to avoid the same sorts of backlash.

In terms of the three streams, problem definition appears to be a complex thing, and was hard to gauge. Though every community identified particular issues that they faced and

which they hoped bicycle infrastructure might help to address, there was rarely a clearly and widely shared definition of what that problem was. Instead, a bundle of issues were attached to these projects, with different parties viewing different benefits that they hoped to accomplish. Some issues did seem to gain more traction than others, with a common thread in five cities being a desire to attract and retain younger populations and employers. This problem (couched in terms of economic development and competitiveness) was attached to the concept of quality of life, and the idea that their city should be an appealing place to live and to work if it's going to thrive in the future. This problem and solution pairing seemed widely recognized by different parties (including city staff and citizen advocates) across cities, suggesting that this problem definition and solution pairing may open up opportunities in other cities. The influence of this issue space also speaks to the high priority of economic development and competitiveness in each of these communities.

The apparent coupling of problem and solution was consistent across high implementation cities, but it's difficult to assess where the line for that coupling is drawn. It may in fact be that a similar "coupling" has occurred in the other cities, but that the political context/support is not sufficient to generate a sizable enough window. Due to the metaphorical nature of the streams concepts, there is no clear standard by which I can assess a coupling of streams beyond the hypothesized outcome (policy change). The generally recurring references to the same priority issues (economic development and competitiveness) strongly suggest a pairing, however.

Local political support from elected officials for bicycle infrastructure appeared to be reasonably similar across all six cities, with many respondents characterizing the level of interest at just above ambivalence. Even in cases where officials were described as being knowledgeable about the benefits of bicycle infrastructure and interested in implementing it, their overall level of support was considered close to neutral with the exception of a few limited active advocates (who were described as policy entrepreneurs). This was generally attributed to a pair of factors: (1) elected officials are expected to specialize and select their own unique priorities – it would be unusual to have consensus interest in any type of proposal; and (2) there has not been a strong mandate from the public in any of these cities (instead, officials see a vocal minority requesting projects that may be viewed at times as a luxury or contentious¹⁷). Enthusiastic officials helped, especially in tandem with supportive staff, to break through this ambivalence in a pair of cities, but generally political will remains a challenge for all cities. Fortunately, ambivalence can be good enough for projects to be built, especially when an opportunity presents itself that officials cannot easily resist (such as an influx of external funding).

Although each of the case cities was on solid financial footing, the reality of municipal government is one of limited resources. Respondents discussed the challenge cities face in prioritizing among a seemingly endless number of valuable projects and programs.

With bicycle infrastructure being one of many worthy uses of this limited funding,

¹⁷ Every city reported that in the face of major public resistance to a bicycle infrastructure project their officials would shutter it. While perhaps not surprising or problematic, it does speak to the important role that advocates play in drumming up public support.

funding was a major hurdle in all six cities, broadly cited as the single greatest challenge facing each community's efforts to consider or implement bicycle facilities. Though support is often the underlying challenge (since high enough priorities will receive the funding they need), the many serious infrastructure issues plaguing these and other cities reinforce that generating support is not always enough to overcome funding barriers (though some respondents did suggest that funding was used by some parties as a way to avoid bicycle infrastructure discussions). Funding challenges made supporting bicycle projects more political costly, and threatened the viability of many proposals. At best, funding puts a cap on how much a city can implement for any given unit of time, as explained by the high implementation cities and their incremental approach to network expansion.

For all these reasons securing outside sources of funding, such as grants or special tax revenue, was a major factor in creating opportunities for action. External funding provides cities the opportunity to say yes with minimal direct commitment while also expanding their ability to complete projects and accumulate successes within the confines of limited funding. The influence of federal Transportation Alternatives or Enhancements funding was noted multiple times, and other sources of grant funding from state or federal channels were also mentioned as important vehicles for implementing infrastructure projects. Some cities also described state Department of Transportation (DOT) requirements for bicycle policies, planning, or accommodations in order for communities to access their formula funds (i.e. gas tax revenue). Tying bicycle projects to funding seemed to be very influential. Additionally, having municipal policies that

require development or other projects to include bicycle accommodations was effectively leverage by multiple cities, though these policies come with certain limitations (such as facilitating development only in newer or wealthier parts of a city).

Interestingly but not surprisingly, the higher cost of protected and/or separated facilities compared to the more traditional on-street bike lane or shared lane marking has slowed efforts to build protected facilities in all communities, as they need more money per mile of build out (in addition to more political and community support). The ability to build bicycle infrastructure cheaply and while restriping or resurfacing was a major opportunity for some cities, as inexpensive low-hanging fruit, and they provided a lot of mileage for their investment. At the same time, those facilities are becoming broadly outdated as cities shift toward the broader appeal of protected and separated facilities. Given the relative success of trails in these case cities and the desire in those cities to connect trail segments together it seems logical for them to continue building a protected network where possible, despite the funding hurdles.

In review, having a policy entrepreneur and a window of opportunity together served to greatly facilitate implementation in the short term and support it in the time following. Cities with the smallest windows of opportunity and the fewest PEs were at a definite disadvantage at implementation and consideration. The larger the network of actors engaged and interested in these projects, the more effective these efforts were, thanks to their influence at building support, leveraging opportunities, and sourcing resources. At the end of the day, enthusiastic citizens can be effective (Fresno, Tampa, Dayton), absent

(Joliet), or even problematic (Townville), so advocacy is not necessarily the key to success. Similarly, having strong champions that take charge is powerful, but can also cause long-term challenges if relationships aren't managed and parties aren't properly engaged. These case takeaways are valuable, but it's in the context of my research hypotheses that I can give better structure to both the qualitative and quantitative results.

CHAPTER 6

DISCUSSION, FINDINGS, AND FUTURE DIRECTIONS

Multiple Streams as a theoretical framework was constructed upon an investigation into the process by which national level policy proposals make it onto the agendas of governing bodies. Despite my departure from this territory (toward local decision-making and implementation), the question of agenda setting is still interesting. My first hypothesis proposed, in line with Multiple Streams, that the presence and qualities of policy entrepreneurs and windows of opportunity would be the determining factors in whether or not a city had considered bicycle infrastructure (as well as protected infrastructure).

***H1: Agenda Setting** - The public consideration of investment in bicycling as an encouraged mode of transportation (by local governments) is a result of the presence and particular activities (“qualities”) of “Policy Entrepreneurs” and the presence of particular opportunities for action (“windows”), rather than the particular qualities of the local context (such as neighboring governments, local values, and fiscal conditions).*

The survey results generated findings that both support and challenge this hypothesis. Firstly, since every city in the sample had considered some form of bike infrastructure, it was impossible to reach any conclusions about first discussions around bicycle infrastructure (and on the basis of the case interviews, these first discussions occurred in most cities a number of decades ago). Around the question of protected or separated

infrastructure, however, the survey results suggest that policy entrepreneurs may indeed play a part in getting said projects to be considered (or are at least associated with that action in some way), as they were significantly associated with the likelihood of consideration. More populous cities were also more likely to have considered protected facilities (more on this later). Advocacy organizations, on the other hand, appear to have a negative relationship to consideration, somehow actually reducing the likelihood that a city had seriously considered protected facilities. I would hypothesize based on the case interviews (and the positive relationship of advocacy variables to other dependent variables) that many advocacy organizations are not interested in protected infrastructure, but rather other facility types (perhaps because of their association with recreational riding, as note in a number of case cities).

Policy conservatism was one of a number of weakly significant (i.e. only at the .10 level) independent variables, along with cost of living, economic competitiveness, and job access (also population). The more politically conservative a city was on the score attributed to it by Tausanovitch and Warshaw (2014), the less likely it was to have considered protected infrastructure. Discussions around economic competitiveness and job access were positively associated, supporting the case city narrative that a recent and strong desire to attract younger professionals and employers is driving interest in bicycle infrastructure. Cost of living as a priority problem was negatively associated, suggesting that cities with major concerns around affordability may not feel they have the luxury to consider more expensive bicycle facilities like protected/separated projects.

The case interviews and comparison emphasized the important role that policy entrepreneurs play in getting bicycle projects onto the agenda and being discussed. Even in those cities with limited implementation, conversations had occurred at the behest of either an active PE or an enthusiastic group of citizens; without those actors the conversations might not have occurred. Windows of opportunity also seem to be game-changers, with grants or training workshops catapulting bicycle projects onto an agenda. It's unclear whether these opportunities are necessary for consideration, but it does appear that their presence is enough to trigger discussion and consideration in a local community. Finally, non-local parties can actually do a lot to force consideration and get particular projects or ideas onto agendas, either through strong direct requirements, training, gradual pressure, or a number of other angles.

Though agenda-setting is, as noted, where the MSF began, the burden of proof and conviction is much higher for decision-making (i.e. implementation), as funding is not a given and officials and staff juggle many competing priorities. However, I proposed in Hypothesis 2 that the influence of PEs and windows would still be the critical factor separating success stories from those cities that had not yet made investments into bicycle infrastructure.

H2: Decision-Making - *The implementation of investments in bicycling as an encouraged mode of transportation (by local governments) is a result of the presence and particular activities (“qualities”) of “Policy Entrepreneurs” and the presence of*

particular opportunities for action (“windows”), rather than the particular qualities of the local context (such as neighboring governments, local values, and fiscal conditions).

Once again, general bicycle infrastructure was very common, with 95% of cities reporting some form of infrastructure built within their community. This meant that some variables lacked sufficient variation to be included in the models, and the resulting models have less explanatory power or accuracy than might be desired. Still, city population was significant once again (still at the .10 level), with a stronger significant effect from the net level of support across multiple actors (officials, staff, and agencies). Without claiming too much on the basis of these results, it does appear that population is doing something interesting in these models, and that local support may be a matter of more than just one enthusiastic champion.

Although net support does not show up again as significant in any model, the window variable becomes very significant when looking at the tests for implementation of protected infrastructure. Since the window variable ended up as a proxy for the level of local political support, this suggests that having officials who are more supportive than not is a major boon to implementation efforts. City population is now significant at the .05, and though the effect is small for any given unit of increase (the effect of each person is miniscule), its consistent appearance continues to emphasize its importance.

The case interviews strongly supported the hypothesis that windows of opportunity are a serious influence on implementation. Clear and distinguishable opportunities were

present in five of the six case cities, and four of these were the result of PE efforts.

Although the case studies did draw greater attention to the important role played by these champions and organizations, they also showcased just how important having a network of these champions is to making meaningful change over the longer term. A single PE may be influential, as in Fresno, but championing projects (especially unilaterally) consumes political capital and resources and can damage the long-term prospects for change. Far more effective was building a network of multiple PEs that could help to facilitate progress in the myriad ways necessary to build an infrastructure network. This highlights the major difference between consideration and implementation: a PE can put their weight behind a proposal, and that may be enough, but implementation requires the support (or at least a lack of resistance) of multiple departments, officials, local organizations, and the public.

Of course, not all implementation is created equal. Some cities in the survey sample had expansive on-street and off-street networks, bike share programs, and a bevy of other steps taken to support bicycling. Others were just beginning to implement shared-lane markings and disconnected trail segments. Hypothesis 3 proposed that the role of PEs and windows extended beyond simple yes or no consideration and implementation. To support this hypothesis I would expect to see a significant and positive relationship between PE presence and/or window presence and the level of implementation respondents reported for their particular communities.

***H3: Variation in Policy Action** – The level of implementation of bicycle infrastructure is a result of the presence and qualities of “Policy Entrepreneurs” and the presence of particular opportunities for action (“windows”), rather than the particular qualities of the local context (such as neighboring governments, local values, and fiscal conditions).*

The window independent variable was strongly associated to implementation level, as was city population. Both variables increased the likelihood of a city having a higher level of implementation. Once again, window is demonstrating the importance of local support. Population has been the most consistent explanatory variable so far, suggesting that more populous cities are indeed ahead of their smaller counterparts with regard to bicycle infrastructure. Since being a more populous city doesn't have any direct effect on policy, there appears to be an intervening or indirect effect being captured by population. However, many of the possible explanations (conversatism, density, media age, problem areas) are also included in the model, leaving this a major area for future exploration. A promising explanation may be found in the concept of leaders and laggards from Diffusion of Innovation Theory: perhaps larger cities are simply placed into the role of being leaders and innovators, with smaller cities being less inclined to experiment or take risks. The multiple references from less populous case cities to the need for guidance and leadership from state agencies or other parties may indicate a similar phenomenon.

City size in area is significant for the first time in this model, with a negative relationship indicating that the larger a city physically is, the less likely it is to have implemented at a high level. Since a more physically compact city has less infrastructure to convert or

territory to cover to reach a seemingly high level of implementation, this relationship is not altogether surprising.

As discussed with respect to the previous dichotomous dependent variables, the case interviews revealed that implementation is indeed an extended process. In fact, many cities reported periods of notable growth or expansion of their facilities (fueled by grants, plan updates, new staff, etc.), followed by a reduced level of implementation as interest waned, challenges arose, or development slowed. Rather than being a matter of policy “change”, with the suggestion that there is a clear before and after, infrastructure changes are quite gradual. Implementation itself takes time, as funding is limited and projects are planned and programmed out many years (or even decades) in advance. At the same time, opportunities for short-term progress may arise without being noticed, and having the right support and expertise (and/or policies) could become the difference between a high and low level of implementation.

These networks of actors that facilitate the new direction being maintained and pursued are a major component, made more so by their ability to create opportunities as well as take advantage of them. The case studies showcased that windows are not necessarily matters of fate or fortune, or the result of outside activity. Instead, individuals committed to bridging gaps and addressing barriers to action can create windows and then work together with other actors to lead a city through that window. Of course, the job isn't done at that point – taking advantage of an opportunity was merely the first step for

cities, who then faced the more difficult process of continuing to secure funding, generate support, and build out a network.

Before moving on to my remaining three hypotheses, a note about the “qualities” variables for policy entrepreneurs. Since these quality variables correlated too highly with the simple PE dummy independent variable, they could not be included in the same models. As such, I conducted the final models displayed above (Tables 8-11) and replaced the PE dummy with the dummy variables for PE persistence, patience, opportunism, savvy, connectedness, expertise, collaboration, and investment. None of these attributes were significantly associated with any of my dependent variables, and I elected not to spend more time with them. Nonetheless, these results suggest that any one PE attribute is not particularly influential with respect to consideration or implementation.

Though policy entrepreneurs have been proposed to vary based on attributes (and as I hypothesized in H1-H3), my findings did not yield any support for this claim. However, personal character attributes are only one part of what might make a PE more or less successful. The location of a PE within the streams might also matter, as a city staff member or elected official have different types of influence and relationships. Hypothesis 4 explored this concept of PE role, proposing that elected officials should have the greatest impact, compared to interest group advocates or local staff.

***H4: Variation in Effectiveness** – Elected officials who play the role of “Policy Entrepreneur” have a greater impact on both public consideration and selection of prioritization of bicycling as a mode of transportation than do other actors who play a similar role (specifically interest group advocates and agency staff); Interest group advocates playing a similar role have a lesser impact than elected officials, but a greater impact than agency or department staff playing that role.*

PE role was not found to be a significant factor in any model, though PE’s that were elected officials had a slightly more pronounced relationship than for interest group advocates or city staff. Importantly, I only tested for the first PE being each role, so it’s possible that a PE for each role was present in most cities, and distinguishing the impact of these multiple individuals may warrant a different analytical approach. Still, as things stand at the conclusion of this project there is no evidence that PE role plays a part in a PE being more or less effective.

The cases, meanwhile, suggested that pairs of roles could be effective (as with a city staff + supportive official), but that simply being a solo PE was not the same in all cases. It’s also unclear on the basis of the case studies whether PE role guarantees anything, though the opportunities can be large for each role. Elected officials might be able to have greater short-term influence than staff, since a strong mandate from a Mayor could change the direction of multiple offices. On the other hand, a motivated staff person could push the steady inclusion of bicycles in plans and projects for decades. The difference between elected official PE influence in Tampa and Townville (for example)

showcases that individual PEs within one role type may also have very different impacts based on what scale they're at, whether they have support from other parties, and other factors. Simply put, role is not a clear-cut influence on whether a PE is successful or not.

***H5: Coupling of the Streams** – In order for a “window” of opportunity to support a shift in infrastructure implementation the streams must be effectively coupled. This means a shared conception of the problem and bicycle infrastructure as a solution, along with a supportive local political context, and one or more entrepreneurial individuals to facilitate this coupling.*

While I devoted substantial attention to the concepts of policy entrepreneurs and windows, an important component of Multiple Streams is that a window of opportunity and a PE are not necessarily sufficient for policy change to occur. A window could open and a PE could be present, but the PE fails to take advantage of the opportunity to effectively couple the streams. For example, Springfield displayed circumstances that clearly qualify as a window of opportunity, and some local actors that fit the model of a PE, but early action provided as part of the window has not yet converted into a more serious commitment from the city to implementation of bicycle infrastructure. Multiple Streams proposed that in order for this to happen, a shared problem conception must be fostered, bicycle infrastructure must be broadly accepted as a solution, and the political context must be amenable to this pairing.

Shared problem conception proved hard to assess during the interviews, as respondents identified many different problems that their city might be hoping to address with bicycle facilities, and it was not clear that broad agreement on one or more of these issues actually existed in any of the cities. At the same time, some cities (such as #3 and #5) shared stories of how local leaders had prioritized bicycle infrastructure explicitly as part of a strategy to make their city more appealing, and that that vision of the value of these projects was becoming more widely shared over time. From these cases it seems that a pairing of problem and solution may be part of the policy change process, but that broad agreement on the pairing is not so much a requirement as a facilitator. Either way, a supportive local context was clearly an important factor. Though all cities reported limits on the support of their local officials for bicycle infrastructure, those cities with higher levels of implementation also reported greater levels of political support in both the survey and case results.

***H6: Post-Entrepreneurial Activity** – Networks established by policy entrepreneurs act to preserve the long-term consideration and implementation of the policy change after policy change occurs.*

My final hypothesis departed somewhat from the core of Multiple Streams, and proposed that PEs might develop network structures to preserve their policy change over time. From the case studies it does seem that networks have been developed in the high implementation cities, and that these arrangements serve to facilitate the ongoing expansion of the bicycle infrastructure network in each city. In four of the six cities that

network may include or take the form of a Bicycle Advisory Committee (BAC or Bicycle and Pedestrian Advisory Committee, BPAC). These committees contain city staff and citizens from around each community, as well as state and/or regional agency representation. Implementation of any transportation infrastructure is a long-term process as noted, and the selection and implementation of projects generally requires coordination among departments or offices, to say nothing of public engagement and other stakeholders. Additionally, infrastructure is only one component of encouraging higher rates of bicycling (along with education programs, encouragement campaigns, effective enforcement, and quality evaluation and data collection). These committees (and the networks they represent or tap into) may have responsibilities that go beyond purely the built environment and include these other elements.

Importantly, though networks were identified as present and active, it is not clear that all of these arrangements were established by or around a policy entrepreneur (the history of these committees pre-dated many of the windows identified as well). Instead, these committees and/or networks serve an important function but are not necessarily inclusive of PEs (or at least not all PEs). In part, this may be due to the perhaps temporary quality of the PEs identified in the case comparisons – some left for other jobs or cities, or ran for higher office, or made way for new advocate voices. Only a limited number of the PEs identified in the case interviews as having played a major role locally were still present, and only a couple were still in the same role. Nonetheless, it does appear that building or contributing to networks was at times an important part of the PE impact, as these networks were identified as a core part of ongoing local implementation. Future

research may be warranted in this area, as the incremental implementation of cities appeared to heavily leverage the reciprocal relationships between staff, citizens, and officials. These arrangements also came into play during periods of change, so an even more intensive focus on networks may be an important contribution to future understanding of municipal policy change

CHAPTER 7

CONCLUSION

This project took the step of applying an established policy change theory (the Multiple Streams Framework) to a unique and interesting policy action (bicycle infrastructure) that has seen varying adoption across the United States to date. At the outset of this project I expected to hear a lot of stories like that of Davis, CA and former UC Davis Chancellor Emil Mrak (or the similar stories from Portland, New York City, and Louisville). While the case studies did support the important role that individuals can play in local infrastructure and policy change, they also revealed a more complex reality and actually highlighted a less prominent part of those famous narratives of bicycle infrastructure. Davis was not solely due to Emil Mrak – it also took the work of a couple of professors, motivated city staff, and supportive local officials. The pairing of passionate local official and knowledgeable (and enthusiastic) city staff person was a game-changer in Portland; the same could be said of New York City, and all three of my successful case study cities. Indeed, it seems more and more clear (from both case and model results) that while singular PE's may be able to generate consideration, it takes broader local support to change the direction of a municipality's transportation infrastructure.

Another major departure from what I had hypothesized was that infrastructure policy change was not only gradual (as expected), but also actually waxed and waned as opportunities, support, and resources fluctuated. Windows could provide a jumpstart to implementation locally, and projects would be set in motion, but in time attention and

enthusiasm would settle back down and implementation would rely upon plans, programs, and policies set in place. This is not to say that these are necessarily signs of stagnation – many cities reported that they had settled into a routine of implementing where possible, adding facilities per development and/or resurfacing, and continuing to search for funding or partners to tackle larger or more costly projects. In many ways this incremental implementation is the hallmark of infrastructure, and is a sign of the legitimate inclusion of bicycling into a city’s transportation priorities. Where present, formal policies (e.g. Complete Streets) do a lot of the lifting by providing a minimum level of consideration or implementation at all times, regardless of interest or funding opportunities. At the same time, even the successful case and survey cities reported only programming for a fraction of the network they’d like to see, and annual progress in a number of cities had fallen below previous years as practical barriers to implementation (cost, right of way) presented themselves.

7.1 Reflections on Theory

The previously noted observed fluctuation from periods of interest and progress to steady implementation (or even a slowing) has ramifications for models of the policy change process, especially their use for policy changes that are by their nature incremental or step-wise. Multiple Streams explicitly expresses policy change as a matter of incremental progress punctuated by periods of sharper change, which matches the experience of the case cities. This is a particularly apt expectation given the experiences of cities with regard to bicycle infrastructure, where path dependency, limited funding, and a multitude of competing demands come together to create an incremental evolution even in the most successful of cities. Changes that occur are not one-off events. If mapped over time,

annual bicycle infrastructure implementation for those cities in the process of implementation would likely look like mostly like a consistent and positive linear relationship, punctuated at points by steeper periods of implementation (and possibly a few periods of slow down).

Based on the experiences of the case cities and my survey findings, those periods of expansion seem to be the result of the level of local political support (aided by citizen enthusiasm), staff interest, and funding opportunities (each of these being potentially sufficient to trigger an expansion in implementation). However, the marginal political cost of bicycle infrastructure projects is not consistent, providing an additional barrier to progress at different points in the evolution of a city's network. Some cities will run into barriers, potentially physical (narrow right of way, topography, geography), social (norms, attitudes, demographics), political (priorities, ideology, relationships), or fiscal. These barriers can make a project more costly or difficult than previous projects. On the other hand, they can also make the next project less costly or difficult than previous projects.

While Multiple Streams does assume incrementalism in the policy arena, it fails to effectively distinguish the characteristics that contribute to it, especially in the face of a policy change event. If we understand windows, PEs, and a coupling of the streams as an event sufficient to overcome the barriers that are otherwise limiting policy change, why then does the change so rapidly slow itself and continue to experience incremental implementation? This question is a critical one, and may be an important opportunity for

future MSF research to begin to tie in the language of institutions as well as the fundamental competition of issues for limited public and political attention. In the case of transportation infrastructure, it may be easy to place the blame on funding, but at the same time cities are very rarely utilizing a significant proportion of their existing transportation funding for bicycle infrastructure. Perhaps a more frank assessment is that even the periods of policy change are still incremental, just at a temporarily accelerated rate.

The above description calls to mind the Punctuated Equilibrium Theory (PET) discussed early on, which may be a fitting model for bicycle infrastructure implementation over time. However, the primary reason for passing on it as a theoretical structure was its limited falsifiable propositions about the causes of those punctuated changes. Multiple Streams introduced policy entrepreneurs (PEs), but it also introduced the concept of windows of opportunity. While the survey project struggled with operationalizing the concept of the window¹⁸ (since it is by its nature an abstract concept that may not always be obvious or distinct, and is often identified in retrospect on the basis of resulting progress), making it difficult to say with confidence that windows specifically are a significant factor, the case study comparison revealed these opportunities as critically important for cities that had made strides on bicycle infrastructure. While evidence for a coupling of the streams was mixed (shared problem definition may or may not actually

¹⁸ As noted earlier, the final operationalization ended up acting more as a proxy for local political support and presence on policy agendas.

occur – agreement can be reached with multiple problems attached, so long as everyone sees a reason to at least not say no), particular opportunities did repeat themselves in case interviews. These opportunities (often tied to funding in some way) were commonly generated or leveraged by local actors to instigate progress.

Earlier in the project I identified the possible applicability of the concept of “wicked problems”, especially with regard to issues like congestion, air quality, quality of life, and economic competitiveness. If bicycle infrastructure projects are being attached to these sorts of problems, then the wickedness of those problems could greatly complicate the selection of solutions (including bicycle infrastructure). Achieving a shared understanding of problem or solution when problems and/or solutions lack clear definition in the way we may be used to (a result of “wickedness”) could be a serious challenge to this aspect of stream coupling. On the other hand, wicked problems may actually offer greater opportunities for coupling since their interrelatedness with other problems may provide solution choices the opportunity to be attached to different problems depending upon the audience. Either way, policy action does not seem to be (in this case at least) the result of a clearly and widely agreed-upon pairing of specific problem and solution, but rather an alignment of opportunity and multiple issues that provided sufficient shared interest and support.

All of this is to say that in terms of policy change perspectives Multiple Streams may fit, but it will require a much finer focus on the particular rising and falling of bicycling on the local agenda. Rather than look solely at when a city’s general interest in bicycling

began, it's possible that the existence and behavior of the streams shows itself in the waxing and waning of bicycle projects in the hands of city councils, planning departments, and engineers. A longitudinal approach would be well suited to this, but securing accurate historical data on annual implementation and contextual factors is at best a substantial challenge. A project that follows the experience of a select group of cities over time might be viable, but would likely be better structured as a qualitative project (perhaps an ethnographic approach or something similar).

In general, I believe this project highlights the opportunity available to develop an improved policy change theory (particularly with regard to local decision-making). PET and MSF display what appears to be a broadly accurate structure, but the casual mechanisms functioning behind the scenes (especially during periods of incremental implementation) are not as clear. The importance of the proposed constituent elements of windows (problem conception and solution agreement) are challenged by my findings, and the conception of the individual policy entrepreneur as sufficient to trigger major change is threatened by a greater awareness of the role of networks and/or cooperation among multiple actors. Couching the impact of these networks purely in terms of their being tools of PEs (as is currently the case in the MSF literature (Oborn et al 2011, Mintrom and Norman 2009)) may fail to recognize the importance of the network itself, or its independence (especially over time) from any one entrepreneur.

Establishing a model of local government choice or a set of falsifiable tenets around policy change and path dependency and/or incrementalism would be an ambitious but

invaluable research direction (it would likely need to draw from perspectives of organizational choice, institutional analysis, policy change, and possibly others, and defend whether decisions function similarly at different steps (i.e. visioning, planning, and implementation). As things stand, Multiple Streams and other perspectives presume the stickiness of policy arenas (using the language of Incrementalism), but focus on this as the result of limitations on decision-making at the individual and organizational level. In reality, there are important causes for the ‘friction’ occurring during policy change and implementation. Having a model that can better account for not only forces that act to trigger policy change, but also those that resist it, would be a noble (if sizable) task. If nothing else, developing some proposed general models for how change occurs and varies based on different characteristics/opportunities/actors would be valuable and natural as a next step. The biggest challenge may be that the characteristics of the policy or policies being studied may greatly impact what factors are playing a part.

7.2 Moving Forward

Another area worthy of additional study moving forward is the influence of city population on consideration and implementation. This relationship could be capturing something important underlying the dynamic of transportation infrastructure (are larger cities more likely to innovate? Do they face greater pressure to be at the forefront? To address issues? Is it a matter of what other cities globally they’re seeking to emulate?), and this warrants further exploration. All I can say at this point is that with regard to bicycle infrastructure implementation, more populous cities are leaders, and smaller cities appear slightly more resistant to newer forms of projects. The case interviews suggest

that communities are heavily reliant upon outside validation for their project designs (such as guidance documents or design manuals like the MUTCD), and that knowledge and understanding of good bicycle design is a very real hurdle to progress in these less populous cities. As state DOTs and other parties generate their own guidance materials and updates, this will facilitate progress (especially if training is provided to whole departments, and not just individual planners or engineers, as noted by multiple interview respondents).

For practitioners, the major takeaways from this project are the importance of networks, external funding opportunities, and problem shopping. While individual policy entrepreneurs weren't the critical facilitators I expected, when paired with other individuals sharing their interests (and ideally situated in a diversity of offices or roles) they can have a tremendous impact. These networks of supporters make it possible for projects to progress expeditiously and effectively, and to draw outside funding. By sourcing external funding opportunities or tying bicycle projects to existing funding city's are free from the burden of selecting bicycle projects as a priority over other projects, and instead as a supplement or means to also build other projects. Given the relatively small percentage of residents in these cities that are currently riding, funding attachment creates priority and opportunity. Lastly, not all problems are equal in the eyes of officials, staff, and citizens. Public health and sustainability were considered issues in many communities surveyed or interviewed, but it was economic competitiveness and development that appeared to effectively resonate with a wider audience and gain traction.

Although survey instruments are nothing new or innovative, the sample I selected and the data brought together (including the novel conservatism metric of Tausanovitch and Warshaw (2014), municipal budgets and expenditures, survey responses, and Census Bureau city-level data) contribute to a unique dataset. Using appropriate analytical tools that are also hopefully accessible to practitioners was an attempt to ensure that my findings are not only valid but also useful to those individuals and groups most likely to take next steps to explore and utilize the results of this project. In addition to the quantitative component, the qualitative element (and the combined mixed method approach) implemented a new but promising matching technique to generate theory-grounded case pairs. Additionally, this qualitative component allowed for a critical assessment of the conclusions generated by the quantitative analysis, as well as provide improved validity compared to single-method projects (which are common in MSF studies).

This combination of approaches allowed for a more thorough study of the role and influence of policy entrepreneurs, windows, and streams, and may hopefully provide some practical value to the public and non-profit sector by offering them insight into how to effectively pursue desired policy changes with their limited resources. Case studies and survey instruments are both well-established methods on their own, and offer their own unique benefits. Case studies proved to be an effective way to understand the experience and process of cities, while the survey cast a broader net and offered more generalizable results. On the other hand, level of awareness/expertise varies across

potential survey respondents, and language is a challenge, as not all parties use the same definitions or terms (this was demonstrated in assessments related to the terms ‘protected’ and ‘separated’). Case studies on the other hand are very time intensive, and lack the ability to make broad claims with the same degree of confidence. Combining the two methods expands the labor requirements of social science research, but provides an important check on over-reliance upon either analytics or interpretation.

For the better part of the last decade there’s been an increasing academic interest in bicycle infrastructure in the United States, complementing similar research out of Europe, South America, and Asia. This attention implies that the gap in knowledge or barrier to action is around the built environment’s role in transportation and recreation decisions, but this is simply no longer the case. We may be gently refining our understanding of barriers to riding, and improving our recommendations for what facilities to build for any given context, but the greatest challenge facing many communities is merely generating the support (and prioritizing or securing the funding) necessary to change local infrastructure priorities. This project highlights where those barriers are most pronounced and where they can be best addressed, by focusing on building relationships and networks of actors who are invested, supportive, and knowledgeable. Advocacy can be helpful or damaging, and singular champions are not enough to lead the long-term process of policy transition (perhaps a more accurate name for this implementation process than policy “change”). Communities seeking to learn from the successes of their peers should look to create funding opportunities (by tapping into federal grants, state partnerships, and local tax measures, among other options), and prioritize policies and ordinances that will

support implementation regardless of fluctuation in public attention. Additionally, city and regional staff are critical actors at all levels, and training and recognizing these staff for their work on bicycle projects is an important step.

As more and more cities across the United States make the decision to invest in higher quality infrastructure and other supportive policies for bicycling and join the list of bicycle friendly communities, the questions posed by this project will become more and more significant to the understanding of local policy change (particularly around transportation). At this point there exists a clear spectrum of action with regard to bicycle infrastructure at the municipal level across the United States. Exploring the causes for this diversity is a great opportunity to challenge and improve policy change theories, including the Multiple Streams Framework. Efforts to support the growth of bicycling and the research associated with those efforts have too narrowly focused on mode choice work, without appreciating the practical realities of the problem, solution, and political contexts. Simply put, without an appreciation and understanding of how actors initiate and accomplish policy change, the selection of preferable project and policy alternatives by researchers and advocates could become too easily relegated to an ignored piece of guidance. Given the tremendous progress made on mode choice, it's now time for the academic community to take the next step to study the actors and processes that govern infrastructure decision-making (at a variety of scales), if additional policy change is to be fostered. This project highlights how small the difference can be between making sizable progress and stalling out at the municipal level, and the more we understand about this the better we can equip advocates, staff, and officials to be effective at facilitating

implementation not only of bicycle infrastructure but of other policy changes down the road.

APPENDIX A

MODEL SPECIFICATIONS

Hypothesis Tests for H1 and H2

DV (Dummy Variable) = either considerprotected (in the case of H1), implemented (H2), or implemprotected (H2).

$$\text{Log} \left[\frac{DV}{(1 - DV)} \right] = \beta_0 + \beta_1(\text{window}) + \beta_2(\text{pe})$$

Figure 2. Model 1

$$\text{Log} \left[\frac{DV}{(1 - DV)} \right] = \beta_0 + \beta_1(\text{window}) + \beta_2(\text{pe}) + \beta_3(\text{citypop}) + \beta_4(\text{citysize}) + \beta_5(\text{percwhite}) + \beta_6(\text{medage}) + \beta_7(\text{netsupport}) + \beta_8(\text{advoimpact})$$

Figure 3. Model 2

$$\begin{aligned} \text{Log} \left[\frac{DV}{(1 - DV)} \right] &= \beta_0 + \beta_1(\text{window}) + \beta_2(\text{pe}) + \beta_3(\text{citypop}) + \beta_4(\text{citysize}) \\ &+ \beta_5(\text{percwhite}) + \beta_6(\text{medage}) + \beta_7(\text{netsupport}) \\ &+ \beta_8(\text{regionpolitical}) + \beta_9(\text{expenditurescapita}) + \beta_{10}(\text{ideology}) \\ &+ \beta_{11}(\text{advoimpact}) \end{aligned}$$

Figure 4. Model 3

$$\begin{aligned} \text{Log} \left[\frac{DV}{(1 - DV)} \right] &= \beta_0 + \beta_1(\text{window}) + \beta_2(\text{pe}) + \beta_3(\text{citypop}) + \beta_4(\text{citysize}) \\ &+ \beta_5(\text{percwhite}) + \beta_6(\text{medage}) + \beta_7(\text{netsupport}) \\ &+ \beta_8(\text{regionpolitical}) + \beta_9(\text{expenditurescapita}) + \beta_{10}(\text{ideology}) \\ &+ \beta_{11}(\text{peadvocate}) + \beta_{12}(\text{peofficial}) + \beta_{13}(\text{advoimpact}) \end{aligned}$$

Figure 5. Model 4

$$\begin{aligned}
& \text{Log} \left[\frac{DV}{(1 - DV)} \right] \\
& = \beta_0 + \beta_1(\text{window}) + \beta_2(\text{pe}) + \beta_3(\text{citypop}) + \beta_4(\text{citysize}) \\
& + \beta_5(\text{percwhite}) + \beta_6(\text{medage}) + \beta_7(\text{netsupport}) \\
& + \beta_8(\text{regionpolitical}) + \beta_9(\text{expenditurescapita}) + \beta_{10}(\text{ideology}) \\
& + \beta_{11}(\text{peadvocate}) + \beta_{12}(\text{peofficial}) + \beta_{13}(\text{congestion}) \\
& + \beta_{14}(\text{airquality}) + \beta_{15}(\text{costliving}) + \beta_{16}(\text{econcompete}) \\
& + \beta_{17}(\text{econdev}) + \beta_{18}(\text{energyuse}) + \beta_{19}(\text{livability}) \\
& + \beta_{20}(\text{jobaccess}) + \beta_{21}(\text{advoimpact})
\end{aligned}$$

Figure 6. Model 5

$$\begin{aligned}
& \text{Log} \left[\frac{DV}{(1 - DV)} \right] \\
& = \beta_0 + \beta_1(\text{window}) + \beta_2(\text{citypop}) + \beta_3(\text{citysize}) + \beta_4(\text{percwhite}) \\
& + \beta_5(\text{medage}) + \beta_6(\text{netsupport}) + \beta_7(\text{regionpolitical}) \\
& + \beta_8(\text{expenditurescapita}) + \beta_9(\text{ideology}) + \beta_{10}(\text{peadvocate}) \\
& + \beta_{11}(\text{peofficial}) + \beta_{12}(\text{congestion}) + \beta_{13}(\text{airquality}) \\
& + \beta_{14}(\text{costliving}) + \beta_{15}(\text{econcompete}) + \beta_{16}(\text{econdev}) \\
& + \beta_{17}(\text{energyuse}) + \beta_{18}(\text{livability}) + \beta_{19}(\text{jobaccess}) \\
& + \beta_{20}(\text{peinvested}) + \beta_{21}(\text{pecollab}) + \beta_{22}(\text{peexpert}) \\
& + \beta_{23}(\text{pepatient}) + \beta_{24}(\text{pepersist}) + \beta_{25}(\text{pesavvy})
\end{aligned}$$

Figure 7. Full Model with PE attributes

APPENDIX B

ASSUMPTION TESTS

Table 18. Collinearity Tests

Variable	VIF	1/VIF
coupled	12.06	0.0829
window	10.75	0.093
expenditures_capita	6.63	0.150
taxes_capita	6.30	0.159
politicalsupport	5.89	0.170
netsupport	5.27	0.190
pe	4.72	0.212
pop_density	3.35	0.298
ideology_pos	2.92	0.343
pe_collab	2.64	0.380
city_pop	2.63	0.380
officialsupport	2.62	0.381
pe_expert	2.60	0.385
pe_invested	2.57	0.390
agency-support	2.50	0.399
pe_opport	2.47	0.405
pe_savvy	2.32	0.452
pe_persist	2.21	0.493
peofficial	2.03	0.500
econcompete	1.97	0.506
pe_patient	1.91	0.522

Table 19. Parallel Odds Assumption

Variable	chi2	p<chi2	df
All	9.06	0.616	11

A Brant test conducted on the simplified model (excluding the PE attributes, roles, and problem shopping variables to allow the test to function) found an insignificant result, indicating that the proportional odds assumption had not been violated. The above Brant table was generated using a compacted version of the implementlevel dependent variable (where the seven levels of implementlevel have been compacted into a three-tiered high, medium, and low system). This compacting was done because not all independent variables could be retained in all binary logits in the full model. Although this change does alter the cut points and it is technically possible that the parallel odds assumption is not violated here but is violated in the full seven-level model, it's unlikely enough conceptually and practically so as to allow the above Brant table as evidence of support for the use of the parallel odds model (aka the ordered logistic regression).

APPENDIX C

SURVEY INTERVIEW QUESTIONS

Questions	Type	Response Options
1. How familiar do you consider yourself with bicycle planning, programming, or policy practices?	Multiple Choice	1=Not very, 2=Somewhat, 3=Very
2. In what municipality do you conduct your work?	Short Answer	
3. What is the name of your organization?	Short Answer	
4. What is your role and title?	Short Answer	
5. Which type of organization do you represent?	Multiple Choice	Local government or agency; regional government or metropolitan planning organization; state government or state agency; local advocacy group; state or regional advocacy group; local non-profit; private company; other
6. Has your city considered the implementation of bicycle infrastructure (such as bike lanes, shared lanes, multi-use paths, and/or any other form of bicycle facility)?	Multiple Choice	Yes / No
7. Has your city considered the implementation of separated and/or protected bicycle infrastructure (such as cycletracks or buffered bike lanes)?	Multiple Choice	Yes / No
8. Has your city implemented any bicycle infrastructure projects?	Multiple Choice	Yes / No
9. Has your city implemented any separated and/or protected bicycle infrastructure projects (such as cycletracks or buffered bike lanes)?	Multiple Choice	Yes / No
10. On a scale of 1 to 7, with 1 being “No consideration” and 7 being “Substantial Implementation”, how would you rate the level of	Multiple Choice	1=No consideration; 2=Very little consideration; 3=Some consideration; 4=Active consideration but

implementation of bicycle projects in your city?		no implementation; 5=Some implementation; 6=Good amount of implementation; 7=Substantial implementation
11a. How many total miles of <i>dedicated bicycle infrastructure</i> (bike lanes, cycletracks, multi-use paths, and other facilities that separate cyclists from motor vehicle traffic) would you estimate were implemented in your city over the last ten years?	Short Answer	
11b. How many total miles of <i>shared-use bicycle infrastructure</i> (facilities where bicyclists share space with motor vehicle traffic) would you estimate were implemented in your city over the last ten years?	Short Answer	
12. Has bicycling been discussed as a way to address any specific problems facing your community? If so, please select up to four.	Multiple Choice	Air Quality; Congestion; Cost of Living; Economic Competitiveness; Economic Development; Energy Use; Job Access; Livability; Public Health
13. Are there any particular values or ideological priorities/principles that seem to be influential in your community, and which might influence whether or not bicycle infrastructure is considered or implemented?	Short Answer	
14. Do you think these values/ideologies have played a part at all in your community's consideration or implementation of bicycle infrastructure projects?	Multiple Choice	1=Very much so; 2=Somewhat; 3=Not at all
15a. How supportive or resistant do you believe [the Local political climate] has been toward the consideration or implementation of bicycle infrastructure projects?	Multiple Choice	1-5 (1=Highly resistant, 5=Highly supportive)
15b. How supportive or resistant do you believe [State elected officials] have been toward the consideration or implementation of bicycle infrastructure projects?	Multiple Choice	1-5 (1=Highly resistant, 5=Highly supportive)

15c. How supportive or resistant do you believe [State agencies] have been toward the consideration or implementation of bicycle infrastructure projects?	Multiple Choice	1-5 (1=Highly resistant, 5=Highly supportive)
16. Has your city ever had any major changes in staffing or public office that might have changed priorities or preferences around bicycling in your community? If so, please explain.	Short Answer	
17. How has securing funding for bicycle infrastructure projects compared to securing funding for other transportation infrastructure projects in your community?	Multiple Choice	1=Larger challenge than usual; 2=Similar challenge to usual; 3=Smaller challenge than usual
18. Have any particular individuals been centrally involved in, or been instigators for, the implementation of bicycle infrastructure in your community?	Multiple Choice	Yes/No
19. If yes, please identify up to 3 individuals and their titles	Short Answer	
20. What role does each influential individual have?	Multiple Choice	Elected official; interest group advocate; government agency/department staff; non-affiliated citizen
21. How did each person listed above influence local decision-making? What did each person do that facilitated consideration or implementation?	Short Answer	
22. Would you use any of the following terms to describe each of these people and their work to develop bicycle infrastructure? If so, please select the 3 that you think best describe each person. [Asked for each person]	Multiple Choice	Collaborative; Invested; Issue Expert; Opportunistic; Patient; Persistent; Politically Savvy; Well-Connected
23. As your community considers or considered implementing bicycle infrastructure, are/were there any special circumstances that made those projects more visible, appealing, or feasible for your community?	Short Answer	

<p>24. Were there any recurring circumstances that might have influenced whether or not it was the right time for implementation? (For example, the local or regional planning process, or the renewal of a SPLOST or other funding or planning opportunity) If yes, please explain briefly:</p>	<p>Short Answer</p>
<p>25. Can you suggest other individuals who could speak knowledgeably about bicycle infrastructure projects? If so, please provide their name and organization.</p>	<p>Short Answer</p>
<p>26. Does your city have an organized bicycle advocacy organization? If yes, please provide the name of this organization or a contact email.</p>	<p>Short Answer</p>
<p>27. On a scale of 1 to 7, with 1 being "no impact at all" and 7 being "very large impact", how much of an impact has this organization had on bicycling in your city?</p>	<p>Multiple Choice 1-7 (1=No impact at all, 7=very large impact)</p>
<p>28. Are there any other factors not discussed that may have played a role in whether your city has considered or implemented bicycle infrastructure? If so, please note them below.</p>	<p>Short Answer</p>

APPENDIX D

CASE INTERVIEW QUESTIONS

Name and Title:

Organization Name:

How would you describe your organization's Mission or purpose?

How familiar or experienced are you with bicycle planning or policy?

Has your city *considered* implementing bicycle infrastructure projects? How about specifically separated and/or protected bicycle infrastructure?

Could you elaborate on how these discussions about bicycle infrastructure began, and perhaps what triggered them? -Alternatively, why you think such discussions have not occurred (in the case or protected infra)

How would you describe the status of these proposals?

Has your city implemented bicycle infrastructure projects? Has your city implemented any separated and/or protected infrastructure projects?

If so, how would you describe the scale of this implementation?

Is the city active in planning for bicycle infrastructure? Active in implementing? Feel free to elaborate as you see fit

Is there a specific time in history (month/year) that you would mark as the start of your city's implementation?

If you were to hazard a guess, what do you think spurred action to be taken then? -or not- (why did you or did you not go from consideration to implementation at that time)?

How many total miles of bicycle infrastructure would you estimate were implemented in your city in 2014 and 2015? How do you think that compares to previous years? How does that scale of implementation compare to what you have planned?

Has bicycling been discussed by your community/government as a way to address any specific issues facing your community? If so, what issues?

Why are those priority issues for your community?

Are those issues often discussed when discussing bicycle projects? If so, by whom?

How is bicycling a "solution" to this problem?

Has the city considered other "solutions" to these problems? If so, what were they?

Were any of these other solutions implemented? If so, which, and how extensively?

Why were those solutions selected?

Are there particular values or ideological priorities/principles that seem to be particularly influential in your community?

Do you think this has played a part at all in your community's implementation (OR lack of) of bicycle infrastructure/policies?

How conducive would you say the local political climate has been (or is) toward bicycle infrastructure projects?

Have there been any major changes in staffing or public office that might have changed priorities or preferences around bicycling?

Are there any other factors that influenced your city's implementation of bicycle infrastructure? For example, activity of neighboring cities? Peer Cities?

How has funding played a role, if at all, in influencing implementation?

Have any particular individuals been centrally involved in or responsible for the consideration implementation of bicycle infrastructure in your community?

If so, who? What role and title do they have?

How have they influenced the process? What did they do that led to consideration or implementation (or that hampered it)?

Are there any particular character traits or qualities of these person(s) that seemed to make them more influential or successful? If so, what?

Is this person(s) still involved in decisions or discussions around bicycle infrastructure? If so, in what way?

Has this person played any part in influencing how the problem discussed earlier was defined, viewed, or discussed? If so, please describe:

Did they play a part in characterizing bicycling as a solution to this problem? If so, how

did they do this?

Prior to your community's consideration or implementation of bicycle infrastructure (if applicable), were there any special circumstances that made bicycle projects more visible, appealing, or feasible for the community? If so, what?

If your city has not yet reached the level of consideration or implementation of other cities, do you think there are any particular reasons for that? Have there been opportunities for progress in this area? If so, why do you think they didn't convert into action?

Put another way, do you think there were any reasons that that time (discussed before) became the right time to consider or implement bicycle projects? Was it a unique opportunity in any way, or something that could have happened any time? *Examples (if needed to clarify): For example, the injury of a bicyclist, the opportunity to receive special grant funding, growing awareness of some local issue (air quality, sustainability), or growing appeal or research on dedicated infrastructure?*

Were there any recurring circumstances that might have influenced whether it was the right time or not? For example, the local or regional planning process, or the renewal of a SPLOST or other funding or planning opportunity?

Looking at these opportunities (if present), how would you describe the size of the opportunity (for example, was it a small opportunity, or a large one)?

Were there any factors limiting the size of the opportunity? If so, what?

Any other factors not discussed at this point that may have played a role in consideration/implementation?

Are there other individuals who could speak knowledgeably about your local community's consideration or implementation of bicycle infrastructure projects?

If so, would you be willing to provide their name and organization, and perhaps a contact email?

REFERENCES

- Agranoff, R., & McGuire, M. (1999). Managing in Network Settings. *Policy Studies Review*, 16(1), 19–41.
- Agranoff, R., & McGuire, M. (2001). Big Questions in Public Network Management Research. *Journal of Public Administration Research and Theory*, 11(3), 295–326.
- Akar, G., & Clifton, K. J. (2009). Influence of Individual Perceptions and Bicycle Infrastructure on Decision to Bike. *Transportation Research Record: Journal of the Transportation Research Board*, 2140(-1), 165–172. doi:10.3141/2140-18
- Bertolini, L. (2007). Evolutionary urban transportation planning: an exploration. *Environment and Planning A*, 39(8), 1998–2019. doi:10.1068/a38350
- Bickerstaff, K., & Walker, G. (2005). Shared visions, unholy alliances: Power, governance and deliberative processes in local transport planning. *Urban Studies*, 42(12), 2123–2144. doi:10.1080/00420980500332098
- Boroovah, V.K. (2001). *Logit and Probit: Ordered and Multinomial Models*. SAGE Publications.
- Broach, J., Dill, J., & Gliebe, J. (2012). Where do cyclists ride? A route choice model developed with revealed preference GPS data. *Transportation Research Part A: Policy and Practice*, 1–11. doi:10.1016/j.tra.2012.07.005
- Buehler, R., & Pucher, J. (2011a). Sustainable Transport in Freiburg: Lessons from Germany's Environmental Capital. *International Journal of Sustainable Transportation*, 5(1), 43–70. doi:10.1080/15568311003650531
- Buehler, R., & Pucher, J. (2011b). Cycling to work in 90 large American cities: new evidence on the role of bike paths and lanes. *Transportation*, 39(2), 409–432. doi:10.1007/s11116-011-9355-8
- Buehler, R., & Pucher, J. (2012b). International Overview: Cycling Trends in Western Europe, North America, and Australia. In J. Pucher & R. Buehler (Eds.), *City Cycling*. MIT Press.
- Buehler, R., & Handy, S. (2008). Fifty Years of Bicycle Policy in Davis, California. *Transportation Research Record: Journal of the Transportation Research Board*, 2074(-1), 52–57. doi:10.3141/2074-07
- Cavill, N., Kahlmeier, S., Rutter, H., Racioppi, F., & Oja, P. (2008). Economic analyses of transport infrastructure and policies including health effects related to cycling and

- walking: A systematic review. *Transport Policy*, 15(5), 291–304.
doi:10.1016/j.tranpol.2008.11.001
- Cervero, R., & Duncan, M. (2003). Walking, bicycling, and urban landscapes: evidence from the San Francisco Bay Area. *American journal of public health*, 93(9), 1478–83. Retrieved from
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1447996&tool=pmcentrez&rendertype=abstract>
- Christopoulos, D., & Ingold, K. (2011). Distinguishing between political brokerage & political entrepreneurship. *Procedia - Social and Behavioral Sciences*, 10, 36–42.
doi:10.1016/j.sbspro.2011.01.006
- Cole, R., Burke, M., Leslie, E., Donald, M., & Owen, N. (2010). Perceptions of representatives of public, private, and community sector institutions of the barriers and enablers for physically active transport. *Transport Policy*, 17(6), 496–504.
doi:10.1016/j.tranpol.2010.05.003
- Cradock, A. L., Fields, B., Barrett, J. L., & Melly, S. (2012). Program practices and demographic factors associated with federal funding for the Safe Routes to School program in the United States. *Health & place*, 18(1), 16–23.
doi:10.1016/j.healthplace.2011.08.015
- Cradock, A. L., Troped, P. J., Fields, B., Melly, S. J., Simms, S. V., Gimmler, F., & Fowler, M. (2009). Factors associated with federal transportation funding for local pedestrian and bicycle programming and facilities. *Journal of public health policy*, 30 Suppl 1(2009), S38–72. doi:10.1057/jphp.2008.60
- Creswell, J. and Plano Clark, V.L. (2011). *Designing and Conducting Mixed Methods Research*. Thousand Oaks, CA: SAGE Publications.
- Crow, D. A. (2010). Policy Entrepreneurs, Issue Experts, and Water Rights Policy Change in Colorado. *Review of Policy Research*, 27(3), 299–316.
- Curtis, C., & Low, N. (2012). *Institutional Barriers to Sustainable Transport*. Ashgate Publishing.
- De Hartog, J. J., Boogaard, H., Nijland, H., & Hoek, G. (2010). Do the health benefits of cycling outweigh the risks? *Environmental health perspectives*, 118(8), 1109–16.
doi:10.1289/ehp.0901747
- De Zeeuw, D., & Flusche, D. (2011). How a Bill Becomes a Bike Lane: Federal Legislation, Programs, and Requirements of Bicycling and Walking Projects. *Planning & Environmental Law*, 63(8), 8–11.
- Dill, J. (2009). Bicycling for transportation and health: the role of infrastructure. *Journal of public health policy*, 30 Suppl 1(1), S95–110. doi:10.1057/jphp.2008.56

- Dill, J., & Carr, T. (2003). Bicycle Commuting and Facilities in Major U.S. Cities. *Transportation Research Record, 1828*(03), 116–123.
- Dobson, N. G., & Gilroy, A. R. (2009). From partnership to policy: the evolution of Active Living by Design in Portland, Oregon. *American journal of preventive medicine, 37*(6 Suppl 2), S436–44. doi:10.1016/j.amepre.2009.09.008
- Dovalina, R., & Timmons, L. (2008). How to obtain and use federal aid funding for transportation projects. *Journal of Public Works & Infrastructure, 1*(1), 51–63.
- Evenson, K. R., Aytur, S. a, Satinsky, S. B., Kerr, Z. Y., & Rodriguez, D. A. (2011). Planning for Pedestrians and Bicyclists: Results from a Statewide Municipal Survey. *Journal of Physical Activity and Health, 8*(Suppl 2), 275–284.
- Evenson, K. R., Aytur, S. a, Satinsky, S. B., & Rodriguez, D. a. (2011). Barriers to municipal planning for pedestrians and bicyclists in North Carolina. *North Carolina medical journal, 72*(2), 89–97. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/21721492>
- Evenson, K. R., Sallis, J. F., Handy, S. L., Bell, R., & Brennan, L. K. (2012). Evaluation of physical projects and policies from the Active Living by Design partnerships. *American journal of preventive medicine, 43*(5 Suppl 4), S309–19. doi:10.1016/j.amepre.2012.06.024
- Fischer, Frank. (1998). Beyond Empiricism : Policy Inquiry in Postpositivist Perspective. *Policy Studies Journal, 26*(1), 129–146.
- Flynn, B. S., Dana, G. S., Sears, J., & Aultman-Hall, L. (2012). Weather factor impacts on commuting to work by bicycle. *Preventive medicine, 54*(2), 122–4. doi:10.1016/j.ypmed.2011.11.002
- Forester, J. (1994). *Bicycle Transportation: A Handbook for Cycling Transportation Engineers* (Second Edi.). MIT Press.
- Fung, a., & Wright, E. O. (2001). Deepening Democracy: Innovations in Empowered Participatory Governance. *Politics & Society, 29*(1), 5–41. doi:10.1177/0032329201029001002
- Gaffron, P. (2003). The implementation of walking and cycling policies in British local authorities. *Transport Policy, 10*(3), 235–244. doi:10.1016/S0967-070X(03)00024-6
- Gelman, A. & Hill, J. (2007). *Data analysis using regression and multilevel/hierarchical models*. New York, NY: Cambridge University Press.
- Gotschi, T. (2011). Costs and benefits of bicycling investments in Portland, Oregon. *Journal of physical activity & health, 8 Suppl 1*(Suppl 1), S49–58. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/21350262>

- Gotschi, T., & Mills, K. (2008). *Active Transportation for America: The Case for Increased Federal Investment in Bicycling and Walking*.
- Guldbrandsson, K., & Fossum, B. (2009). An exploration of the theoretical concepts policy windows and policy entrepreneurs at the Swedish public health arena. *Health Promotion International, 24*(4), 434–44. doi:10.1093/heapro/dap033
- Hajer, M., & Kesselring, S. (1999). Democracy in the Risk Society? Learning from the New Politics of Mobility in Munich. *Environmental Politics, 8*(3), 1–23.
- Handy, S. (2008). Regional transportation planning in the US: An examination of changes in technical aspects of the planning process in response to changing goals. *Transport Policy, 15*(2), 113–126. doi:10.1016/j.tranpol.2007.10.006
- Handy, S. L., Boarnet, M. G., Ewing, R., & Killingsworth, R. E. (2002). How the Built Environment Affects Physical Activity: Views from Urban Planning. *American Journal of Preventive Medicine, 23*(2 Suppl), 64–73. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12133739>
- Handy, S., & McCann, B. (2010). The Regional Response to Federal Funding for Bicycle and Pedestrian Projects. *Journal of the American Planning Association, 77*(1), 23–38. doi:10.1080/01944363.2011.526537
- Heclo, H. (1978). Issue Networks and the Executive Establishment. In *The New American Political System* (pp. 87–107, 115–124).
- Heinen, E., & Handy, S. (2012). Similarities in Attitudes and Norms and the Effect on Bicycle Commuting: Evidence from the Bicycle Cities Davis and Delft. *International Journal of Sustainable Transportation, 6*(5), 257–281. doi:10.1080/15568318.2011.593695
- Heinen, E., Maat, K., & van Wee, B. (2011). Day-to-Day Choice to Commute or Not by Bicycle. *Transportation Research Record: Journal of the Transportation Research Board, 2230*(-1), 9–18. doi:10.3141/2230-02
- Heinen, E., Maat, K., & Wee, B. Van. (2011). The role of attitudes toward characteristics of bicycle commuting on the choice to cycle to work over various distances. *Transportation Research Part D: Transport and Environment, 16*(2), 102–109. doi:10.1016/j.trd.2010.08.010
- Heinen, E., van Wee, B., & Maat, K. (2010). Commuting by Bicycle: An Overview of the Literature. *Transport Reviews, 30*(1), 59–96. doi:10.1080/01441640903187001
- Henstra, D. (2010). Explaining local policy choices: A Multiple Streams analysis of municipal emergency management. *Canadian Public Administration, 53*(2), 241–258. doi:10.1111/j.1754-7121.2010.00128.x

- Howlett, M., McConnell, A., & Perl, A. (2014). Streams and stages: Reconciling Kingdon and policy process theory. *European Journal of Political Research*, 1–16. doi:10.1111/1475-6765.12064
- Huxham, C. (2003). Theorizing collaboration practice. *Public Management Review*, 5(3), 401–423. doi:10.1080/1471903032000146964
- Hysing, E. (2009). Greening Transport-Explaining Urban Transport Policy Change. *Journal of Environmental Policy & Planning*, 11(3), 243–261.
- Imperial, M. T. (2005). Using Collaboration as a Governance Strategy: Lessons from Six Watershed Management Programs. *Administration & Society*, 37(3), 281–320.
- Jaynes, C., Lethco, T., Khuong, Y., & Riscica, V. (2012). Looking Back and Moving Forward. *Transportation Research Record: Journal of the Transportation Research Board*, 2271(-1), 1–8. doi:10.3141/2271-01
- Kane, L., & Mistro, R. D. E. L. (2003). Changes in transport planning policy: Changes in transport planning methodology? *Transportation*, 30, 113–131.
- Khayesi, M., & Amekudzi, A. a. (2011). Kingdon's multiple streams model and automobile dependence reversal path: the case of Curitiba, Brazil. *Journal of Transport Geography*, 19(6), 1547–1552. doi:10.1016/j.jtrangeo.2011.06.012
- Khisty, C. J., & Arslan, T. (2005). Possibilities of steering the transportation planning process in the face of bounded rationality and unbounded uncertainty. *Transportation Research Part C: Emerging Technologies*, 13(2), 77–92. doi:10.1016/j.trc.2005.04.003
- Kingdon, J. (1995). *Agendas, Alternatives, and Public Policies* (Second Edi.). Addison-Wesley Educational Publishers.
- Krizek, K. J., Barnes, G., & Thompson, K. (2009). Analyzing the Effect of Bicycle Facilities on Commute Mode Share over Time. *Journal of Urban Planning and Development*, 135(2), 66–73.
- Krizek, K. J., Poindexter, G., Barnes, G., & Mogush, P. (2007). Analysing the benefits and costs of bicycle facilities via online guidelines. *Planning Practice and Research*, 22(2), 197–213. doi:10.1080/02697450701584386
- League of American Bicyclists. (2015). *Where We Ride: Analysis of Bicycle Commuting in American Cities*. http://www.bikeleague.org/sites/default/files/Where_We_Ride_2014_data_web.pdf
- Lewis, P. G., & McGhee, E. (2001). The Local Roots of Federal Policy Change: Transportation in the 1990s. *Polity*, 34(2), 205–229.

- Litman, T. (2013). The New Transportation Planning Paradigm. *ITE Journal*, 83(6), 20–28.
- Liu, X., Lindquist, E., Vedlitz, A., & Vincent, K. (2010). Understanding Local Policymaking: Policy Elites' Perceptions of Local Agenda Setting and Alternative Policy Selection. *Policy Studies Journal*, 38(1), 69–91.
- Low, N., & Astle, R. (2009). Path dependence in urban transport: An institutional analysis of urban passenger transport in Melbourne, Australia, 1956–2006. *Transport Policy*, 16(2), 47–58. doi:10.1016/j.tranpol.2009.02.010
- Lowry, M. B. (2010). Using optimization to program projects in the era of communicative rationality. *Transport Policy*, 17(2), 94–101. doi:10.1016/j.tranpol.2009.11.004
- Mannheimer, L. N., Lehto, J., & Ostlin, P. (2007). Window of opportunity for intersectoral health policy in Sweden--open, half-open or half-shut? *Health Promotion International*, 22(4), 307–15. doi:10.1093/heapro/dam028
- Mapes, J. (2009). *Pedaling Revolution: How Cyclists are Changing American Cities*. Corvallis, OR: Oregon State University Press.
- Marsden, G., Frick, K. T., May, a. D., & Deakin, E. (2011b). How do cities approach policy innovation and policy learning? A study of 30 policies in Northern Europe and North America. *Transport Policy*, 18(3), 501–512. doi:10.1016/j.tranpol.2010.10.006
- Marsden, Greg, Trapenberg Frick, K., May, A. D., & Deakin, E. (2012). Bounded rationality in policy learning amongst cities: lessons from the transport sector. *Environment and Planning A*, 44(4), 905–920. doi:10.1068/a44210
- McCullagh, P. (1980). Regression Models for Ordinal Data. *Journal of the Royal Statistical Society. Series B.*, 42(2), 109–142.
- McGinnis, M. D. (2011). Networks of Adjacent Action Situations in Polycentric Governance. *Policy Studies Journal*, 39(1), 51–78. doi:10.1111/j.1541-0072.2010.00396.x
- McKelvey, R. D., & Zavoina, W. (1975). A Statistical Model for the Analysis of Ordinal Level Dependent Variables. *Journal of Mathematical Sociology*, 4, 103–120.
- Meier, K. J., & O'Toole, L. J. (2003). Public Management and Educational Performance: The Impact of Managerial Networking. *Public Management and Educational Performance*, 63(6), 689–700.
- Meyer, M., Campbell, S., Leach, D., & Coogan, M. (2005). Collaboration: The Key to Success in Transportation. *Transportation Research Record*, 1924(1), 153–162. doi:10.3141/1924-20

- Meyer, M. D., & Miller, E. J. (2001). *Urban Transportation Planning: A Decision-Oriented Approach* (Second Edi.). McGraw-Hill.
- Miller, J. S. (2011). Characteristics of Effective Collaboration in Response to Diversified Transportation Planning Authority. *Advances in Decision Sciences*, 2011, 1–25. doi:10.1155/2011/725080
- Mintrom, M. (1997). Policy Entrepreneurs and the Diffusion of Innovation. *American Journal of Political Science*, 41(3), 738–770.
- Mintrom, M., & Norman, P. (2009). Policy Entrepreneurship and Policy Change. *Policy Studies Journal*, 37(4), 649–667. doi:10.1111/j.1541-0072.2009.00329.x
- Monsere, C. M., McNeil, N., & Dill, J. (2012). Multiuser Perspectives on Separated, On-Street Bicycle Infrastructure. *Transportation Research Record: Journal of the Transportation Research Board*, 2314(-1), 22–30. doi:10.3141/2314-04
- Neshkova, M. I., & Guo, H. (2011). Public Participation and Organizational Performance: Evidence from State Agencies. *Journal of Public Administration Research and Theory*, 22(2), 267–288. doi:10.1093/jopart/mur038
- Newhall, M. N. (2013). Biking to Work in American Cities: The Effect of Federal Infrastructure Funding.
- Nielsen, Richard A. (2016). Case Selection Via Matching, *Sociological Methods & Research*, forthcoming.
- Nielsen, T. a. S., Skov-Petersen, H., & Agervig Carstensen, T. (2013). Urban planning practices for bikeable cities – the case of Copenhagen. *Urban Research & Practice*, 6(1), 110–115. doi:10.1080/17535069.2013.765108
- Oborn, E., Barrett, M., & Exworthy, M. (2011). Policy Entrepreneurship in the Development of Public Sector Strategy: the Case of London Health Reform. *Public Administration*, 89(2), 325–344. doi:10.1111/j.1467-9299.2010.01889.x
- Ostrom, E. (2011). Background on the Institutional Analysis and Development Framework. *Policy Studies Journal*, 39(1), 7–27. doi:10.1111/j.1541-0072.2010.00394.x
- Page, M. (2005). Non-Motorized Transportation Policy. In K.J. Button & D. A. Hensher (Eds.), *Handbook of Transport Strategy, Policy, and Institutions* (pp. 582–596). Elsevier Ltd.
- PBIC. (2010). *The National Bicycling and Walking Study*.
- Petridou, E. (2014). Theories of the Policy Process: Contemporary Scholarship and Future Directions. *Policy Studies Journal*, 42(S1), 12–33.

- Provan, K. G., & Kenis, P. (2007). Modes of Network Governance: Structure, Management, and Effectiveness. *Journal of Public Administration Research and Theory*, 18(2), 229–252. doi:10.1093/jopart/mum015
- Providelo, J. K., & Sanches, S. da P. (2011). Roadway and traffic characteristics for bicycling. *Transportation*, 38(5), 765–777. doi:10.1007/s11116-011-9353-x
- Pucher, J., & Buehler, R. (2008). Making Cycling Irresistible: Lessons from The Netherlands, Denmark and Germany. *Transport Reviews*, 28(4), 495–528. doi:10.1080/01441640701806612
- Pucher, J., Buehler, R., & Seinen, M. (2011). Bicycling renaissance in North America? An update and re-appraisal of cycling trends and policies. *Transportation Research Part A: Policy and Practice*, 45(6), 451–475. doi:10.1016/j.tra.2011.03.001
- Pucher, J., Dill, J., & Handy, S. (2010). Infrastructure, programs, and policies to increase bicycling: an international review. *Preventive medicine*, 50, S106–125. doi:10.1016/j.ypmed.2009.07.028
- Ridde, V. (2009). Policy Implementation in an African State: an Extension of Kingdon’s Multiple-Streams Approach. *Public Administration*, 87(4), 938–954. doi:10.1111/j.1467-9299.2009.01792.x
- Robinson, S. E., & Eller, W. S. (2010). Participation in Policy Streams: Testing the Separation of Problems and Solutions in Subnational Policy Systems. *Policy Studies Journal*, 38(2), 199–216. doi:10.1111/j.1541-0072.2010.00358.x
- Roskowski, M. (2013). *Selling Biking: A new study on the “swing voters” of the street* (pp. 1–9).
- Schank, J., & Rudnick-Thorpe, N. (2011). End of the Highway Trust Fund? *Transportation Research Record: Journal of the Transportation Research Board*, 2221(-1), 1–9. doi:10.3141/2221-01
- Schneider, M., & Teske, P. (1992). Toward a Theory of the Political Entrepreneur: Evidence from Local Government. *American Political Science Review*, 86(3), 737–747.
- Sears, J., Flynn, B. S., Aultman-Hall, L., & Dana, G. S. (2012). To Bike or Not to Bike: Seasonal Factors for Bicycle Commuting. *Transportation Research Record: Journal of the Transportation Research Board*, 2314(-1), 105–111. doi:10.3141/2314-14
- Talvitie, A. (1997). Things planners believe in, and things they deny. *Transportation*, 24, 1–31.
- Tausanovitch, C. and Warshaw, C. (2014) Representation in Municipal Government, *American Political Science Review*, 108(3), 605-641.

- Travis, R., & Zahariadis, N. (2002). A Multiple Streams Model of U.S. Foreign Aid Policy. *Policy Studies Journal*, 30(4), 495–514.
- UCLA: Statistical Consulting Group. R Data Analysis Examples: Ordinal Logistic Regression. <http://www.ats.ucla.edu/stat/r/dae/ologit.htm> (accessed November 20, 2014).
- U.S. Census Bureau. (2014). *Modes Less Traveled – Bicycling and Walking to Work in the United States: 2008-2012*. American Community Survey Reports. <https://www.census.gov/prod/2014pubs/acs-25.pdf>
- U.S. Census Bureau. (2012). Population Estimates Program. Retrieved from <http://www.census.gov/popest/>
- U.S. Census Bureau. (2015). QuickFacts. Retrieved from <http://www.census.gov/quickfacts/table/PST045215/00> (accessed December 2015)
- Vigar, G. (2006). Deliberation, Participation and Learning in the Development of Regional Strategies: Transport Policy Making in North East England. *Planning Theory & Practice*, 7(3), 267–287. doi:10.1080/14649350600841446
- Weible, C. M., Heikkila, T., deLeon, P., & Sabatier, P. a. (2011). Understanding and influencing the policy process. *Policy Sciences*, 45(1), 1–21. doi:10.1007/s11077-011-9143-5
- Weir, M., Rongerude, J., & Ansell, C. K. (2008). *Collaboration Is Not Enough: Virtuous Cycles of Reform in Transportation Policy*. *Urban Affairs Review* (Vol. 44, pp. 455–489). doi:10.1177/1078087408322590
- Williams, R. (2006) Generalized ordered logit/partial proportional odds models for ordinal dependent variables. *The Stata Journal*. 6 (1), pp. 58-82.
- Willson, R. (2001). Assessing communicative rationality as a transportation planning paradigm. *Transportation*, 28, 1–31.
- Winship, C., & Mare, R. D. (1984). Regression Models with Ordinal Variables. *American Sociological Review*, 49(4), 512–525.
- Winters, M., Davidson, G., Kao, D., & Teschke, K. (2010). Motivators and deterrents of bicycling: comparing influences on decisions to ride. *Transportation*, 38(1), 153–168. doi:10.1007/s11116-010-9284-y
- Wray, H. (2008). *Pedal Power: The Quiet Rise of the Bicycle in American Public Life*. Boulder, CO: Paradigm Publishers.
- York, N., John, P., Schlegel, H., & Su, R. (2011). I Want to Ride My Bicycle: Why and How Cities Plan for Bicycle Infrastructure +. *Buffalo Law Review*, 59, 585–619.

Zahariadis, N. (2003). *Ambiguity and Choice in Public Policy: Political Decision Making in Modern Democracies*. Georgetown University Press.

Zahariadis, N. (2013). Building Better Theoretical Frameworks of the European Union's Policy Process. *Journal of European Public Policy*, 20(6), 807–816.

VITA

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JOHANN WEBER was raised in Canby, Oregon, where he almost never rode a bike on account of growing up out in the country. After finishing an undergraduate thesis on environmental ethics at the College of Wooster in Wooster, Ohio (where he earned a B.A. in Sociology and Philosophy), he returned to Oregon and rediscovered the beauty of the bicycle. Arriving at Georgia Tech in 2010 to continue studying environmental ethics, he instead found himself immersed in planning, civil engineering, and advocacy (of course around bicycling). Mr. Weber loves to hike, mountain bike, and partake in most any other active endeavor.