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PUBLIC TRANSIT FUNDING THROUGH REAL ESTATE:
OPPORTUNITIES FOR AGENCY REFORM

A Dissertation Presented
by
GEORGE R. CHICHIRAU

Submitted to the Office of Graduate Studies,
University of Massachusetts Boston,
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2023

Public Policy Program

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ABSTRACT

PUBLIC TRANSIT FUNDING THROUGH REAL ESTATE: OPPORTUNITIES FOR AGENCY REFORM

December 2023

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This study examines the potential for the Massachusetts Bay Transportation Authority (MBTA) to transition towards a funding model based on real estate. Given the MBTA's history of underinvestment, as well as the inefficiency of its current funding model - which relies on an appropriated portion of the state sales tax - there is a pressing need for reform. The research is driven by two main questions, centered on (1) the potential social welfare implications of shifting MBTA's revenue to a real estate-centric model, and (2) the challenges and opportunities inherent in such a transition. Consequently, the first part conducts a physical survey to pinpoint potential sites for real estate development, while the second part, based predominantly on interview data, explores the political landscape and the ways in which politics may either facilitate or hinder the proposed reform. The findings from this study not only shed light on the feasibility of the proposed funding model but also provide insights on the broader interplay between public transit economics, real estate, and political dynamics. The final chapter makes a few recommendations, most notably on (1) transitioning towards a new revenue model; (2) streamlining oversight boards; (3) developing

a comprehensive regional plan and (4) implementing a cost-benefit analysis for suppliers, among others.

ACKNOWLEDGEMENTS

All things are interconnected. Countless causes and conditions come together to give us life and shape our experiences. I am here because of the work of ten thousand generations before me, and I hope that there will be yet another ten thousand, and more, after I am gone.

Within this chain of events, I only know of the closest links. It has been my great fortune to have been nourished and cherished in childhood by a loving grandmother, Ruja, and to have had an astonishingly talented sister, Paula, who served as a role model for many years. It is this sister who convinced me to join a PhD program, and often pushed me to work on it through graduation.

It has also been my great fortune to find a woman I could get along with in marriage. Ingred made life bearable when difficult, and pleasant when easy; she is a wonderful person, who has taught me most of the important things I know.

These, then, are the three links closest to me, in the infinite chain of the human experience. Where they have built, I have dwelled, rested, and learned. Whatever merit there may be in this is far more theirs than mine.

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CHAPTER 1

INTRODUCTION: THE MBTA AS AN INSTITUTIONAL ACTOR

1.1 Structure of the Study

This is a study in two parts, seeking to answer whether or not the MBTA could successfully transition towards a funding model reliant on real estate. First, I perform a physical survey, identifying the sites where the MBTA could establish a real estate presence. Secondly, I carry out an institutional study, based largely on interview data, which attempts to identify the political conditions necessary for such a transition.

The MBTA (Massachusetts Bay Transportation Authority), the Commonwealth's Public transit agency, has suffered from chronic underinvestment caused by a faulty funding model; the current funding model, centered on the appropriation of a portion of the state sales tax, is widely seen as economically inefficient, socially regressive and providing low-quality service. Economic inefficiency derives from the funding not being linked in any way to the core business of transit; social regressiveness, from the fact that the sales tax is flat and thus impacts low-income earners more as a proportion of wages; and insufficient service quality for a wide variety of reasons, which include troubled finances and a dysfunctional institutional set-up.

Importantly, the MBTA needs more revenue than it currently can secure to address the challenges in its infrastructure, services, and current and projected deficits. The need for reform is clear, but where should it look for guidance?

Noting that many of the best-rated public transit agencies in the world derive a great deal of revenue from real estate operations; and furthermore, that in the Boston area itself, early 20th century public transit companies developed real estate (resulting in the “streetcar suburbs”), I tasked myself with researching if the MBTA could, indeed, transition towards a real estate funding model, and if such a transition were likely to solve more problems than it may cause.

This study is the result of that research. It is structured as follows: chapter 1 provides an introduction to the MBTA, the subject matter of the study. Chapter 2 introduces the reader to relevant public transit economics. Chapter 3 delineates the research methods used; chapter 4 explores the economic costs and benefits of a proposed transition towards funding through real estate; and chapters 5 and 6 examine the influence of federal politics, state politics and institutional politics on the functioning of the agency. Finally, chapter 7 re-iterates the main points of the research project while proposing a number of reforms.

1.2. Brief History of the MBTA

Public transit in Boston is about as old as the city. In November 1630 – two months after the city itself was incorporated – a ferry service was begun between Boston, Charlestown and Winnissimmet (a town now known as Chelsea). The lucrative service was transferred to Harvard College, which ran it between 1637 and 1831. That ferry company –

called Winnissimmet Ferry – also started operating horse-pulled cars in 1857, and is one of the many companies merged into today's MBTA (Cheney and Sammarco, 1999, p. 11-12).

Rail service relying on steam engines began in Massachusetts in 1834, with the Boston & Worcester Railroad Company, but city transportation relied on horse-powered railways until 1889, when the lines were electrified. In the 1880s, seven different companies provided urban transit, including West End Street Railway, which opened America's first subway line in 1897. However, starting in the 1920s, strong competition appeared in the form of the automobile, while Boston entered an era of economic decay from which it wouldn't recover until the 1990s. The private rail operations went bankrupt one by one, until the state was forced to create, in 1964, a publicly-owned agency to continue providing service: the Massachusetts Bay Transit Authority (MBTA) – the subject of the present study (Cheney and Sammarco, 1999, p. 15-20).

1.3. The MBTA Funding Model

The MBTA is the fourth largest transit agency in the United States, with an annual ridership of approximately 172 million; before the 2020 pandemic, roughly half of all work trips into Boston were made by public transit. Its current funding model, usually called “Forward Funding”, was legislatively enacted in 1999, and implemented beginning in FY 2001, as a response to the drawbacks of the previous, “backward funding” model. Prior to 2001, public transit had been treated by the Commonwealth as just another utility: the MBTA would incur costs by providing transit services, and these costs would be billed to the Commonwealth and paid the following year, to an unlimited amount.

Perhaps unsurprisingly, the MBTA’s previous incarnation was a “budget buster”. A survey of the press of the 1990s reveals reoccurring financial scandals and very vocal criticisms in the legislature. The House budget chief in 1999, Paul Haley, pushed for reform by depicting the MBTA as “an insatiable, dollar-eating demon”, and stating that “the way the T is operated today is an embarrassment... they do anything they please” (MacQuarrie, 1999). Whatever hope for push-back against reform some may have had disappeared with a large scandal in August 1999, when whistleblower Nancy Evans, who sat on the capital projects committee, brought charges to the effect that “cost overruns on the order of hundreds of millions of dollars” were tolerated, and that “a code of silence” prevailed at the agency (Palmer, 1999). Her memorandum prompted investigative efforts by the Legislature’s transportation committee.

The Forward Funding reformers thought they could cap spending while maintaining the same level of service at the MBTA, meaning the reform would achieve a gain in efficiency. This has not happened. To understand why, one must delve into the reform a little deeper.

The Forward Funding legislation rested on three main planks. First of all, cutting off the financial ties between the Commonwealth and the MBTA, with the exception of a dedicated sales tax portion (20%), which would remain the sole state subsidy. Outside this, the MBTA was expected to balance its own costs and revenues. (One-fifth of state sales tax receipts is a substantial amount of money: for example, in FY 2019 this funding stream represented \$1.03 out of a total of \$2.02 billion in MBTA revenue, or approximately half. The sales tax share generally accounts for 40% to 50% of MBTA revenue in all years.)

The second plank consisted of a transfer of \$3.2 billion of debt to the MBTA (in 1999 dollars). The legislature thought the sales tax stream was quite generous – in effect, a theoretical subsidy of around half – so they assumed that thus endowed, the MBTA could manage repaying a substantial amount of historical debt, including some prior obligations from the Big Dig that the MBTA had nothing to do with (around \$1.7 billion out of the \$3.2 total). As of FY 2022, however, the MBTA debt had ballooned to \$7.6 billion (Murphy 2022), with debt service budgeted at \$468 million for that year (or approximately 20% of total expenses).

The third plank consisted of allowing the MBTA to issue debt. However, debt issues have been a locus of spirited debates, with one recent example being the idea of floating pension obligation bonds (POBs) to refinance some of the MBTA Retirement Fund’s (MBTARF) \$1.3 billion unfunded pension liability. A Pioneer Institute report then called out the MBTARF for its “mismanaged investments” and “misleading and self-deceptive actuarial accounting practices”, while strongly recommending against new POBs (McMahon 2022, p. 12).

While it was hoped that Forward Funding would solve the agency’s budgetary problems for good, this was far from the case: the legislature both over-estimated sales tax receipt growth in its projections, and underestimated operating costs. In 2000, the Legislature assumed an average growth rate of Sales Tax receipts of 3% per year; actual growth over the past two decades has averaged less than 1.5 percent. In 2017, this translated into a difference of \$219.5 million less per year than was projected in the original finance plan for dedicated sales tax funding (around 12% of the MBTA total revenue of approximately \$1.8 billion that year) (Baxandall 2018). The operating costs had been assumed by the legislature to decrease

by 2% per year, over the first 8 years of the reform; they increased instead by around 5% per year (D'Alessandro 2009). As of 2022, the financing structure and these deficits remain largely the same. Table 1 depicts the MBTA's financial situation at a glance. Both FY 2019 (actual) and FY 2023 (budgeted) are provided, to illustrate the most recent situation as well as the agency's condition pre-pandemic.

Table 1: MBTA Budgets, FY 2019 and FY 2023

**Massachusetts Bay Transportation Authority
FY 2019 and FY 2023 Budget**

REVENUES	FY 2019 (\$M)	FY 2023 (\$M) (Budget Request)
Operating Revenues		
Fares, all modes	\$ 671.70	\$ 474.30
Own-Source	90.2	82.6
- Advertising	28.3	21.7
- Parking	37.7	31.7
- Real Estate	15.8	20.0
- Other Operating	8.5	9.2
Total Operating Revenue	761.9	556.9
Non-Operating Revenues		
Dedicated Sales Tax	1,053.2	1,325.1
Dedicated Local Assessments	170.1	183.8
Other Income	57.2	13.0
Federal Funds	-	32.0
State Contract Assistance	127.0	187.0
Total Non-Operating	1,407.5	1,740.9
TOTAL REVENUES	\$ 2,169.40	\$ 2,297.80
EXPENSES		
Operating Expenses		
Regular Wages	\$ 438.10	\$ 550.80
Overtime	49.4	43.2
Total Wages	487.5	594.0
Pensions	101.6	152.4
Healthcare	99.7	104.1
Health & Welfare Fund	11.7	14.4
Other Fringe	12.1	15.0
Payroll Taxes	39.8	52.0
Total Benefits & Taxes	265.0	337.9
Materials	47.2	66.5
Services	114.4	200.2
Fuel	17.7	23.1
Utilities	43.5	40.6
Contract Cleaning	24.8	35.1
Materials and Services	247.5	365.6
Insurance	16.2	29.0
Purchased Commuter Rail Service	409.2	503.5
- Fixed Price	327.3	353.9
- Extra Work & Services	43.2	99.0
- Fuel	29.7	38.8
- PRIIA (NECC)	9.0	11.8
Purchased Local Service Subsidy	140.2	148.1
- THE RIDE	121.6	126.2
- Ferry Services	15.5	18.7
- Other LSS	3.2	3.3
Financial Service Charges	7.8	9.0
Total Operating Expenses	\$ 1,573.40	\$ 1,987.10
Debt Service		
Interest	266.6	248.3
Principal Payments	220.3	318.2
Lease Payments	-	-
Total Debt Service	\$ 486.90	\$ 566.50
TOTAL EXPENSES	\$ 2,060.30	\$ 2,553.50
Net Revenue/Expenses	-\$109.10	-\$255.70

Some things are immediately obvious. First of all, the largest share of revenue comes from a portion of the state sales tax; this inscribes the MBTA in the first family of transit financing described in the preceding sections, that of politically negotiated budgetary transfers. Note that the relatively large revenue increase between FY 2019 and FY 2023 is almost entirely driven by an increase in the sales tax proceeds (\$1,053 vs. \$1,325 million). This, however, is unlikely to be sustained over the next period of economic contraction, whenever that may occur.

Secondly, fare revenue has declined by around 30% post-pandemic, although it is difficult to quantify how much of that is driven by shifts in flexible work arrangements, reduced transit service, or other reasons.

Thirdly, the income derived from real estate or any other activities is small. Note that parking revenue declined only by around 15% (vs -30% fares), perhaps indicating that MBTA parking rates are particularly accessible. The MBTA owns more than 44,000 parking spots, and its estimated 2023 parking revenue of \$31.7 million implies that each parking spot brings in around \$720/year, or \$60/month. That seems to be a low investment yield for the Boston metro area, which has particularly high real estate costs.

Fourthly, investments and capital expenditures have not been part of the agency's general budget in recent years. The MBTA has a separate Capital Investment Plan, updated every 5 years, which has largely relied on sources outside the agency (federal and state grants); to the extent that MBTA sources are present, they have so far tended to be bonds and loans (Massachusetts Bay Transportation Authority, 2022). However, the MBTA is planning to use money from its operating budget to pay back newly assumed debt as part of its FY 2023-27 capital plan—between \$200 million and \$300 million per year (Murphy 2022). This

plan is the most ambitious in the agency's history and is currently estimated at a total of \$9.6 billion, including \$2.4 billion in new vehicles, and \$2.2 billion towards railway track repairs and bus lane expansions (Murphy 2022). It has raised, however, affordability concerns, voiced, among others, by Brian Kane, the executive director of the MBTA Advisory Board (Murphy 2022).

Fifthly, again comparing the pre- to post-pandemic situation, expenses are up more than 26%, driven by items such as wages (up 26%), pensions (up 50%), cost of materials and services (up 48%) and debt service (up 16%). Note that the company is deeply indebted, with 22-24% of its expenses earmarked for servicing debt for each of the previous five years, even while it is planning to assume more debt. (The deficit situation is not new – the agency produced a deficit on most years since the Forward Funding reform, even though it has repeatedly engaged in extreme measures such as one-time land sales. However, the amount of funds going to debt service has only gone up.)

To conclude, there are numerous disadvantages to this funding model. First of all, it is not linked in any way to the core business of transit (this probably results in inefficiency, since the link between cost and price is broken). Secondly, the sales tax is flat, which means it is socially regressive: low-income earners pay more as a percentage of their salaries, compared to higher-income earners. Finally, a sales tax is assessed on all state residents, which makes it politically difficult to adjust even when absolutely necessary; in other words, the funding model is highly vulnerable to political risk (Smith and Gehring 2006, p. 755).

1.4. Real Estate Holdings

The MBTA is the second largest land holder in Massachusetts, after the Department of Conservation and Recreation (Davis 2007). It managed its real estate outright until 1996, when its real estate division was spun off, as the only result of an otherwise failed attempt at privatization by Governor Weld. Since 2014, it is managed by a contractor named Greystone Management Solutions. It is a relatively sparse operation: in 2014, Greystone was awarded a 5-year management contract for \$2.8 million (Greystone 2014). The backbone of the operation is represented by the MBTA LandTracker Application, which keeps track of all parcels and documentation. The LandTracker was developed and is being run by just one employee: “Ms. Goldsmith is the only employee maintaining the database... There is a steady stream of documents coming from the MBTA to Ms. Goldsmith, who is the only one with editing permissions” (Federal Highway Administration, 2018).

I had one conversation with Ms. Goldsmith, during which she indicated that most of the unused, legacy parcels have already been sold by the MBTA, and that the overwhelming majority of the current holdings (well over 95%) are used for transportation purposes, maintenance facilities, or commuter parking.

Press coverage confirmed Ms. Goldsmith’s observations. The MBTA has sold most of its unused parcels in the recent past, sometimes for prices low enough to solicit curiosity. One example would be the sale of 1.75 acres to Wynn for a casino site in Everett for \$6 million – a relatively small parcel but characterized by journalist Adam Vaccaro as “crucial” (Vaccaro, 2015). Another example is the sale of 17.8 acres in South Boston, on East First Street, to Massport for \$7 million. Massport – a public authority, similar to the MBTA – runs

three airports and the Port of Boston, but has proved nimbler at running a real estate portfolio.

1.5. The State Advantage: Bonding Authority and Regulatory Takings

The MBTA has issued bonds, usually multiple times per year, for every year over the past two decades and further back. The agency’s bonds usually fall into two categories: sales tax bonds, secured by liens on the agency’s share of the state sales tax; and assessment bonds, secured by liens on assessments. (The MBTA also has a variety of “prior obligations” from contracts entered before Fiscal Year 2000.) Issuing bonds is the primary way through which the MBTA has been able to access funds for capital improvements – or more often, for repairs required by federal and state regulations.

The MBTA has consistently been able to access funds at some of the lowest interest rates on the market, because of its high credit rating, driven by the backing of the Commonwealth. As an example, one of the more recent Moody’s credit opinions awarded the MBTA sales tax bonds an “Aa2 stable” rating (the 3rd highest out of 21 possible ratings), citing “continued strong financial, operational and capital support” from the Commonwealth of Massachusetts, notably by virtue of the fact that the MBTA’s dedicated sales tax revenue cannot decline because of a statutory revenue floor (the “Base Revenue Amount”), instituted to guarantee continued support during recessions (Moody’s Investor Service, 2022).

State backing could conceivably make a difference in one other respect: unlike private actors, state agencies may take land, if they deem the action important for public benefit, through an “order of taking” (Mass. Gen. Laws Ch. 79, § 1 and following). However, takings can be highly litigious and protracted: see, for instance, Claff Inc. v. Massachusetts

Bay Transportation Authority, a case settled by the Supreme Judicial Court of Massachusetts in 2004, with regard to a dispute originating with an order of taking issued by the MBTA in 1993 ([FindLaw.com](#), 2004). While 11 years is on the longer side of the usual duration of such judicial disputes, a cursory review of eminent domain cases in Massachusetts suggests they are rarely settled in less than four or five years.

1.6. Management and Administration

The MBTA is run on a day-to-day basis by a general manager and a deputy general manager. It is overseen by a 7-member board of directors, all but one appointed by the Governor. The MBTA was an independent agency during the first 45 years of its existence, but a 2009 reform turned it into a division of the Massachusetts Department of Transportation (MassDOT). As such, the MBTA General Manager reports to the Secretary of Transportation, as well as to a different, MassDOT 11-member board of directors.

There may be considerable overlap in the membership of the two boards: in October 2022, for example, three members sat on both the MassDOT and the MBTA boards, one de jure (Jamey Tessler, the Secretary of Transportation) and two others by seeming happenstance (Thomas Koch, Mayor of Quincy, and Betsy Taylor, a former Director of Finance and Treasury at Massachusetts Port Authority).

Following a 2015 crisis, and until June 2021, the MBTA had also been under the supervision of a separate board, a 5-member Fiscal and Management Control Board (FMCB) (all appointed by the Governor). Likewise, there had been some overlap between its membership and other boards or other positions of leadership within MassDOT: e.g., the current MBTA General Manager, Steve Poftak, is a former member of FMCB (Mohl 2021).

The MBTA is also under the purview of the MBTA Advisory Board, a 176-member body which represents the municipalities within the MBTA service area. This board has certain approval powers over the MBTA's annual budget, as well as the agency's long-term capital plan. There is again some overlap between its membership and that of the other boards, e.g. the current Chair of the MBTA Advisory Board, Thomas Koch, also sits on the MBTA and MassDOT boards.

Finally, as a large agency with complex operations, the MBTA is subject to regulations and oversight stemming from a wide range of federal and other state actors. Most notably, safety at the MBTA is under the purview of the Transportation Oversight Division, which is not part of the Department of Transportation (MassDOT), but rather of the Department of Public Utilities (DPU), and therefore under the direction of a different secretary, and yet other various boards. This structure is seen by some as unwieldy, with recent public criticism encouraging the move of the Transportation Oversight Division either to MassDOT, or to another autonomous body (Seay 2022).

1.7. Unions

Union conflicts exist within the MBTA, notably with regard to remuneration, pensions, and staffing and scheduling issues. Privatization is a recurring threat used by management in contract negotiations, although the MBTA unions have always pushed back with success. This is not costless to the workers: in 2016, for instance, MBTA unions first negotiated a 2.5% raise, then a few months later gave it back: the \$81 million thus saved were used as a bargaining chip to prevent any jobs being outsourced (Dungca 2016).

In terms of dollars and cents, however, the largest point of contention is the pension system. Until 2012, MBTA workers could retire after 23 years of service; since then, the retirement age has been set at 55. This still leaves the MBTA with an unfunded pension liability, as of 2022, of around \$1.3 billion (Boston Globe Editorial Board, 2022). In percentages, the MBTA's pension fund went from being 94% funded in 2006 to 53.6% in 2021, one of the worst ratios nation-wide (e.g. the Washington DC transit agency is at 82%, and the New York MTA at 74%) (Perdomo-Hernandez, 2023).

The pensions are a major financial issue: in Fiscal Year 2021, the MBTA had to cover \$148 million in pension contributions, two thirds of which went towards the unfunded liability, with only one third representing the normal employer pension share. As of 2022, the MBTA has a larger unfunded pension liability and a lower funding ratio than all US transit agencies, except for the Chicago Transit Authority (The Pioneer Institute, 2022). In FY 2021, employee contributions represented approximately 11% out of the pension fund's total revenue, the employer's contribution represented approximately 31%, with the remaining 58% being net investment income (MBTA Retirement Fund, 2022).

1.8. Conclusion

This chapter introduced key features of the subject of the present study, beginning with a brief history of the MBTA, and describing the agency's funding model, including current finances. Prior to FY 2001, incurred costs were billed to the Commonwealth and paid the following year; but the "Forward Funding" reform scrapped this model, in order to cap what was seen by some at the time as out-of-control spending.

However, the reform failed to achieve its stated goals: the state's sales tax receipts grew at a rate slower than projected, while the MBTA's operating costs escalated. By FY 2022, the MBTA's debt reached \$7.6 billion, with debt service higher than 20% of the budget. Additionally, the Forward Funding model can be critiqued for not being tied to the core business of transit and for being socially regressive.

This chapter then went on to note the nature of the MBTA's real estate portfolio, before briefly describing the agency's management structure, as well as an outstanding point of contention regarding pensions. I specifically identified the agency's finances, overall, as the main point of contention (see Table 1).

Note that the MBTA cannot easily fix its finances by raising fares, or by reducing costs. On the first point, fares only make up about a third of its revenue, and its prices are already mid-range (higher than San Francisco and Washington DC, lower than New York). Furthermore, to the extent that transit demand is elastic, any increase in price will result in a demand decrease. Secondly, I argue later (in section 6.1.) that the MBTA has already done well in terms of controlling costs over the previous four decades: the agency is moving more people than ever, for a cost that has remained largely the same since the 1980s, as a percent of state spending. So the current funding model has never worked; the next chapter proposes an alternative.

CHAPTER 2

BASIC ECONOMICS OF PUBLIC TRANSIT

2.1. Introduction

At the Massachusetts state level, all the most recent winning campaigns for state-wide offices emphasized the need to improve public transit, as well as housing. Governor Healey described MBTA issues as her “first challenge” while campaigning in 2022 (Mintz 2022). House Speaker Mariano and Senate President Spilka both cited the MBTA and the lack of affordable housing as two of the most three pressing state issues, along with child care (Lisinski and Drysdale, 2023). State Auditor DiZoglio campaigned and was elected on a platform calling for an MBTA audit, which began shortly after her inauguration (Seay 2023). Public transit may finally be getting the political attention needed for substantive reform.

But what are the options for public transit financing? The rest of this chapter will introduce the reader, in an abbreviated way, to the main elements of public transit economics; then I review considerations of what to charge the end users; and finally, I make a more in-depth presentation of the “rail+property” model, that is, financing transit operations through real estate revenue.

2.2. The Economic Nature of Public Transit Agencies

While private companies provided nearly all transportation service at the beginning of the 20th century, the industry is currently controlled by public monopolies. Vehicles changed as well: while a century ago cities developed around streetcar lines, towards the middle of the century streetcars disappeared to free space for automobile travel (before making a modest come-back at the beginning of the 21st century) (Hensher and Button, 2007).

Public transit agencies have very specific economic characteristics; most notably, they tend to be natural monopolies benefiting from large economies of scale. These economies of scale are in turn at the origin of indirect network externalities and snowball effects that provide a very interesting insight into the growth of public transit that many urban centers experienced since the 1990s (Hess and Lombardi, 2005).

The provision of public transport services is not only about the number of buses or trains provided by an operating company; the number of vehicles is only an intermediate product in the production process, which must be combined with a certain quality of service (Small, 1992). The product, therefore, is a service, with its measurement indicators most often demand-oriented (Berechman, 1993): the most commonly used measures in the industry are “unlinked passenger trips” (the number of times passengers board public transportation vehicles) and “passenger miles” (the cumulative sum of distances ridden by each passenger).

In the economic literature on the subject, the total cost of production of public transit is the sum of the cost of supplying the vehicles (borne by the operating company) and the cost of time (born by the passengers) (Hensher and Button, 2007). An important component of this time cost is the waiting time in the actual stations, which is inversely proportional

with the number of vehicles in use. It follows that the cost of travel time spent by end users is a decreasing function of the number of passengers, *Ih* highlights the existence of economies of scale. These economies of scale originate in both categories of costs. First of all, they are related to the reduction in the users' time costs: an increase in the number of passengers results in an increase in the number of trains traveling on that line, which reduces the cost of waiting time at stops. Secondly, usage rate often increases together with the density of service (trains may go from 60% full if run every 30 minutes to 80% full if run every five minutes): this reduces operating costs per vehicle. Thirdly, greater use of infrastructure may result in technical economies of scale: a large-scale business can afford to invest in expensive, specialized, more efficient machinery, which should decrease fixed costs (Berechman, 1993). As an example, the MBTA possesses two jet snow blowers; these are expensive, powerful engines able to clear quickly almost any amount of snow on the tracks, used only during the largest snow storms (Moskowitz 2011, Annear 2018). For an agency that operates in winter, costs can fluctuate significantly proportional to the number of snow blowers acquired.

These economies of scale are at the origin of certain positive externalities with consequences on the structure of transit networks (in particular to size) but also on their pricing models and overall funding. Foremost among these are network externalities, which appear when “the utility that a user derives from consumption of a good increases with the number of other agents consuming the good” (Katz and Shapiro, 1985). As an example, Goetzke (2008) has found strong positive transit network externalities for the New York subway: his study suggests that levels of crime go down and cleanliness improves with higher numbers of passengers.

Within the subject literature, positive network externalities are classified into two broad categories. Firstly, direct network effects are linked to the existence of social effects: below a hypothetical threshold of congestion, each user sees his satisfaction increase proportionally with the increase in the overall number of customers – this is the case for telephone networks or the Internet. Secondly, there are indirect network effects, which apply to public transit. This is different from the previous situation, since consumers do not benefit directly from the presence of other passengers choosing to travel by public transport; on the contrary, the presence of a large number of passengers may even result in crowding and less satisfaction. However, this indirect network externality is based on the economies of scale mentioned above: an increase in the number of passengers makes it possible to offer better service at a lower price (Hensher and Button, 2007).

Economies of scale and network externalities, when applied to public transit, can result in a virtuous snowball effect: a high number of consumers, meaning increased demand, should result in safer, more frequent service on a larger network, which should lead to an increase in consumer satisfaction, which should attract new users, which further decreases the marginal cost of providing the service, freeing more capital which allows the agency to make further investments, and so on.

Unfortunately, the snowball effect works in the opposite direction as well (as illustrated, notably, by MBTA commuter rail operations in recent years). Infrequent service discourages customers from boarding trains, resulting in fewer passengers and lower revenue, resulting in price hikes as well as service cuts and network deterioration, leading to even slower and more infrequent service, with even fewer patrons, and so on. Furthermore, public transit agencies have both high investment and high fixed costs borne out of the public

purse, and the state needs to shoulder much expense, and perform accurate planning, before a transit agency has a chance to embark on a virtuous cycle. This makes transit agencies particularly vulnerable to the vagaries of democratic politics.

There is one recent quirk to this discussion: the effect of the Covid-19 pandemic on the finances, infrastructure, and subsequent prospects of public transit. While as of the time of writing the effects are still widely debated, enough literature has been published to allow us to at least ball-park short-term effects, and perhaps indicate some longer-term trends. In the short-term, public transit revenue dropped sharply, given the much-reduced number of paying customers. The riders are coming back, but slowly: the MBTA's 2022 ridership was only 58.5% of 2019 ridership. Partial 2023 data available as of the time of writing implied a further increase, during 2023, to around 70% of pre-pandemic levels, with normalization to be expected in 2025 or 2026 (Kess 2023).

However, pandemic-era federal funding, notably through the Coronavirus Aid, Relief, and Economic Security (CARES) Act, the Coronavirus Response and Relief Supplemental Appropriations Act of 2021 (CRRSAA), and the American Rescue Plan (ARP) Act was so large that it more than offset, for most US transit agencies (including the MBTA) the negative revenue effects of losing ridership – at least for FY 2020 and 2021 (Sullivan 2021).

Furthermore, the Bipartisan Infrastructure Deal signed in late 2021 allocated another \$90 billion to public transit funding through FY 2027 – by far the largest such federal investment in US history (The White House, 2021). Concurrent with this, the MBTA announced in mid-2022 a five-year, \$9.6 billion investment plan – the largest in its history – of which \$4.3 billion are federal funds, and \$1.4 billion state funds, with the balance essentially borrowed (MBTA 2022). The net effect of these transfers is that in the short-to-

medium term, the MBTA finds itself in a significantly better financial position than before the pandemic.

What about the agency's long-term prospects? In this respect, the pandemic is important to the extent that it may have durably changed work life patterns, most importantly the rate of remote work. It is too early, however, to say anything with certainty, as published projections vary widely. Intuitively, it would seem that an increase in the rate of remote work would reduce the overall need for transportation, including public transit. But according to Reilly and Tawfik (2022) the opposite may happen instead: their analysis of the travel activity of traditional, in-person workers versus telecommuters found that it was telecommuters that made more trips per day and traveled longer distances. While telecommuters make fewer work trips, they may increase their travel for all other purposes to a higher level: essentially, those who work from home have more flexibility, and they may use this flexibility to travel more.

2.3. What Contribution from the End Users?

In a perfectly competitive market, a firm charges for a product or service a price equal to the marginal cost of producing an additional unit. This is because if the market price is set at less than the marginal cost, the firm loses money (and should produce less); conversely, if it is set at higher than marginal cost, and each sale is profitable, it should produce more (and the equilibrium is broken) (Harvey and Gayer, 2013, p. 40-45).

However, transit agencies are not competitive in the usual sense, because of simple spatial geography: one cannot lay multiple competitive tracks between neighborhoods A and B. The public transit market is naturally monopolistic. Furthermore, it delivers a "merit

good”, meaning, important positive externalities, and as such it is subject to intervention by social planners. (Merit goods are those which are under-produced and under-consumed in a market economy because their public benefit is greater than their private benefit, such as education, healthcare and welfare services, firefighting, or public parks. For example, many consumers are not willing to pay to enter parks, and if things were left entirely to market forces, there might not be any public parks at all, with important negative health consequences.)

Because transit agencies are both monopolistic and responsible for a merit good, they are usually regulated so that their pricing is most beneficial to the served community: and when the price exceeds marginal cost, society gives up net benefits. But there is a problem: marginal cost pricing, in this example, means a price that is less than average total cost; therefore, the transit company must be subsidized. For a straightforward argument, see Mattson and Ripplinger (2011):

The optimal subsidy can be defined as that which will maximize social welfare, and social welfare can be calculated as total revenues minus total cost plus consumer surplus. From this, it can be shown that social welfare is maximized when prices equal marginal cost... If a transit agency has increasing returns to scale, then marginal cost is lower than average cost. The agency would need to set fares equal to average total cost for it to cover all of its costs, but doing so would result in a decrease in consumer surplus and total social welfare. Setting price equal to marginal cost, therefore, would require a subsidy.

Mattson and Ripplinger (2011), p. 4.

This, of course, happens all the time: taxpayers subsidize natural monopolies in order to produce as much social welfare as possible (generally, water, electricity, and fossil fuel consumption tend to be the most heavily subsidized). In economics, a natural monopoly is a situation in which a single firm – the monopolist – can efficiently provide a good or service to the entire market at a lower cost than multiple competing firms. In general, this arises due to economies of scale, when the average cost of production decreases as the quantity produced increases. In addition to this, in the case of public transit, a key factor is the geography of the built environment: cities generally do not have enough physical space to accommodate competing travel infrastructure. Furthermore, transit agencies are characterized by both high start-up and high fixed costs, and rely on network effects to keep their ridership, which makes it even more challenging for new entrants to establish themselves. Together, these four factors – economies of scale, geographical constraints, high start-up and operating costs, and network effects – create almost insurmountable barriers for potential competitors.

Public provision of natural monopolies can enhance social welfare, as long as externalities are well accounted for, and the pricing model implemented is appropriate. In the case of public transit, positive externalities include environmental benefits, congestion reduction, and the improvement of land-use patterns (see Chapter 4 for an example of measuring externalities in the Boston context), while an optimal pricing model can be achieved through flat fares, distance-based fares, time-based fares, free fares, or any combination thereof. As often is the case, the devil is in the details, with enormous amounts of literature published on measuring externalities and implementing pricing models: see Horcher and Tirachini (2021) for a good recent overview of public transport economics, including links to over 300 studies on pricing, capacity provision, subsidies, and more.

Institutionally, subsidies are most easily paid when the government owns the natural monopoly, and this thinking resulted in many such companies, especially transit agencies, being nationalized (Berechman 1993). However, this introduces both political incentives to provide subsidies (even when they are no longer necessary), as well as political vulnerabilities.

One other solution for regulators is to set public transit fares that maximize collective well-being at zero profit through Ramsey pricing. This sets the price according to the elasticity of demand: the more elastic the demand for a trip, the smaller the price. (This is illustrated on many travel booking sites, where the consumer has the option of hunting for lower prices if he is flexible in terms of travel time, duration etc.; or on ride-sharing apps, which may offer lower prices for lengthier trips.) There are over five decades of research on Ramsey pricing as applied to transit, with Vickrey (1969) being an early example of research on how to correct negative externalities through this method.

Ramsey pricing is economically efficient, but politically difficult, since it raises obvious problems of fairness: under it, highly captive customers (usually the poorest citizens, who cannot easily afford to change modes of transit) pay the highest price. The issue is that the working class works on a set time schedule and does not have the flexibility required to access lower fares.

What then happens in the case of most public transit agencies is that fees are set lower than the average cost per passenger, with the remainder made up by substantial subsidies. This relatively low pricing results in higher quantities of this merit good being consumed, with obvious advantages: higher rates of public transit use lead to a reduction in car-related nuisances (pollution, noise, accidental deaths, loss of territory to car infrastructure etc.)

Furthermore, affordable pricing makes it possible to maximize population mobility, with positive spillover effects in terms of education, healthcare, employment and more (Jansson, 1993).

2.4. Options for Financing Public Transit

Throughout the world, the public transportation sector shows strong economies of scale, with end user fees significantly lower than the marginal cost, which is in turn lower than the average cost. Costs are divided between the costs of capital (infrastructure and vehicles) and operating costs (labor, maintenance, fuel, etc.); on the revenue side, the largest categories are commercial revenues (usually derived from tickets sold, but not always) and subsidies (Mills 1987). A common way of measuring end user fee impact is the farebox recovery ratio, the fraction of operating expenses met by the fares paid by riders. Table 2 provides an overview of systems around the world: outside East Asia, it is fairly uncommon for end user fees to cover most costs.

Public transit can be financed in many ways. As mentioned above, state and local authorities usually represent the main contributors at all times in the life of a transit agency, beginning with investment in infrastructure, and ending with perhaps covering year-end deficits. But governments can use different tools in order to generate funding and may target different types of contributors.

Table 2: Farebox Recovery Ratio, Selected Cities. (Verbich et al., 2017)

Agency	Farebox recovery ratio	Reporting year
Hong Kong MTR	123.68%	2016
Tokyo Metro	119.05%	2016
Taipei Metro	100.14%	2015
Kaohsiung MRT	83.16%	2015
London Metro	67.62%	2016
Paris RATP	50.59%	2015
New York City MTA	37.75%	2016
Boston MBTA	30.10%	2015
Vancouver TransLink	27.88%	2016

First of all, they may use the general budget, which is funded by all taxes paid by the citizens. In some cities, tax revenues are put into a common pot with a principle of non-appropriation of revenue. In this case, tax revenues have no direct counterpart in terms of expenditures, and all spending is politically negotiated (Mohring 1972). In other cities, authorities have decided to dedicate a specific tax or contribution to public transit. This is the case in California, where sales taxes are regularly proposed in local legislatures or through ballot propositions in order to fund specific projects: in 2004, for example, San Francisco voted affirmative on a sales tax increase of 0.5% over thirty years in order to raise extra revenue for public transit (Smith and Gehring, 2006).

Secondly, public authorities can involve more specific types of actors in order to finance transit. These rather forced contributors are usually those who directly benefit from

the deployment of public transit stops. Companies in a served area are sometimes taxed, since they benefit from public transport through the daily use of their employees. As an example, companies with more than 11 employees headquartered anywhere in the Paris metropolitan area pay a tax levied on the total gross salaries of their workforce. This tax varies according to the municipality where the company is present, from 1.4% to 2.8% in 2015, and covers around 40% of total public transport costs (Hensher and Button 2007).

Another category susceptible to taxation is that of automobile drivers. Car owners, after all, benefit from a more fluid circulation because of investments made in public transport. It is thus fair to reallocate part of the revenues from the taxes and contributions they pay (parking fees, tolls, fuel taxes, vehicle registration fees etc.) towards public transit. In certain American states, and in Australia and Canada, some of the car taxes paid are directly allocated to public transit agencies. In London, all the net revenues collected through urban tolls and congestion charges are allocated to metro operations (Munoz and de Grange 2010).

Owners of commercial or residential properties adjacent to transit stops can also be subjected to increased taxes: this is called “land value capture” financing. A fairly innovative way of transit financing consists of introducing a tax on the property value appreciation following the introduction of transit station. Dublin is an example of this: all property owners residing in the vicinity of a new transit line have to pay an additional fee (Buehler and Pucher 2011).

Finally, there is the model of subsidizing public transit agencies by giving them favorable conditions of purchasing or developing land around proposed stations. Usually called the “R+P” (“Rail + Property”) model, this way of doing things effectively turns transit

agencies into real estate developers. This is the model behind the world's most successful transit agencies today: in Tokyo, Singapore, Hong Kong, real estate income represents a high share of total revenue. (It was also a very successful model in the US from the 1850s until the 1920s, with streetcar companies often involved in the developing of "streetcar suburbs".)

The dominating mindset in many Asian cities is to consider real estate and transit as complementary goods, since they do exhibit, after all, significant negative cross elasticity of demand: as the price of transit (in time and money) to a certain location goes down, its desirability increases. Since the demand for real estate largely depends on its accessibility, the two goods experience joint demand, and transit can be sold at a discount as a loss leader for the real estate business. This initiates a virtuous cycle: fast, affordable transit guarantees a large inflow of customers into metro-owned properties, driving up their value significantly beyond the stranded competition.

As an example, the near totality of the profits of the Singapore Mass Rapid Transit Corporation come from sources other than rail (mostly from real estate):

Table 3: Singapore Metro Group Financial Highlights, Fiscal Year 2016, \$m.

Revenue	1,296.6
- Rail	681.0
- Non-Rail	615.6
Other Operating Income	77.3
Earnings before interest and tax	138.5
- Rail	7.4
- Non-Rail	133.3
Profit after Tax and Minority Interest (PATMI)	109.3

The next section will examine this model in more detail.

2.5. The Rail + Property Model

Using transit as a loss-leader for real estate operations is how public transit operated in Boston, at times, during its first 70 years, and in many other US cities as well. Boston's first streetcar company began service in 1852, between Harvard Square (in Cambridge) and Union Sq (in Somerville); six other companies were incorporated by 1873 (Warner 1978, p. 22-23). Most of what Bostonians call "streetcar suburbs" were built in the subsequent five decades, between around 1870 and 1920, although by now this development model is entirely forgotten:

Many of the founders and investors in street railways were real estate speculators who wanted to attract new customers for their land. Henry M. Whitney first established his West End line to Brookline for the sole purpose of promoting his Beacon street development. The Dorchester land speculators Nathan Carruth and Henry L. Pierce were both pioneer street-railway investors. [...] In 1886 Henry M. Whitney and his associates in the West End Land Company bought farms along what was then a popular country drive. With the aid of the town of Brookline they made Beacon Street into a model French boulevard. Simultaneously they formed the West End Street Railway to bring customers to their property. The operation was a success and in the ensuing decade the land sold well.

(Sam Warner, *Streetcar suburbs: The process of growth in Boston, 1870–1900*, p. 60 & p. 125)

In East Asia, coupling public transit and real estate development began during roughly the same era, but never stopped. As an example, take the case of Japan, which traces the beginnings of real estate development by railway companies to 1906 (the year of Japan's first nationalization of the sector's infrastructure). At the time, the Japanese government prohibited any increase in tariffs on the part of rail operators, which remained private. Many of these relatively small businesses immediately ran into financial difficulties. The ones with significant land holdings survived thanks to the construction of commercial and residential buildings in the vicinity of the stations. In 1920, the concept was extended to the development of the interior of station buildings, with the opening of the first department store in a train station in Osaka (Ceder, 2016).

In 1987, the privatization of JNR (Japanese National Railways), the national railway company, resulted in a geographical division into six separate JR (Japan Railways) passenger operators. These companies attempted to follow the same model of development but having no land near the railway facilities, they had to invest heavily within the station premises. Since then, the concept has become widespread and railway companies are exploiting it within various diversification strategies, developing residential properties, offices, shopping centers, cultural centers etc. Investment is heavy because the Japanese government does not allow real estate profits to be used in any other way than for funding capital projects. In 2006, the share of real estate revenue out of total operating income was between 5% and 42%, depending on the company. By comparison, on continents other than Asia, there was no operator with real estate revenue in excess of 8% of total income (Ceder, 2016).

The iconic success story of the Rail+Property model is Hong Kong, a city with transit service of extremely high quality that does not receive any government subsidies. The Hong

Kong metropolitan area is served mostly by two companies: the Kowloon Motor Bus Company, which manages nearly 70% of the bus network, and the Mass Transit Railway Corporation (MTR), which manages the rail network. MTR is a public company, with 75% of its shares owned by the government. User fees account for 90% of revenues for the KMB and 50% for the MTR. The latter has much higher costs to bear since it maintains the railway infrastructure, while the bus company does not contribute to the maintenance of the road network. The state provides these companies with an indirect subsidy: first rights of real estate development and exploitation (Tang and Hong 2010, 300-305). The transit agency buys land, then partners with private developers for construction purposes, and eventually recovers its investments from property sales and commercial rents. This type of income accounts for around half of MTR's revenues and around 90% of its pre-tax profits (Tang and Hong 2010, 307).

In the case of KMB – a private operator – the company is exempt from the gas and registration taxes, as well as the licensing fees imposed on all other vehicles; this represents savings of around 4% on its operating budget. But the bus company benefits from the same real estate deal as MTR: exclusive development rights on its stations and garages. Like MTR, KMB has an interest in offering quality service and attractive prices to ensure a high level of traffic through its properties. A strong customer base leads to more commercial revenue in their stations and a higher value of the properties built on them, which translate into higher profits. This formula has been successful: KMB generates annual profits of around 15% while charging low fees (Tang and Hong 2010, 314).

Major debates are still ongoing as to what are the most important factors in Hong Kong's undeniable success story. Some authors emphasize the local government policies on

restricting accessibility to car acquisitions and promoting compact development; others argue the Rail + Property model is strong enough to be applied in markets considerably different from Hong Kong (Munoz and de Grange 2010, 379). In the US, however, the debate seems to have settled somewhat since the 2000s. A landmark study by Cervero et al. (2004) identifies the most significant barriers to large -scale transit-oriented development to be mostly political and institutional: according to Cervero's interviewees, the most important factors in the decision to develop TODs are zoning, degree of coordination and expertise:

Struggles over turf and resistance to change within public agencies are legendary and present major obstacles to effective project implementation... [sometimes] transit agencies have “gotten the short end of the stick” when dealing with business-savvy, seasoned developers who know how to negotiate a favorable deal. Bad experiences have at times turned transit board members against potentially lucrative joint development deals when opportunities have arisen. (Cervero et al. 2004, p. 103)

Perhaps an example of deficient implementation should be mentioned as well since Rail + Property does not always work. In Copenhagen, the 1990s saw one of the most ambitious transport infrastructure development projects in the history of the city, with a metro system and a city district being developed from scratch: the Orestad development. The project had two objectives: to build two subway lines, but also to develop housing and commercial real estate, on a state-owned island 2 km from downtown. In 1992, the total cost was optimistically projected at €1.7 billion, to be covered from land sales (50%), direct payments from existing building owners (10%), other property taxes (10%) and metro ticket sales

(30%). The project became embroiled in controversy because of large cost overruns during construction, and because the real estate market in the area actually collapsed post-transit development, with poor design and competition of similar real estate projects elsewhere often cited as important causes of its downfall (Olsson and Loerakker, 2013).

My review of both historical transit operations in Boston, as well as those of agencies elsewhere, pushed me to ask whether or not the MBTA could become a real estate developer, along the lines of some of its 19th century precursors. The next chapter delves into detail on my narrowing of the field of study, my research questions, and my method of action.

CHAPTER 3

METHODS

3.1. Introduction

My methods of research have necessarily had to adapt to the realities of researching this complex subject. My initial proposal had been to pair a quantitative real estate valuation of MBTA property with a qualitative institutional investigation, in order to answer questions I had thought relatively straightforward: what revenue stream could be generated by turning the MBTA into a real estate developer? Would a transition to this different financing model be achievable, and a net positive?

There is a wide range of revenue that the MBTA could conceivably derive from real estate. The maximum revenue that any transit agency in the world has derived from this source, on any given year, was of around 75% of that agency's total revenue (this was achieved in Hong Kong); if the financing picture were identical in Boston, with the MBTA's yearly revenue at around \$2 billion, this would suggest an upper bound of the possible at \$1.5 billion/year. The assets required would be in excess of \$100 billion (that is, 200,000 residential units at \$500 k per unit), assuming yields comparable to US large residential real estate investment trusts. (E.g. Mid-America Apartment Communities, Inc., Fiscal Year 2020: \$11.1 billion in total assets, \$1.6 billion in revenue, and \$254 million in net income.)

However, given that East Asian transit agencies rely to a large extent on commercial and industrial property, a Boston equivalent would perhaps be an MBTA real estate portfolio composed of 50,000-100,000 residential units, complemented by clusters of industrial, commercial, and medical facilities. This range will be useful to keep in mind in Chapter 4, as I go through estimating savings from increasing TOD developments.

As to the second question – would an MBTA funding reform be achievable? – it was too ambitious as stated in my initial proposal since there are inherent limitations in examining the achievability of a political process (my interview data could not support formulating falsifiable hypotheses on the likelihood of future events). Instead, I moved towards an exploratory examination of the opportunities and the constraints present in the agency’s functioning, in order to inform a number of resulting reform proposals.

3.1.1. Research questions

The previous two chapters answered some preliminary research questions, necessary for grounding this research project. In Chapter 1, I have explained how the MBTA (or its precursor agencies) functioned under different financing models, what was the impetus for the last reform, and what were the assumptions undergirding the current model. Notably, the assumptions undergirding the Forward Funding reform did not hold up well. I have also mentioned that in terms of levels of service and customer satisfaction, there were probably two different eras when Boston public transit functioned reasonably well: the late 19th/early 20th century, and also during the late 1980s (for which later period we have opinion polls). Further on, I described the MBTA’s current financing model, together with some

alternatives, and expressed my view that the model is neither efficient nor sustainable in the long-run, despite recent episodes of large federal cash transfers.

With this in mind, the present study had two main research questions:

1. What would be the social welfare effects of transitioning MBTA revenue to a model reliant on real estate?
2. What are the key challenges and opportunities that could shape the MBTA's transition towards a real estate funding model?

The first question necessitated quantitative treatment: an evaluation of the potential for real estate funding, given the built geography of the Boston area. This question could receive one of three answers: strong evidence may be found that a real estate funding model would produce significant savings; or that it would not; or, finally, the evidence could be ambiguous.

Answering the second question was somewhat more complicated, as the investigation here relied mostly on interview data, and there were many moving parts. Essentially, I wanted my interviewees to identify and rank potential barriers from most to least important. At the outset, given my review of prior literature, I had certain expectations with regard to the nature of the barriers (e.g. restrictive zoning, high development costs, cultural issues), although I did not know which ones would prove to be important.

3.2. Research Design

Addressing my research questions necessitated a mixed-methods research project; the first four questions – having to do mostly with the history of the MBTA and other transit agencies – were largely precursory, and fall into the realm of historical (and financial) analysis, which I conducted through archival research and literature review. Luckily, the Massachusetts Archives are stellar, and my greatest difficulty has been sorting through an over-abundance of primary source data; in addition, I have greatly benefited from access to all Boston Globe editions – the Commonwealth’s newspaper of record – going back to 1872. I have also relied on secondary sources to better organize background information and to provide context for my primary sources.

Assuming the answer to Question 1 assesses net positive social welfare effects to the proposed funding model transition – and that the reform can technically be done – then Question 2 becomes the main research question for this study:

“What are the key challenges and opportunities that could shape the MBTA’s transition towards a real estate funding model?”

The nature of this question invites an institutional investigation, which I chose to ground in a systems-thinking framework. A systems approach seemed beneficial to me because my initial literature review repeatedly emphasized the merits of comprehensive, interdisciplinary, holistic approaches in performing institutional investigations. My conceptual framework relied on the general theory of institutions of Acemoglu, Johnson and

Robinson (2005) described in a previous section (at 1.6), with an emphasis on the social, political and cultural background stemming from a critique by Vitola and Senfelde (2015).

This framework is centered on exploring institutions by mapping the ebbs and flows of political power, and seemed to me ideal to studying a large transit agency, which involves many political actors, millions of end users, and billions of dollars per year. According to Acemoglu, Johnson and Robinson, if one 1) performs a good demarcation of the groups affected by an institution; 2) identifies the relative winners and losers; 3) maps unofficial channels of *de facto* power; and 4) examines the reasons for political commitment (or lack thereof), one is likely to find the most important leverage points in the system.

Going in, I understood my primary challenge to be understanding what happens to public transit with each iteration of the elections/policy renewal/resource distribution feedback loop (see figure below): the MBTA is created (and reformed) by political actors, who are both incentivized and limited by a number of electoral, economic, and institutional factors stemming from the prevailing distribution of resources at the time. Political actors exercise *de jure* power (which is transparent and widely publicized), in ways shaped by *de facto* political power (often obscure); the most difficult part of an institutional analysis is therefore the mapping of groups with *real* political power, their disputes and alignments, and

what struggles undergird the currently prevailing social, political, and economic outcomes.

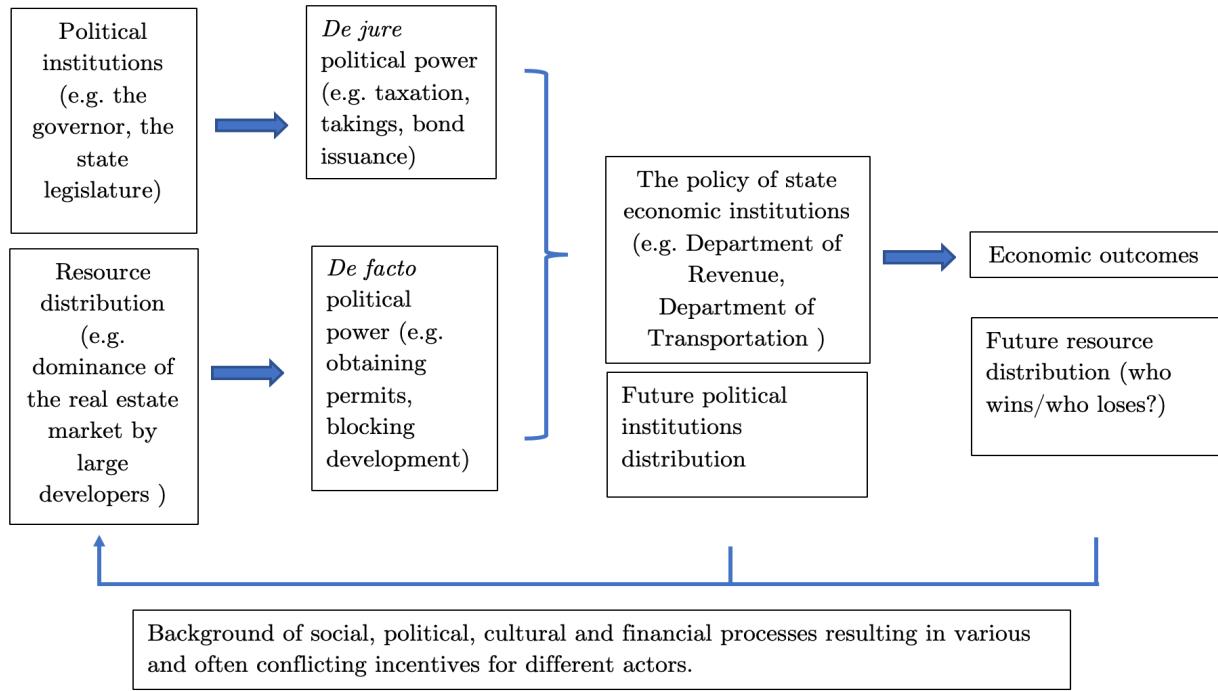


Figure 1: General Conceptual Framework of Problem Definition: A Systems-Thinking Feedback Loop.

In recent years, *de facto* political power has become a focal point in institutional research, with Foldvari (2017, p. 760) calling this “the next focal point in institutional economics”. The current literature on transit funding is sparse on the *de facto* political power of groups to capture government, beyond relatively basic discussions of community NIMBYism and how to enlist stakeholder support. For example, the last three National Academy of Sciences studies on the topic allocated 8 pages, 1 page and 3 pages respectively to this issue (Transportation Research Board 2004, 2014 and 2018).

In order to conduct my institutional investigation, I have devised an interview protocol in line with systems thinking goals, with open-ended questions, and prompts covering actors and topics listed by the relevant literature (Cervero et al. 2004), given the fact

that identifying the degree of political power of all actors is one thing, but it is not clear in what direction the actors are likely to push. For instance, elected officials may find it in their electoral interest to either engage for MBTA expansion (as recently, in Somerville) or resist expansion (as in Arlington during the 1980s); environmentalists may try to limit projects (on account of probable damage to certain areas) or push for their completion (on account of reducing the overall level of emissions); the union of conductors may not agree with the union of engineers; and so on.

3.2.1. Assumptions

There are two main assumptions undergirding the substance of this study. First of all, that the level of funding is at least somewhat correlated with transit agency performance, and that any MBTA reforms should prioritize obtaining more revenue (or at least keep funding levels on the current path). While I have been inspired by studies that show a correlation between the two (e.g. Grisby 2016), there are also studies that emphasize cutting costs, improving efficiency, quality of leadership, or other factors in reforming transit agencies in order to achieve higher levels of customer satisfaction.

Secondly, I assumed that the relevant classes of actors are already mapped out by previous studies; the usual approach to research projects such as this one is to interview policy elites. I took an initial list of potential interviewees from the most recent federal government guidebook on TOD (Transportation Research Board, 2018), which lists many relevant groups of stakeholders, and I mitigated potential gaps by adopting a purposive snowball approach for finding other interviewees, allowing me to find and contact

professionals working for Massachusetts-specific organizations (such as the Boston Redevelopment Authority, or local real estate developers.)

3.3. Qualitative Methods

This section reviews my qualitative research methods: identifying and accessing primary source data, identifying the interview population, how I conducted interviews, and all subsequent data analysis.

3.3.1. Primary data

The most important primary data I examined consisted of audited financial statements and budgeting documents and plans (especially capital investment reports). I looked at annual reports going back 42 years (starting with the MBTA 1981 annual report), but looked especially closely at documents from 2001 to the present day (FY 2023), since the MBTA's current revenue model dates from July 2000 (with the implementation of the "Forward Funding" plan) – and previous years are not comparable at the level of line items.

These reports fall into three categories: 1) audited financial statements; 2) detailed operating budgets; and 3) Capital Investment Program reports. This allowed me to compare projections vs. actually realized revenue and expenses at a detailed level.

I have also looked at the legislative record, especially the debates surrounding the 2009 Transportation Reform Act, which overhauled the organization of state transportation agencies and created a unified Massachusetts Department of Transportation. (However, the Reform Act left the funding model untouched, despite much change elsewhere). I have also extensively used the Boston Globe archive to gain context on particular legislative

proceedings; this was invaluable, especially in understanding the late 1990s transition to the “Forward Funding” model.

3.3.2. Interviews

In order to begin identifying relevant actors, I used the most recent federal government guidebook to funding transportation through land values (Transportation Research Board, 2018), which lists many relevant groups of stakeholders, in decreasing priority order, beginning with (1) Elected officials and staff; (2) State and local transportation agency management and staff; and (3) Economic development agency management and staff. In addition to this, my committee has strongly encouraged me to seek the opinion of (4) national transit experts in academia, as well as (5) local journalists on the MBTA and the legislative beat. I have prioritized gaining access to these actors, following a purposive-snowball strategy – leading to other relevant actors (e.g., landowners and developers).

I was able to interview 16 individuals who had held the following positions over the course of their careers:

- two presidents of the Senate (Will Brownsberger + one confidential source),
- two senators/representatives on the Joint Committee on Transportation (Will Brownsberger + one confidential source),
- three MBTA general managers (Richard Davey + two confidential sources),
- two Massachusetts Secretaries of Transportation (Richard Davey and Jeffrey Mullan),

- one senior vice president for one of the largest US developers (confidential),
- one Assistant Secretary of Transportation for Real Estate and Asset Development (Jeffrey Simon – now President of Simon Properties Inc.),
- one US Deputy Secretary of Labor (confidential),
- the two Boston Globe journalists who wrote most of the MBTA coverage for the past decade, either on the state house beat (Matt Stout) or MBTA beat (Adam Vaccaro),
- one Director of Planning at the Boston Redevelopment Authority (Kairos Shen),
- two national transit experts (Professors – Michael Duncan and John Renne),
- and one City Councillor from a large MBTA-served community (confidential).

In total, I conducted 15 formal interviews (this number differs from a simple sum of the previous list because certain individuals held more than one relevant post). This was supplemented by notes gathered through an equally large number of briefer, informal conversations, usually on the margins of conferences or similar events; the notes were usually jotted down after a conversation, with an e-mail follow-up when I needed a clarification. In this category, I would especially like to thank Rachel Goldsmith of Greystone & Co. (the subcontractor which runs MBTA's real estate) and Dr. Robert Cervero for offering their thoughts.

My interviews had a suggested length of 45 minutes, but the actual range was from 35 minutes to around 90. All of them were conducted through Zoom, during 2020 and 2021, given the restrictions of the pandemic. The interviews were transcribed by an independent paid professional, and then coded for analysis.

3.3.3. *Sampling*

As mentioned previously, I began by purposive sampling, a non-probability sampling method, since political power is highly concentrated in a small pool of people. I prioritized contacting the most relevant elected officials: the governor, the president of the senate, the speaker of the house, and the members of the joint committee on transportation (seven senators and 13 representatives). These officials have full legislative power over transportation matters in the Commonwealth, since it is almost unheard of that a bill that makes it out of committee (with the backing of the two chamber leaders) could be killed on the floor.

I have also asked my participants to suggest further candidates (snowball sampling), and around half of my interviews were obtained through this method. For instance, Jeffrey Mullan (Massachusetts Secretary of Transportation) referred me to Jeffrey Simon (Assistant Secretary for Real Estate and Asset Development) for all questions relative to real estate.

In brief, I chose non-probability sampling because I suspected that I might need to identify unofficial actors in order to trace the circuit of de facto political power. The best way I could find was to ask my interviewees for suggestions. In the ideal case, the researcher is able to conduct interviews either with the whole elite population (if it is small enough) or until reaching saturation (when the same comments begin to repeat). My study is limited by the fact that I was not able to interview certain categories of actors (most notably, governors and speakers of the house), although for the journalist, transit expert, and real estate developer categories, I am reasonably confident I reached saturation.

3.4. Interview Questions

I devised my initial interview instrument (see Appendix A) in light of my research questions and my review of past research, and adapted it to the relevant experience of the interviewees. I began with the most general questions (e.g. What are the major issues with implementing good transportation policy in Boston?) in order to allow full freedom to the interviewees to touch on whatever they thought was most important.

I used each interview as a steppingstone in better focusing my inquiry, by asking subsequent interviewees to confirm – or disapprove of – points made by other participants. As an example, I asked a former Senate president questions about the legislative process on transit issues, and the major stumbling blocks in the process; then followed up on their remarks with another state senator; and then ran these remarks by the Boston Globe journalist on the State House beat. Each one brought a unique perspective to the table.

My study was approved by the UMass Boston Institutional Review Board. For the interviews, I granted participants the option to remain anonymous, ensuring that their identities would not be disclosed. I have also provided named participants the opportunity to share certain pieces of information “off the record”, under the condition of confidentiality. I made sure this data cannot be traced back to individual contributors, first by securing my notes, and secondly by avoiding identifiable details in this report.

3.5. Analysis

I have used as initial categories of inquiry the transit reform themes listed in the literature, and additional themes have emerged from the interview data. I have performed the

analysis with the help of the MAXQDA software package, and coded passages by system areas.

More specifically, the transit funding literature lists a certain number of main categories of inquiry; here are some examples of the issues I expected to spend most time examining going in:

(1) accountability (there are numerous strands, as the MBTA should be accountable to the public, the governor, and the legislature, while the governor and legislature should be accountable to the public as well)

(2) contracting practices (defined by a specific legal framework, within an existing ecosystem of contractors)

(3) cost of labor, turn-over, staffing issues (e.g., the MBTA may suffer from Baumol's cost disease, which refers to the rise of salaries in jobs that have shown little increase in labor productivity, in response to rising salaries in other jobs)

(4) union bargaining power

(5) sustainability of the operating budget (with regard to national economic trends, e.g., healthcare and pension costs have exploded in recent decades)

(6) investment in new infrastructure vs. maintenance (one may be prioritized over the other for purely political reasons)

However, my interviewees have often steered the conversation towards other themes; some prominent examples include:

(7) deindustrialization (the difficulty of domestic train procurement at present, as opposed to past eras)

(8) federalism (to highlight transit policy is a national issue at least as much as a local one)

(9) in-built, historical inequalities

I used exploratory, eclectic coding during the first cycle, relying primarily on two different methods: descriptive coding and versus coding. Descriptive coding involves assigning labels to the data, in order to summarize in a word or short phrase the basic topic of a passage. This is an initial phase of data analysis that helps to organize the data into categories, which can then be used to identify patterns (Saldana 2013, p. 87). This process allowed me to break down data into manageable sections on recognizable themes (e.g. infrastructure, cost of labor, legislative gridlock etc.) This method generated an index of the data's contents: Saldana calls it "essential groundwork for Second Cycle coding and further analysis and interpretation" (Saldana 2013, p. 89). These codes dealt with relatively broad issues.

I have also gained some valuable insights through applying Versus Coding, since my set of policy problems is political, with different social groups having different views (e.g., technocrats vs. political appointees, progressives vs. neoliberals etc.) Versus Coding essentially identifies binary oppositions in data that represent conflicts or dilemmas, and it typically takes the form of "X vs Y", where X and Y represent conflicting concepts or actions (Saldana 2013, p. 115-116). I categorized codes, at the beginning, into one of three major categories: stakeholders, perceptions/actions, and issues (following Saldana 2013, p. 117). Some observable conflicts have emerged, though overall my interviewees were in agreement a remarkable proportion of the time.

Finally, I used axial coding to help me establish a hierarchy of importance. Axial coding “relates categories to subcategories [and] specifies the properties and dimensions of a category” (Charmaz, 2006, p. 60). In the later stages of writing, I used this hierarchization to help me structure the identified elements of causation, including the context of the problem, current conditions, specific interactions and likely consequences in case of reform.

3.6. Press Coverage

The *Boston Globe* archives were priceless as a source for political debate, and to gain insight on the thinking of the policy makers who shaped the MBTA prior to the current era. Because of the sheer quantity of press coverage on the issue, I was not able to do a comprehensive review and coding along the same lines as interview data: over the past 30 years, the *Boston Globe* has published many thousands of articles on the MBTA, and my attempts to narrow down by theme did not reduce the coverage to a manageable load. However, I have done my best to perform exhaustive research on key points, for instance, on the discussions surrounding the pivotal Forward Funding reform, on which the *Boston Globe* published around 150 articles. When possible, I have used public agency documents to verify the claims made, and to help place the tone and tenor of the *Boston Globe* coverage (which, as any source, cannot be taken at face value). Overall, I have reviewed over two hundred articles in connection to the MBTA funding reform discussion over the past three decades, and referred to some of the more in-depth ones in this study.

3.7. Quantitative Methods

Could the MBTA transition to a funding model depending largely on real estate? Does it have the space to do it? If so, what would be the socioeconomic consequences of such a transition?

I began by attempting an automated real estate valuation of the MBTA's portfolio. In the process of doing so, I gained valuable insights into the limitations of such endeavors (see section 7.1 and following). Apart from technical issues, by 2023 the MBTA had spent two decades selling most of its valuable plots of land anyway, so there is currently not enough property in its portfolio to undergird the reforms discussed in this study.

If the MBTA does not own the land necessary to build something on the order of 100,000 residential units (together with some commercial real estate) – as mentioned in section 3.1. – where could it get it from? Using data from a recent MAPC project (MAPC 2022), as well as from MassGIS (MassGIS 2022), I identified the most promising plots for acquisition by the MBTA for redevelopment. I decided to focus on underperforming strip malls in light of my interviews, which suggested that while there might be significant local opposition to any kind of development, suburban strip mall redevelopment is somewhat easier to push through (for a variety of reasons, e.g. utility lines tend to be already in place, environmental concerns are minimized, developing abandoned industrial and commercial facilities can be considered blight removal etc.)

This introductory spatial analysis was conducted in Tableau, focusing on real estate that is already close to a transit station (within half a mile), and following MAPC guidelines for estimating the number of housing units that could be built on a specific site. The MAPC methodology (MAPC, 2022) uses an equation to approximate the number of housing units

that may be built on any particular site relying on seven parameters, a) minimum floor area per dwelling unit; b) maximum number of floors; c) parking spaces required per dwelling unit; d) parking spaces required per 1000 square feet of commercial space; e) fraction of the building's first-floor area that would be devoted to commercial space; f) fraction of site area that must be devoted to open space and g) fraction of site area that must be setbacks from site boundaries.

The MAPC methodology could be considered somewhat conservative for my purposes, given that it takes certain zoning requirements (e.g. on parking spaces or setbacks) as non-negotiable, irrespective of the most recent efforts to wrest away zoning power from municipalities – as illustrated by the recently passed H.5250, “An Act Enabling Partnerships for Growth”. Nonetheless, in an effort to produce numbers of some reliability, I chose to stick with the more conservative approach. See Chapter 7 for the results, including an estimate of number of potential housing units assuming 100% residential, an estimate assuming a residential-commercial mix, and an estimated increase in commercial revenue for the developer, as well as tax revenue for the state.

I then used the numbers obtained through my spatial analysis in an OLS model that provides quantitative estimates of certain social costs and benefits arising from the proposed reform. This cost-benefit analysis models the change in a number of relevant variables (e.g. wasted time, fuel consumption, change in air pollution, carbon emissions etc.) in order to arrive at an overall estimate for the studied scenario.

3.8. Limitations and Threats to Validity or Reliability

A first major limitation had to do with access to the interview population. It is not always easy to obtain answers from political elites, let alone candid ones. I partly mitigated this by interviewing past, retired holders of an office, under the assumption that institutional constraints have largely remained the same since their time in office.

A second important limitation is the timing of the study; institutions may behave differently under various electoral outcomes, and Massachusetts may be run differently under a Democratic governor and a Democratic legislative body than in other, previous situations. I have tried to control for this by expressly asking interviewees what would change under different electoral scenarios (e.g., with a Democrats or a Republican winning the governorship).

There are also the usual limitations of qualitative research with regard to researcher bias. The main way for me to mitigate bias was to look intentionally for contrary data, and also by going back to the interviewees, post data treatment, and ask them whether my interpretations are representative of their beliefs (or if they are at least reasonable, if otherwise). As an example, I am personally very pro-union, and generally on the side of the Democratic Party in policy debates. Mindful of this, I have actively sought to understand if the MBTA's current major problems may be traced to union activity, and carefully contrasted their stated positions to reports produced by more conservative think-tanks, on issues such as wages, pensions and scheduling. Furthermore, I have actively sought the opinion of Republican members of the legislature. In this, I have been helped by concurrent practice: one point of strength is that I drafted this report during a period when I was also employed,

as a researcher, by a state agency with the duty to produce apolitical, balanced reports (the Office of the State Auditor).

3.9. Ethical Issues

Following my dissertation proposal, my study was determined to be exempt from review under the 45 CFR 46.104(d)(2) guidelines (“Educational tests/survey/interview procedures, or observation of public behavior”). I conducted my research without further reporting to the University of Massachusetts Boston IRB, beyond the initial application. I have followed, however, all requirements listed in the Investigator Manual (HRP-103). Part of my research relied on data that is publicly available (e.g. press articles, financial statements), and as such, ethical concerns on privacy were inherently mitigated. For the interview portion, I did have an ethical obligation towards participants who expressed a preference for anonymity, which I ensured by storing my data securely (a password-protected archive on my personal computer). Furthermore, all confidential data is scheduled to be deleted at the conclusion of the present study, thus making accidental releases impossible.

3.10. Concluding Remarks

From this section, we move on to examining what an MBTA real estate portfolio could look like, in Chapter 4, and then to an in-depth examination of institutional politics, in Chapters 5 and 6. In other words, I performed a physical survey first, identifying the sites where the MBTA could establish a real estate presence, followed by an institutional study, based largely on interview data, which attempts to identify the political conditions necessary for such a transition.

CHAPTER 4

THE POTENTIAL FOR A REAL ESTATE PORTFOLIO

4.1. Introduction

This chapter focuses on answering main research question 1: “What would be the social welfare effects of transitioning MBTA revenue to a model reliant on real estate?” To this end, I begin by describing the existing MBTA real estate portfolio; I discuss some issues related to automated valuations; and then I focus on a specific number of identified sites – consisting largely of under-used commercial sites within half a mile to either train or bus stops – to examine their potential for redevelopment.

Three scenarios are provided, a maximalist one, through which the MBTA could derive from real estate considerably more than it presently needs for its operations, a minimalist one, of development only of sites close to rail stops, and a middle-of-the-road option, combining some of the features of the previous two.

4.2. Current MBTA Portfolio: Characteristics and Total Value

The MBTA has historically been the heir of a significant number of properties subject to state takings, mostly during the 1960s, which have never been developed. However, the agency has aggressively auctioned off its unused plots of land during the 21st century,

sometimes at below-market prices (for an example, see Carlock 2015); today, little remains of what had been, until the 1990s, a relatively large portfolio.

I have undertaken an exhaustive exploration of the MBTA current real estate holdings, using tax assessor data, from data compiled by MassGIS (the Commonwealth's Office of Geographic Information) and refined by the MAPC (the Massachusetts Land Parcel Database).¹ While the records contain numerous errors (as an illustration, see Appendix D for names listed as owners of MBTA properties), I am confident I have identified the vast majority of MBTA real estate, through an extensive manual review.

I began by locating all plots with a variation of the MBTA name listed. In total, I identified 911 properties, with a total assessed value of \$1,016,678,592 (all values in this paragraph are in 2019 dollars) . I have then performed a second search of real estate by using the “address” field, using all variations of 10 Park Plaza, the address of abode for both the MBTA and the Mass Department of Transportation (see Appendix D). This returned 1,323 properties, with a total assessed value of \$1,459,499,904. The assessed value of land only was \$650,177,920 for MBTA properties, and \$768,235,200 for all properties registered at 10 Park Plaza (with the balance represented by structures or other improvements).

I can therefore say with a high degree of confidence that the assessed value of all MBTA real estate (FY 2019) is almost certainly lower than \$1.5 billion. Note that by law in Massachusetts, assessments should be “100% of full and fair cash value”, meaning, equal to market value (Mass.gov 2023). In practice, assessment values may trail market values by a number of years, but in any case, even if ballparked at \$1.5 to \$2 billion, I have found that

¹ Available at <https://datacommon.mapc.org/browser/datasets/360>

the total value of current MBTA properties represents only a very small portion of the amount it the agency would need to fund a sizable part of its operations through real estate – I estimate the amount required, in the following sections, to be at least \$40 bn.

4.3. Automated Valuation: Attempts and Pitfalls

The total assessed value of approximately \$1 - \$2 billion for all MBTA real estate struck me as low. Given that this assessment could trail market values by a significant amount, for any reason, I have attempted an automated valuation.

Pricing algorithms for real estate have seen an increase in interest around 2010, with a nadir during 2020, with the Zillow debacle. Zillow is an American real-estate marketplace company which attempted a transition towards assembling its own portfolio during 2018-2021. It invested heavily in an algorithmic tool called “Zestimate”, to serve as the main value indicator for its home buying unit. The attempt failed spectacularly, with Zillow quickly accumulating large losses, losing 80% of its stock market value, and having to liquidate its home-buying business and fire a quarter of its staff (Sarnoff 2023).

For this study, I have also conducted research on automated pricing, and I found that appraising the MBTA’s properties cannot be automated through mainstream data science approaches. This attempt did not result in a reliable estimate; you may read about it fully in Appendix C.

4.4. Underused Commercial Sites: A Quantification

The following two sections focus on answering main research Question 1, “What would be the effects of transitioning MBTA revenue to a model reliant on real estate?” This

refers to social welfare effects understood in a wide sense, meaning impacts on a large variety of variables from vehicle affordability to air pollution and health markers. Would transitioning be a good idea? Why or why not?

But first, we need to identify where MBTA-driven densification could take place. If mass new housing development is to happen in Massachusetts – and recent years have seen ever more powerful political forces pushing for it, as shown by the passage in 2021 of H.5250, “An Act Enabling Partnerships for Growth”, which places certain limits on zoning restrictions – then it is likely to happen in the order of what is politically feasible. There are certain categories of land for which the political barriers are so high that development discussions are largely moot: historical neighborhoods in Boston and its nearby streetcar suburbs, expensive neighborhoods in upper-middle class communities, or environmentally protected land. At the other end of the spectrum, lower-income communities are very often eager to invite development, most definitely for abandoned or under-used commercial and industrial properties. Between the two, there is the largest category of all: middle-income communities where the pro- and anti-development forces battle it out every day, on a site-by-site basis.

To the extent that densification is possible in middle-income communities, it is again easiest to implement on under-used properties, the largest class of which is represented by mid-20th century suburban strip malls. This category of commercial real estate was battling severe headwinds even before the 2020 Covid pandemic, as online sales boomed; as of 2023, its revenue model is severely challenged on a majority of sites. (For an in-depth look with further references, see Leslie 2022).

Could then the MBTA transition towards operating a real estate portfolio mostly built on currently under-used commercial space? What would this look like? And what would be the socio-economic effects?

In order to answer these questions, I began by obtaining data on under-used commercial sites. By far the most exhaustive dataset available to date is the one assembled by the MAPC for its 2022 report, “Rethinking the Retail Strip” (MAPC 2022). This is an analysis of 3,028 total sites in the Boston metro region, which may be redeveloped, according to the MAPC methodology, into a maximum of 379,217 residential units (or any combination of residential and commercial real estate).

MAPC (2022) estimated the number of units through an equation available in their methodology section,² consisting of 7 variables: (1) Minimum floor area per dwelling unit; (2) Maximum number of floors; (3) Parking spaces required per dwelling unit; (4) Parking spaces required per 1000 square feet of commercial space; (5) Fraction of the building(s)' first-floor area that would be devoted to commercial space; (6) Fraction of site area that must be devoted to open space; and (7) Fraction of site area that must be setbacks from site boundaries.

I have decided to keep their methodology for estimating the number of units, even though it may be somewhat conservative in light of recent legislative pushes against setback and parking requirements. I have then mapped Boston metro area unused and under-used

² Available at <https://mapc.gitbook.io/rethinking-the-retail-strip/readme/methods>

sites using Tableau visualization software, focusing on units within half a mile of either a bus or a rail transit stop. I made the results publicly available on an online portal.³

Using tax assessor data, as refined by MAPC (2022), I have found 759 sites in proximity to a bus stop, 869 in proximity to a rail stop, or 1601 in proximity to either rail or bus. Following the MAPC methodology, I estimated the number of units which may be built on these sites as 82,564 (in proximity to rail stations); 122,003 (in proximity to bus stations); or 199,976 (either rail or bus stations). These are maximalist numbers, which assume each site is to contain residential units only, with no commercial or industrial development.

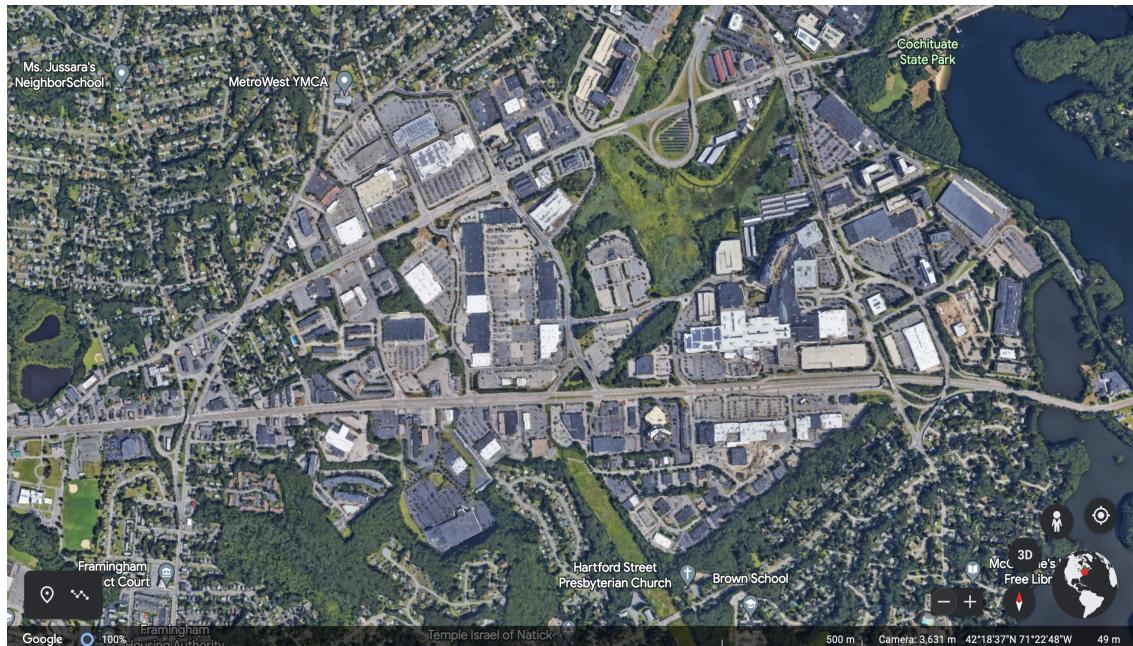


Figure 2: Example of a Low-Density Commercial Strip Overhead View. Big Box Stores Between Cochituate Rd and Worcester Rd in Framingham, MA.

³ Visit https://public.tableau.com/views/parcels3_16796005397550/Parcels?:language=en-US&:display_count=n&:origin=viz_share_link; or search for my data profile (“George Chichirau”) on public.tableau.com for a full list of public visualizations.



Figure 3: Example of a Low-Density Commercial Strip. Big Box Stores Between Cochituate Rd and Worcester Rd in Framingham, MA.

4.5. Quantifying the Shift from Driving to Public Transit in TODs

What is the difference in VMT (vehicle-miles travelled) between TODs and non-TODs? The most comprehensive data on this topic comes from the NHTS (National Household Travel Survey), conducted by the Federal Highway Administration, which is the authoritative source on US travel behavior (Chatman et al. 2019). Households within half a mile of a rail transit stop drive, on average, 12.08 fewer miles per day, or 4410 fewer miles per year.

I decided to adopt this indicator for all of my transit stops, even though they vary between commuter rail, heavy rail, light rail and key bus stops. The reason is that any mode, well run, can be superior to any other transit mode, not so well run. Furthermore, as noted by Chatman et al. 2019, “rail access by itself may be less important in affecting auto use than

built environment factors like population density, employment density, or parking availability” (p. 7).

The average VMT per household also varies by state; in Massachusetts, there were 66,772 million VMT in 2018 (MA Office of Grants and Research 2020, p. 10), for 2.64 million households, or 25,292 VMT per household per year. Thus, I assume proximity to a transit stop may lower VMTs by about 18%.

4.6. Effects of Transforming Underused Sites into MBTA-Owned Rental Properties

Using existing research best practices, I attempted to estimate the effects of allowing the Boston metro transit agency to develop the aforementioned underused sites. According to James et al. (2014), perhaps the most wide-ranging health impact assessment of the MBTA over the previous decade, one should attempt to account for the following six categories: (1) Air pollution; (2) Physical activity; (3) Time wasted spent in traffic; (4) Fuel consumption savings; (5) Fatal crashes; (6) Carbon emissions. Following Baxandall and Olivieri (2015), I have also added (7) Car purchase savings and (8) Car maintenance savings.

This list is not exhaustive: there are other variables of interest, which I have not been able to ballpark in a way satisfactory to myself. As examples, the effects of noise or the change in road repair costs. With regard to the first one, it is difficult to hypothesize as to what noise reduction there might be, over such a large number of disparate sites and lines (especially since some MBTA vehicles, notably on the Green Line, have been known to produce much noise). With regard to the second one, heavy vehicles, such as buses and trucks, damage the roadway much more than personal vehicles; under the proposed scenario,

heavy truck traffic should remain similar, bus traffic should increase, and light vehicle traffic should decrease, but the relationships are not linear and thus become difficult to quantify.

Nonetheless, my literature review makes me confident that my listed variables add up to a majority of net effects quantifiable in dollars:

Table 4: Gain Estimate of Proposed TOD Densification. All Values in FY 2022 Dollars.

	Scenario 1	Scenario 2	Scenario 3
No. of added TOD units	80,000	150,000	200,000
Asset Value	\$43.6 b	\$81.8 b	\$109.1 b
Revenue	\$4.36 b	\$8.1 b	\$10.9 b
Income per year	\$1.09 b	\$2.04 b	\$2.72 b
Population increase in TOD communities (households)	80,000	150,000	200,000
Population increase in TOD communities (individuals)	198,400	372,000	496,000
Population shift from driving to transit (fewer VMT)	326,050,560	611,344,800	815,126,400
Air pollution	\$10,926,941.23	\$20,488,014.81	\$27,317,353.09
Physical activity	\$603,583,420.58	\$1,131,718,913.58	\$1,508,958,551.44
Time wasted spent in traffic	\$967,814,795.06	\$1,814,652,740.74	\$2,419,536,987.65
Fuel consumption savings	\$165,465,110.12	\$310,247,081.48	\$413,662,775.31
Fatal crashes	\$108,053,155.58	\$202,599,666.72	\$270,132,888.96
Carbon emissions	\$8,845,619.09	\$16,585,535.80	\$22,114,047.74
Car purchase savings	\$44,948,800.00	\$84,279,000.00	\$112,372,000.00
Car maintenance savings	\$103,222,000.00	\$194,180,000.00	\$258,055,000.00
Total Yearly Savings (2022 \$)	\$2,012,859,841.67	\$3,774,750,953.14	\$5,032,149,604.19

The table above summarizes my best estimate, in dollars per year (2022) of net benefits from the transition. I will now explain it line by line.

The first four lines repeat my assumptions explained in previous sections. I have identified sites in proximity to rail stations which may host up to 82,564 housing units, and in proximity to both rail and key bus routes which may host up to 199,976 units. Rounded to 80,000 and 200,000, these represent scenarios 1 and 3. I have also added a middle-of-the-road evaluation, for 150,000 new TOD units.

I have then multiplied the number of units with the median MA home value of \$545,500 at the time of writing to ballpark the value of the entire portfolio, which would then

fall in the \$43 to \$109 billion range. Repeating the assumptions from section 3.1 (revenue at 10% of asset value, net income per year at 25% of revenue) we obtain lines 3 and 4, with an estimated net income in the range of \$1.09 to \$2.72 billion.

The TOD population increase in households has been assumed at simply 1 household per unit; and in individuals, at 2.48 individuals per household, which is the average for Massachusetts (US Census Bureau, 2022).

The population shift in driving to transit has been specified as 18% of the yearly Massachusetts VMT per capita (which is 9,130 according to Davis (2019)), multiplied by the number of individuals.

For the first 6 categories listed (air pollution through carbon emissions), I followed James et al. (2014)'s estimates, computed in 2012 dollars. Thus, for air pollution, James et al. (2014) followed well-established epidemiological research to gauge the relationship between pollution levels and health outcomes, and then monetized it using the EPA value of a statistical life, using the following formula (p. 7):

Health Endpoint = Change in Air Quality x Baseline Rate x Relationship Between PM(2.5) and Health Endpoint x Population

I followed this methodology, updating values to 2022 dollars, and obtained a value of -\$55.07 per person switching from transit to driving (or a net gain of same in the other direction). The values in the table are a multiplication of this value by the number of individuals.

I followed James et al.'s methodology for the next 5 categories. Thus, the net savings by means of physical activity amount to \$3,042.45 per individual per year, mostly through the effect of prevented obesity (an extremely expensive, long-term condition) and early

death. Rushing half a mile to a mile daily between transit nodes can make the difference between obesity and simply being overweight: see for instance MacDonald et al. (2010) for an in-depth study on the effect of transit access on body mass index and physical activity.

For the value of time spent stuck in traffic, I again took James et al.'s estimate of average speed increase with/without those individuals on the road (0.2 mph). Average regional VMTs divided by the average speed in mph under the two different scenarios give the difference in hours. This can then be multiplied by 1.25 (average number of passengers per vehicle in the Boston area), by the value of 1 labor hour (\$21.59), and then annualized (x365). Time savings range from \$967 m to \$2.4 b.

For fuel consumption savings, James et al. (2014) used Schrank et al. (2011)'s equations:

$$(1) \text{Automobile Fuel Economy} = 0.0066 x (\text{speed})^2 + 0.823 x (\text{speed}) + 6.1577$$
$$(2) \text{Truck Fuel Economy} = 1.4898 x \ln(\text{speed}) - 0.2554$$

Assuming road traffic at 95% cars and 5% trucks, we end with savings ranging from \$165 m to \$413 m.

The cost of fatal crashes is easy to ballpark using only 2 components, traffic fatality rates per VMT in Massachusetts, and the costs of crashes as evaluated by the Federal Highway Administration. James et al. (2014) arrive at a figure of \$0.26/VMT for the Boston area; I indexed this number for inflation and multiplied it by VMT to arrive at an estimate.

For carbon emissions, the literature on its social cost contains a very large range of estimates (anywhere from \$1/ton to >\$100/ton); James et al. (2014) chose the mean as identified by a National Academy of Sciences meta-analysis, which in 2022 dollars amounts to \$39.74/ton. Using this number, as well as mean emissions per VMT, results in an estimate in the range of \$8.8 to \$22 million.

For car purchase savings, KPMG (2020) estimates that an 18% reduction in VMT correlates with drop of 10% in new car purchases per household. From the industry report (Massachusetts State Automobile Dealers Association, 2022), we know that in 2021, Massachusetts saw \$14,048,300,000 in new car sales, for 297,297 cars; given that there are 2,714,448 households, this amounts to 0.1095 new cars per household. The average price per new car was \$47,253. Saving 10% out of 0.1095 results in savings of 0.01095 of new cars per household per year, or \$517.42 per household. Multiplied by the number of households, this represents savings in the range of \$45 to \$112 million.

Baxandall and Olivieri (2014) (p. 10) estimate vehicle repair costs per VMT at 5.11 cents per mile. This helps compute car maintenance savings in the range of \$103 to \$258 million.

In total, the total yearly savings thus estimated fall in the range of \$2.01 billion to \$5.03 billion. Note that this is an estimate of gross savings, given the extreme difficulty of computing net savings, driven by multiple offsetting effects: for instance, fewer car purchases and less car use would result in losses to local auto shops and dealerships, and gains to various businesses near transit hubs; but this analysis does not take into consideration such impacts on local businesses.

To my knowledge, this is the first such exercise undertaken for the MBTA (or part of it) since a 2018 report on the MBTA’s “transportation dividend” (A Better City 2018). Using relatively similar methodology, this report computed the MBTA-wide impact on four variables: travel time (savings: \$7.1 billion), travel cost (savings: \$3.6 billion), avoided crash costs (savings: \$640 million) and avoided pollution costs (\$30 million), for a (partial) total of \$11.4 billion in annual benefits, in 2015 dollars. Given that the MBTA’s 2015 budget was

approximately \$1.9 billion, the authors suggested that the social net yearly benefit derived from the agency's operations amount to at least \$9.5 billion.

Note that instead of the previously explained protracted calculations, I could have ballparked the impact of new development using the Better City report: if the system delivers \$11.4 billion in annual benefits at X ridership (e.g., MBTA riders took 1.26 million daily trips in 2019), then if we assume linearity, an increase in ridership by Y amount results in Z new benefit.

In the end, my numbers ended being somewhat close to the Better City 2018 estimates; if we divide their \$11.4 billion by 365 (days per year) and 1.26 million (MBTA daily trips, most recent pre-pandemic year), we see the 2018 report valued the gained social benefits of a single trip at roughly \$24. Assuming +1 daily trip for each +1 individual in a TOD community (an assumption in line with current TOD behavior), I estimate the social gain at \$27 per trip (in 2022 dollars). Given recent inflation, \$27 in 2022 is very close to \$24 in 2018-2019.

However, I considered 8 variables, to their 4; a rather similar final result means that I have been considerably more conservative in my accounting for the common 4 variables than the aforementioned 2018 report.

That a public transit system provides a social benefit many times in excess of its cost is not a surprise: this is the case with every transit agency, in any mid-sized or large city on the planet. For the year 2015, A Better City (2018) ballparked the net social benefit for the MBTA at \$9.5 billion (total benefits of \$11.4 billion less the agency's expenses of \$1.9 billion).

What my exercise shows is that densification on relatively little, under-used land could boost the MBTA's social benefits by an astonishing \$2 to \$5 billion per year. The lower amount may even be achieved without improvements beyond the MBTA transit level of service of 2019.

4.7. Conclusion

This chapter used tax assessor data and spatial data to examine the current MBTA portfolio, and found it is limited to little other than stations and tracks, assessed at a total value in the range of \$1 billion. Finding that there is a class of real estate that is economically under-performing at present – suburban strip malls - I then moved to an assessment of this category in the Boston metro area. My conclusion is that there is enough under-used commercial real estate in proximity to MBTA rail and key bus routes to meaningfully increase urban densification, and fund MBTA operations to a great degree, if these properties were to be acquired by the agency. I estimate the increase in resulting net social gain at \$2 to \$5 billion per year – a significant increase over the current net social gain the MBTA provides (around \$10 billion per year).

I now move on, for the next two chapters, to an examination of both the national and the local factors which shape MBTA institutional politics, and to suggesting reforms in the final chapter.

CHAPTER 5

THE INFLUENCE OF NATIONAL TRENDS

5.1. Introduction

The previous chapter, technical in nature, strongly suggests that more densification, and better transit service, would be of high social benefit. If that is the case, then we should inquire under what circumstances a transition to the proposed revenue model could be implemented. Chapters 5 and 6, therefore, focus on my second research question: “What are the key challenges and opportunities that could shape the MBTA’s transition towards a real estate funding model?”

The present chapter covers national trends and influences, while the following one focuses on state politics and local factors. I have sought to isolate the most impactful factors, as characterized by my interviewees, and describe them (in decreasing order of importance to the extent possible). As expected, there are both national strengths, which local politicians would be well advised to draw upon, and areas of weakness, which eventual reforms should seek to mitigate.

In terms of key challenges, my interviewees insisted above all on three issues: insufficient federal funding, the effects of deindustrialization, and the path-dependency of sprawl. The first refers to the fact that US transit agencies, during the decades preceding the Covid-19 crisis, received relatively little money from the federal government (certainly by

comparison to investments in highways). Secondly, my interviewees indicated that the US's diminished manufacturing capabilities contribute significantly to public transit issues, especially since political factors continue to push for in-state production, leading to a reliance on foreign contractors who need to build in-state factories and train workforces from scratch – for a finite duration, after which the factory and related know-how disappear. This leads to large delays and reliability issues. Thirdly, my research highlighted the often-overlooked role of water and sewer line upgrades in urban development debates, because of the significant financial burden they pose on densification projects.

However, this is also a time of opportunity, and there are reasons to be optimistic. First of all, a remarkable cultural shift has taken place over the previous decade concerning climate change and urban densification, which should significantly increase investment in public transit. Secondly, technology may prove to be a saving grace: the potential impacts of recent advancements are large, on vehicle electrification, autonomous transportation systems, new building materials, or improved planning tools. Overall, the picture is one of important but far from insurmountable challenges.

5.2. National State of Infrastructure

The state of repair of US infrastructure has been in decline for a few decades. The most publicized measure of national infrastructure quality is probably the “report card” issued every four years by the American Society of Civil Engineers (ASCE) (Petroski 2017, p. 337). In 2021, the average grade, across 17 categories, came out to a C- (low in nominal terms, but still the highest since 1988); however, this average is pulled up by some of the

better performing categories, while our main category of interest, public transit, only gets a D- (ASCE 2021a).

The most recent ASCE estimate for the mass transit maintenance backlog is \$176 billion, expected to grow to \$500 billion by 2039 in the absence of strong federal action (ASCE 2021b). In contrast to the situation in many other developed countries, US transit agencies see relatively little funding from the national government (7.1% of the total as of 2019), or even from state governments (23% of the total); by far the largest amounts of funding come from fares and other agency-generated revenue (35.7%) and local governments (34.2%) (ASCE 2021b). Or, because of the peculiar geographic distribution of US economic classes, with those better off situated in suburbs well outside the reach of public transit networks, the local governments expected to fund transit are some of the more starved of revenue.

Given this situation, after decades of relative inaction, the Federal Government did intervene in 2021, with the passage of the Infrastructure Investment and Jobs Act (IIJA) (also known as the “bipartisan infrastructure bill”), which is projected to increase federal spending on infrastructure by about \$550 billion through 2032 – nearly all through grants to lower levels of government (Salwati and Wessel 2022). At the time of writing, in early 2023, public works through the IIJA were in the contracting stages.

The present end-of-cycle situation is the result of multiple historical shocks, both social and technological, and also of comparative institutional stagnation (most notably at the level of the federal government). Prior to the 1950s, US infrastructure was often a model for the world to emulate, but the era of “white flight” left the country with hollowed out urban cores - a unique case among industrialized countries of inner cities that most often became

concentrations of poverty rather than wealth. The motor car revolution represented both an enabler of white flight to the suburbs and an accelerant, while the hegemony of the US in oil-producing areas of the world guaranteed low fuel prices and greatly subsidized the cost of car transportation until today. Highly restrictive zoning, which made anything other than single-family housing illegal in the vast majority of suburbs across the country, further compounded the effect of these factors.

On these points, in terms of the infrastructure landscape and the historical factors that led to the present situation, the interviewees were in consensus. Some were particularly emphatic, such as a previous MBTA General Manager:

The national state of infrastructure is abysmal, okay? That is one of the biggest crises that we have [...] it's a function of us not being clear about the dilemma that we have as a country. I mean you've got the regular ASCE reports that come out. If a particular sector is up to a C, what are we? A D or D-minus. We were D-minus. I think we're a D now.

There is a silver lining: my interviewee was describing the situation as of 2021, when the MBTA had a backlog of over \$10 billion worth of maintenance; the most recent two years, however, as mentioned above, have seen a vast increase in federal funding, with the MBTA projected to receive an extra \$2.8 billion from the Infrastructure Investment and Jobs Act (IIJA) alone (for FY 2023 through FY 2028). The Healey administration has pledged to close the gap through borrowing and state sources: the MBTA's FY 2024-2028 Capital Improvement Plan (CIP) has a programmed spend amount of \$9.2 billion (of which the vast majority - \$7.6 billion – were for critical safety-related projects) (MBTA 2023). However, while this spending should bring the agency back to a state of good repair, it could further

imperil its long-term financial standing, since around \$5 billion of this amount would be borrowed, at heavily discounted – but still not very low – rates. For example, at the time of writing, federal loans through the Build America Bureau (a main source of funding according to the MBTA CIP) were available at a rate of 3.88%, with a normal loan term of 35 years.

But the MBTA already devotes more than 20% of its budget to debt service:(see budget table in Chapter 1), even though most of its debt was acquired during a time of historically low rates. The new spending is no doubt necessary, but one must wonder how the agency will be able to service even more debt down the line. As of FY 2023, the MBTA has \$7.6 billion of debt on the books, to which it will add at least \$0.5 billion per year for the foreseeable future (MBTA Advisory Board Operating Budget Oversight Committee 2023, p. 16). At this rate, it will not be long until the debt service level becomes completely unsustainable.

With regard to funding, Kairos Shen emphasized the difficulty of comparing the United States with other industrialized countries:

The amount of public spending in public realms - I suspect that for the governments of Europe, let's just say Germany - at a local level, which is at the city level, [but also] at the province level, and at the federal level, at the country level are significantly more than what happens in the United States. [...] So I think the fundamental expectation and responsibility of government in the realm of building cities is fundamentally different. I don't know that it's reasonable to compare them.

Jeffrey Mullan summed things up: “We have a lot of inequity in the system and the culture.”

5.3. Deindustrialization

No American companies make train cars (Gruley 2019). Materiel for transit agencies must come from a handful of international companies, benefitting from large domestic markets and decades of consolidation. There is one giant: the China Railway Rolling Stock Corp (CRRC), which as of 2018, claimed to hold a market share higher than 80% of all rail products in the world (Gruley 2019); what's left is disputed between Alstom, Siemens, Hyundai and Kawasaki, none of whom are able to compete on price with the CRRC.

The contrast with the first half of the 20th century, when the US was a manufacturing powerhouse for transit products - including the famous PCC streetcars - could not be greater. Until the 1950s, US-made streetcars could be seen on the streets of Belgrade or Barcelona, and US companies competed worldwide on both quality and price. Since then, however, US transit agencies, unable to rely on a domestic industry, have struggled with procurement from abroad, byzantine contracts, and more often than not, large time and cost overruns.

The MBTA's current struggle to introduce new trains on its two most important lines - the Red and Orange lines - is illustrative. A contract for 284 new train cars was awarded to the CRCC in October 2014 - after a lengthy process, and a previous sour experience with a commuter rail contract with Hyundai over the previous decade.

The commuter rail contract deserves a few lines: in 2008, the MBTA hired Hyundai to manufacture 75 cars, despite the firm's lack of presence in the United States. The delivery date for the first 4 cars was set as October 2010, but 2 years later, there were still no vehicles in sight: Hyundai had been plagued by all sorts of problems in building their factory in Pennsylvania, including clashes between Korean managers and US workers (Moskowitz 2022). Jonathan Davis, the MBTA's general manager at the time, was quoted as saying that

his agency was “having a very difficult time working with them to commit to a schedule that they can achieve” (Moskowitz 2022).

The Hyundai contract turned into a comedy of delays, with one of the main reasons offered by Hyundai being the lack of qualified workforce. S.H. Jun, the chief project manager, told the Boston Globe that “We couldn’t find good welders. After making sure the truck is safe, we did qualification tests but it failed. We have to start again from the beginning; we have to train our welders again.” (Viser and Powers, 2014). Another anecdote involved the product testers: Hyundai had a taller woman test their emergency escape windows, and built a number of trains accordingly; but months after, the MBTA sent a “more petite woman” to open the windows, who was not able to (Viser and Powers, 2014). The windows had to be re-done.

Unsurprisingly, Hyundai’s services were not retained for the 2014 contract, but the comedy of delays continued, with little other than the contracting company’s name switched. Now it was CRRC’s turn to build a factory from scratch, find welders, and deliver a product. It took three years to build a factory, and another three years to deliver the first functional train cars; by 2020, the project had already accumulated 2 years of delays. Lydia Rivera, the CRRC spokeswoman, cited production efficiency challenges, supplier issues and getting workers familiar with building trains as the main reasons for the disappointing pace of work (Vaccaro 2020).

After the first two sets were introduced into service, they had to be pulled out, not once, but three times between 2019 and 2022. At the time of writing, the new trains had spent more time offline than on the tracks, first because of malfunctioning doors (Annear 2019), secondly because of malfunctioning bolsters (the steel center beams that allow cars to rotate

in curves) (Ellement 2020), and thirdly because of a derailment in March 2021, which the MBTA blamed mostly on a pad malfunction, and the CRRC mostly on track infrastructure (Vaccaro 2021).

My interviewees acknowledged the situation as a matter of fact, seeing little that could realistically be improved. A previous MBTA General Manager summarized it thus: "The reality of it is that we in the US, we lost the ability to manufacture. Well, look at it. US manufacturing used to drive about 30% of our GDP and now it's down to 8%..." But my own review of press articles on US train assembly suggests that the MBTA's sourcing problems are more likely to be the result of normal start-up – or ramp-up – problems. Productivity is nearly always lower due to setup challenges after the launch of a factory or production line; this is a major field of study in production and operations management, since it usually takes years to sort out supply chain management issues, quality control, and process optimization.

As an example, the New York MTA ordered 1,662 train cars from an Alstom-Kawasaki joint venture in 2002; Alstom also had start-up production problems at its factory in Hornell NY, and missed its first contractual obligation by 5 months (Chan 2005). After the start-up and ramp-up issues were solved, however, there were no more issues. In 2018, the MTA put out another contract, for a minimum of 1,085 cars, which was won by Kawasaki, and again, the contractor missed the first deadline by 6 months (Bascome 2021). At the time of writing however, in 2023, the work seemed to proceed smoothly, and the MTA had awarded numerous other contracts to both Alstom and Kawasaki, indicating an intention to continue the working relationship.

But these are large, long-term contracts, which allow the supplier to smooth out production kinks, and to deliver, after some initial difficulties, good products and reliable

maintenance. But the CRCC factory in Springfield is small: it will have created between 120 and 300 jobs between 2014 and 2024 (the later number applies to years after 2020), working on a total of 404 cars over the entire contract duration (McDonald and Vaccaro 2019).

Moreover, at the time of writing, CRCC - a Chinese state-owned company – is scheduled to close after 2024, having already been targeted by Congress for expulsion and only saved in extremis - and temporarily - by Massachusetts Democratic lawmakers interested in the delivery of new trains (Davis, 2019). So the gains in know-how and efficiency in Springfield will have disappeared twice, once with the exit of Hyundai, and once with the exit of CRRC.

At the time of writing, it looked likely that the next MBTA major contract, when it comes, will be awarded to yet another contractor, who will have to build a factory from scratch yet again, with the inevitable delays and malfunctions which accompany new operations.

5.4. Cultural Change

While the previous two sections highlight some of the challenges of providing mass transit in the United States, recent decades have also seen an encouraging cultural shift towards densification and climate change mitigation. Both imply the development of more (and ideally better) public transit.

The shift in views on climate change has been particularly striking. In 2009, Pew Research Center was reporting that 35% of Americans saw global warming as a very serious problem, and 36% thought global temperatures were rising as a result of human activity; only 14% felt they were well-informed about cap-and-trade policies that would set carbon dioxide

emissions limits, but 39% of all respondents opposed imposing such limits anyway (Rosentiel, 2009).

By 2020, however, 60% of Americans had grown to see climate change as a major threat to the well-being of the United States, and 65% of Americans said the federal government was doing too little to reduce the effects of climate change; and while the partisan split remained sizable, it was notably shrinking: as an example, 53% of Republicans under 40 thought the federal government was doing too little to protect air quality (compared to just 30% of those older) (Tyson and Kennedy, 2020).

The shift in preferences with regard to urban densification is no less dramatic. “Peak sprawl” - the high point of suburban sprawl development - occurred in the mid-1990s. One exploration of this trend (Bigelow, Lewis and Mihiar, 2022), while pointing out that land development over the 2000–2015 amounts to less than 25% of the peak rate observed in the mid-late 1990s, suggests there are two main factors behind this shift: rising gas prices and a stagnation in income growth. Other studies (e.g. Leblanc and Gensler 2018; Pfeiffer, Pearthree and Ehlenz 2019) confirm the trend, while being more reserved on the cause for the shift in preferences - understandable, since housing preference should be an endogenous variable in most models. Researchers can be more Marxian, looking at culture as a by-product of economics, or more sociologically constructivist, looking at economic behaviors downstream of culture; but regardless of what motivates younger Americans to seek smaller homes in more walkable neighborhoods (rising gas prices; a decline in purchasing power; lower marriage rates; fewer children; lower urban crime rates; etc.), the change remains.

A 2018 survey of 7,860 homebuyers illustrates the shift: 69% of millennials were willing to pay more to live in a walkable community, with 24% of them willing to pay “a lot

more" for walkability, a "much higher" share than previous generations (Leblanc and Gensler 2018, p. 6). Millennials also seem to value access to public transit more than previous generations: a priority for 39% of millennials, as opposed to just 25% of Gen Xers (Pfeiffer, Pearthree and Ehlenz 2019, p. 2).

It is important to note that a large portion of older Americans (mostly Democrat-voting - see Tyson and Kennedy, 2020) have also seen their views evolve, and would presumably support a different model of urban development. Some of my interviewees neatly fell into the categories described in the literature; A previous MBTA general manager spoke wistfully:

I helped to contribute to this mess that we're collectively now leaving to our next generations and that's not a good feeling, and I never intended it to have been that way so I just tell people that I know better now and I need to do better.

There was however some disagreement on the importance of public opinion on the subject of a transition; Jeffrey Mullan,⁴ for instance, was trenchant:

Me: So who could push things forward in your view?

Mullan: The people.

Me: The people?

Mullan: Ultimately the power is in the people. [...] [But] unless there's a crisis, I don't think people are incented to really change the status quo.

Adam Vaccaro,⁵ however, was more nuanced. He agreed that there had occurred a massive shift in attitudes:

⁴ Massachusetts Secretary of Transportation.

⁵ Boston Globe, transportation reporter.

I'm blown away by the fact that when I go to a public meeting on a road redesign or whatever, five years ago that would mostly be people driving cars complaining about whatever they were trying to do, and now it's the bike groups or whatever. They've rallied people to come out to things and take up most of the public comment period. So that's a change that has happened recently.

In his view, the emergence of interest groups pushing towards more densification and better public transit was highly notable. However, he saw transit in particular as a low-priority issue for most voters; when asked how many residents kept track of these issues, he answered:

I don't think it's the majority of voters certainly. Not even within the city of Boston I don't think it's the majority of voters. And you can check me on that but it's not enough to make or break an election. And you can talk to any political figure from the last 50 years in Massachusetts and they'll tell you no election has ever been won or lost on transportation. Even during the Big Dig.

5.5. Vocal Minorities Able to Block Development

One of the largest obstacles to housing or infrastructure development in the United States - other than highways - stems from the fraught, post-1960s politics that highlight crime issues and school funding. In turn, the fears of a significant portion of voters are exploited by highly entrenched interest groups exploiting the fact that it is always easier to block than build something. All interviewees had much to say on NIMBYISM, though they each tended to emphasize different facets of the phenomenon. One important theme is the impossibility of

dialogue when one party does not negotiate in good faith. A previous President of the Massachusetts Senate reminisced on how those who block change in his town would never admit that they are against development, but there still never was any project that they would support:

There's a minority of city counselors that definitely oppose doing any new development. There's also a vocal what I would describe as minority of the city that goes out and campaigns very fiercely against every time one of these comes up. They have their own formal organizations [...] the argument is always, 'We're not against development. We just don't like any of these developments.'

Another common theme was the emphasis on litigation in the American environment, and how state agencies are ill-suited for the task of waging legal battles. In the absence of strong political will, and a legislature that passes unambiguous laws that minimize litigation - akin to the federal emphasis on expropriation and building highways of the 1950s and 1960s - the MBTA and the Department of Transportation turn into slow giants that are easily immobilized by more nimble opponents. Public agencies are not law firms, and do not have the wherewithal or the motivation to wage legal warfare - whereas local real estate barons often do. Consequently, public interests are often blocked, or in the rare cases when they proceed, they do only very slowly and at enormous cost. Kairos Shen⁶ more or less described local transit officials as so disheartened by past experiences that they hardly dare anymore to push projects of any ambition. Talking about the Big Dig, he said:

⁶ Director of Planning at the Boston Redevelopment Authority; Executive Director and Associate Professor of the Practice at MIT's Center for Real Estate (CRE).

What made it expensive was all of the legal process with land taking and all of that, and people trying to take advantage of the system and suing the government, and delaying it. That's the part that the history has never been written. Which is that if you look at the raw construction cost and the complexity of it, it wasn't expensive. [...] I helped negotiate the final land settlement between the state, the city, and this private land owner, and it was outrageous how much money we had to pay this private developer for the inconvenience that these projects caused on their land while the value of the land was hundred times [sic] because of the investment. [...] This was a very particular land owner, very litigious but there are versions of this story throughout the big dig project. And as I said, I think people who know it are so much part of the political system that it's not a history that people want to write about because it's not pretty.

Kairos Shen continued:

This is one of the reasons why you see less bold projects is that one of the things that the state transportation authority learned was to almost avoid one of the first principles of doing transit and highway projects after the big dig was done. Avoid almost at all cost, any private land taking. That's why in a way the Green Line project in many instances could have been even more bold if it ventured outside of the existing right of ways. And so the connection to Union Square, I think would have been very different if it had been done before the big dig when the transportation agency was willing to do land taking to make for better connections as opposed to a spur to Union Square.

Kairon Shen's view – especially in the context of the Green Line Extension and the Big Dig, but generally on Boston development - was that more land takings should be done, but that some high-income individuals are very skilled at extracting maximum value out of

their power to block development. In his experience, politically adept individuals who control some industrial property or office buildings may adversely affect an entire city's fortunes, with profit maximization as the sole driver of behavior, even though their actions may be couched in community-values rhetoric.

Here, one must understand that there is a significant difference between the traumatic takings of the 1960s – largely done in residential areas – which razed entire neighborhoods, most notably in the West End and Lower Roxbury, and the takings of the 1990s and the later, for the Big Dig and the Seaport District development, which largely concerned commercial and industrial property. And yet the takings for the Seaport District, which had no residential population, took longer than the ones of the urban renewal era, at possibly greater cost for the public authorities. Kairos Shen's point that social inequality manifests itself in the courts, with drawn-out litigation brought by powerful individuals often impeding social welfare, should be seen as illustrating more recent developments on the Boston waterfront (as opposed to the earlier ones pushed by the Boston Redevelopment Authority). Similarly, he thought that the Green Line Extension could have been done better on an alternate route, after takings of disaffected industrial land (East Somerville still has a great deal of industrial space).

Some interviewees insisted however on the responsibility of the voters at large, cultural fears, and the personal interests of many homeowners in the US context; the incentives of densification are most often not understood by the already established locals. Mathematically, higher density should result in a higher tax base and more efficient public services, but there are few who can persuasively make this case to suburbanites. In Michael

Duncan's⁷ opinion, "ultimately it's really the lack of incentives at the local level and people just don't want additional affordable housing, or multi-family housing, or additional density built near their neighborhoods. And that's really I think ultimately what drives the lack of TOD we see in places."

A Regional Director for one of the largest developers in the US insisted on the importance of schooling, and the fears of parents:

The biggest impact when you get in the suburbs is school-age children, absolutely.

And there's really just a lot of misconceptions I would say. And then it's other impacts like traffic. There is other impacts as a developer. Lack of infrastructure, i.e. sewer, and there is impacts from a fiscal standpoint. People don't understand the fiscal impacts of a well-conceived multi-family development. They think they're not gonna be huge profit makers for a town, but you're not going to lose money with a multi-family development.

Some of the things that come out in the public dialogue are you just kind of scratch your head a little bit - but the conception is you have 200 units and people are going to have four kids on average. So that's 800 kids. We need to build a new school and the reality of it is, 200 units means probably 30 kids, and they're spread out between kindergarten and high school. It's one to two kids per class. So there's just a lot of misconception. When I was in the thick of it years ago, I was living in a suburban subdivision with 12 homes and 36 kids. And that subdivision would have gotten

⁷ Professor of Transportation Planning and Policy, Florida State University.

approved 12 times over with no issue in my town. But build a 200 unit apartment complex with probably fewer kids and it would have been an issue.

Both Richard Davey⁸ and Matt Stout⁹ emphasized that even within the US landscape, Massachusetts is particularly conservative when it comes to change. In addition to zoning, Davey mentioned the role of unions and micromanaging regulations, for instance on materials used:

I think we have a long and storied history in Massachusetts of nimbyism. And so I think that's why the governor is attempting to find a way to maybe leave out the power of the state, and cities, and towns. But development is really hard in many respects and I think the rules are set largely to discourage developing in most cities and towns in Massachusetts. So it's a huge challenge. I think "Where is housing going?" I think once you're able to get permitted housing then you have the challenges of, 'Are you using organized labor unions or not? What kind of materials are you using?' Which can drive up costs.

Matt Stout simply noted that a local reputation for stagnation and parochialism has been around for as long as he can remember: "I've only really covered politics in Massachusetts... So there is always this reputation of being very parochial here. And NIMBYism being a big part of it especially when you talk about changes within Boston and within the state."

All interviewees agreed that American NIMBYism doesn't map neatly on party lines, and the political party divide has little to do blocking development. In Massachusetts, there

⁸ MBTA General Manager, Massachusetts Secretary of Transportation, and as of 2022, President of the New York City Transit Authority.

⁹ *Boston Globe*, politics & government reporter.

may be more Democrat NIMBYists than Republicans, but that's simply because Democrats greatly outnumber their opponents in the Bay State. Adam Vaccaro¹⁰ described the contradictions of the ideological landscape in the following terms:

It is ideological but it doesn't break down on obvious ideological lines. I've always thought that you could make a conservative argument for zoning reform by basically saying, 'Let's take the rules off', right? And let people build what they want to build. You see this in national politics with basically everything right now. This dueling concept of conservatism which is, 'Is a government hands-off or is a government hands-on the best way to preserve a way of life that we want?' And I always wonder how much of it is just about home owners wanting to retain the value of their own homes even though I'm not sure it's correct that adding more housing would hurt the value of their homes.

Yeah, and certainly when it comes to low-income or affordable housing that comes up. It was really funny [in the summer of 2020] to see signs on people's lawns, I'm not the first person to say this, you've probably seen it. To see a big 'Black Lives Matter' sign last summer right next to a 'Don't let this development get built.' [Sigh] It's like this person doesn't even realize how full of shit they are.

While Adam Vaccaro felt strongly that impeding development mostly promotes upper- or upper-middle-class, predominantly white interests, often at the expense of the minorities the blockers purport to help, it must be said that the academic debate on the effects of densification on gentrification is far from settled. First of all, there is a category of papers

¹⁰ Boston Globe, transportation reporter.

which indicates that TOD does result in increased minority and working-class displacement: as an example, see Chava and Renne (2021), who examined longitudinal data across seven US metro regions, from 1970 to 2010, and found TOD-driven gentrification based on both demographic and economic variables. On the other hand, see Padeiro et al. (2019) for a convincing critique of TOD gentrification literature: their systematic review of 35 studies reveals many methodological flaws, which "render many of the studies' conclusions highly questionable" (Padeiro et al. 2019, p. 1).¹¹

Furthermore, what makes the densification-to-gentrification discussion intractable is the fact that every TOD case study is somewhat special, with state and local regulations, local culture, demographics, and geography combining in different ways to yield varying results. For example, see Dawkins and Moeckel (2016) for a convincing argument that TOD would have resulted in significant gentrification and displacement in certain studied areas of Washington DC, in the absence of certain policy interventions on affordable housing, which they characterize as successful. In other words, there are ways to do TOD right and ways to do it poorly.

¹¹ "Only 54% of the papers discussed the quality of the analysis, and robustness was assessed in a mere 29% of the studies. Despite a wide range of analytical time periods across and within studies, only 34% of them took time into consideration. Only 20% of the studies considered endogeneity and the attributes of the built environment, spillover effects were considered in 17% of the studies, and 14% made room for spatial autocorrelation. The type of distance, the potential influence of other infrastructures, and the performance of the lines examined were almost never included in the analyses (<10%)." Padeiro et al. 2019, p. 13.

5.6. Different Challenges for Poor/Shrinking Cities vs. Wealthy Cities

The previous section described the strong NIMBYism characteristic of American municipalities with incomes higher than the median. But there are, of course, many cities and towns where development is desperately wanted by most everyone; in these locations, it is economic factors that represent a major barrier to improvement, rather than political ones.

There are two categories of municipalities in the Boston metro area that see less development than their citizens would like: distressed cities - roughly equivalent to what was once called "slums" - and shrinking cities, which tend to be further away, and have usually had a strong industrial history up until the mid-20th century. The first category includes cities like Chelsea and Lynn, which are very close to downtown Boston (15 minutes driving in from Chelsea, 30 minutes from Lynn) but which still display highly troubling socioeconomic indicators. According to the US Census Bureau, the annual per capita income, as of July 2021, was \$26,203 for Chelsea, and \$27,405 for Lynn; while the percentage of persons in poverty was high, at 19.1% for Chelsea, and 15.8% for Lynn (US Census Bureau, 2022). It is difficult for such cities to attract development, given their generally less-than-stellar reputation built over many years, as a consequence of a low tax base, underperforming schools, and higher-than-average crime.

5.7. Regional Differences

My interviewees were generally split on the importance of regional differences. While most thought that comparisons with foreign countries are too often inapplicable, they had much more nuanced views on comparing Massachusetts to other American states.

Demographics and internal migration were recurrent themes. Some of my interviewees were under the impression that the state population is shrinking: Jeffrey Simon:¹² "They also in those southern states have a great deal more immigration than we are seeing. We're losing our population and those are the states that are gaining."

However, the 2020 census revealed that the state population has increased by a surprising 7.4% over the previous decade, a rate which matches the country as a whole; furthermore, rural Massachusetts lost some population, while the cities, especially Boston, saw a marked increase (Young, 2021).

The car culture would also seem to be more accommodating, at first sight, of larger investments in TOD developments - at least by US standards. Michael Duncan¹³ remarked:

I live in the South. When I lived in California for graduate school I never saw a truck or SUV driving around Berkeley. Now I would say that 80% of the cars that I see on the road are trucks or SUVs. And so the kind of person that drives a truck or SUV is probably not super interested in taking transit.

Much of the Boston area is closer to Berkeley in mentality rather than the Florida panhandle, where Michael Duncan lives. But if neither population loss nor truck-driving culture are realistic explanations for the Massachusetts trend of underinvestment in TOD, what other national divides are there that could explain the relative Boston immobility?

Richard Davey¹⁴ mentioned the prevalence of unions, the fragmentation of local government in Massachusetts, and a difference in the amount of regulation as key factors:

¹² Director of the Massachusetts Department of Transportation's real estate office.

¹³ Professor of Transportation Planning and Policy, Florida State University.

¹⁴ MBTA General Manager, Massachusetts Secretary of Transportation, and as of 2022, President of the New York City Transit Authority.

One is the strength of labor organizations in construction. Those will tend to be stronger in the Northeast versus the South or the Southwest for example and that impacts cost of construction. I think that's one. I think two is there are some states in the West and the Southwest in particular that rely more heavily on county government as opposed to city and town government. [...] Obviously at the federal level you have environmental protections in place but my impression is Massachusetts tends to be more regulated, and this is not a negative comment. It's just a comment. More regulated on things like waterfront protection and demands for public space than maybe some other states.

Finally, there seems to be an intangible element of insularity to Massachusetts public life; decision makers of the Old Bay State don't seem too interested into how other states are doing things, let alone other countries. A Regional Director for one of the largest developers in the US thought that culture was more important than legal, demographic or physical characteristics:

I think it's just kind of a cultural thing more than anything, and I think a lot of other markets are just much more accepting of it and understand it probably a little bit better. [...] Our development pipeline is say \$3 billion at any given time and that goes up and down but every day as a company we're making choices. So do we want to build something in Boston at a TOD location where there's uncertainty, and political turmoil, and inefficiencies, and you don't know what the outcome is or would we be better served to allocate that capital in Southern California where there's whatever the case may be? [...] I think this is a very insular market, and people don't fully

understand that. Especially as our industry has become a little more centralized and institutional.

When I asked William Brownsberger¹⁵ about how much there was to learn from other states, he gave a guarded answer:

To really understand the dynamics of an institution takes a lot of time. So while I'm interested - I don't mean to suggest that ours is the only way at all or that we can't learn from other places - I just think it's hard to learn from other places because it's hard to figure out what they're really doing actually a lot of the time.

5.8. Importance of the Federal Government

At the time of writing, the president's FY 2023 budget was discussed in mass media: the Biden administration proposed \$72 billion for Housing and Urban Development and \$142 billion for the Department of Transportation (although the second number included \$37 billion in guaranteed Advanced Appropriations, provided under the Bipartisan Infrastructure Law) (U.S. Department of Transportation, 2022). Because of a one-time infrastructure spending boost, these numbers largely overstate what is usually spent by the two departments. As to Defense, the administration proposed \$813 billion for FY 2023 (U.S. Department of Defense, 2022). The ratio in spending between Transportation, Housing and Urban Development, on one hand, and the Pentagon, on the other hand, is around 1:4. This disparity cannot be made up by state and local governments, since the federal government

¹⁵ President pro tempore of the Massachusetts Senate, member of the Joint Committee on Transportation.

consumes about two thirds of all tax receipts, with all other governments receiving the remaining one third.

The legislators I interviewed insisted that they simply lacked money to effectively serve their constituents. Thus, the public image of Massachusetts as a “wealthy” state can be misleading, because its public finances aren’t helped too much by the presence of a large number of wealthy individuals within its borders. This situation was best described by a previous President of the Massachusetts Senate:

We don’t print money at the state level. That’s become a very serious problem for us because in every area of government now, in every area we’re seeing a deficit in everything we do. From housing to healthcare to employment. We just have so many problems and we’re concerned about how we’re going to manage. We need a giant stimulus package to help us to get out of it at this point in time.

When asked about the likelihood of significant federal help, my interviewees were skeptical overall, although there was some hope expressed with regard to the infrastructure bill of 2021 (eventually passed to the tune of \$1 trillion, after I had concluded most interviews). Simply put, Congress tends to serve other interests. Jeffrey Mullan¹⁶ was the most skeptical of my interviewees:

I actually have given up on federal funding for transit. I don’t think that’s coming. And the reason I don’t think that’s coming is we have a very rural congress. Most of the United States is represented by congressmen from districts that don’t have transit and indeed, I think transit is a very local issue.

¹⁶ Massachusetts Secretary of Transportation.

While there was disagreement with regard to the likelihood of reform, my interviewees were in consensus that a national strategy would be welcome, with the caveat that past initiatives based on mandates - regardless of policy domain - often backfired.

Perhaps the most prominent example of housing policy mandate in American history is the Housing Act of 1949, which obliged recipients of federal funds to demolish at least one old unit of housing for each one to be newly built (with no incentive to rehab until a 1960 reform). In some places, this resulted in a much larger number of units being destroyed than were actually built, and the wholesale razing of entire neighborhoods, although the stated reason for policy reform was to relieve an acute housing shortage (Caro 1975, p. 1014). Clearly, badly written legislation can have perverse effects.

When asked to contrast mandates and incentives, John Renne¹⁷ described a certain evolution in his thinking that took place over his years of experience:

I would rather see the federal government provide more of an incentive process rather than a mandating process. And the reason I'll tell you is that often times I've learned in my career over the years, I used to think it should be more like federal mandates but over my career, the more and more I see where it's hard to apply a one size fits all answer across the country because every city and region has different needs, and concerns, and characteristics, and what may work in one part of the country or in one city may not work in a different city.

¹⁷ Professor of Urban and Regional Planning and Director of the Center for Urban and Environmental Solutions, Florida Atlantic University.

The President of the Massachusetts Senate perhaps summed it up best: "In a place like Boston it would make a big difference if we had a national strategy pointing us in a direction on housing, and providing funding for both housing and transportation."

5.9. In-Built, Historical Inequity in the System and Culture

All political systems create winners and losers, but the US discrepancy in resource allocation favoring suburbanites - as opposed to inner-city folk - is both large and difficult to dislodge, because it is built into the existing infrastructure. For a detailed listing of legal subsidies of driving, covering numerous provisions of insurance, tax, tort, contract and criminal law, see Shill (2020); and for a good overview of suburban sprawl housing incentives through insurance, national mortgage markets, and standards for debt structuring, see Zuegel (2017).

A review of landmark studies on the cost of sprawl illustrates this with the following numbers: (1) the yearly cost for road maintenance in the most sprawled communities averaged \$804.74 per household, compared to \$19.87 for high-density communities (2012 numbers); (2) US city governments had to spend \$1,416 per household, on average, to provide public services, for high-density areas, but \$3,462 per household for residents of suburban sprawl (2012 numbers) (Greenbelt Alliance, 2016). Providing street maintenance, water, sewer and electricity to far-flung, low-density suburbs is *much* more expensive than for dense neighborhoods.

Sprawl is entirely a creation of public policy. Most notably, the federal government, for the past 70 years, has greatly incentivized the creation of single-family housing, and heavily subsidized it, through intervening in the national mortgage market, and creating

standards for debt structuring (FHA-backed loans) (Zuegel, 2017); and furthermore, through heavily subsidizing car use (for a summary of research on automobile use subsidies, see Cortright 2015).

Jeffrey Mullan¹⁸ saw this as one of the main causes of rail transit infrastructure neglect:

We have a lot of inequity in the system and the culture. You're asking for some radical changes to the way things get done... the problem with relying on a lot of fare box revenues is that in my opinion, it depends disproportionately on the poor. The people who don't have as much choice. Where we really are subsidising to a much greater extent the highway program. We've got a disproportional power structure here.

Furthermore, because historical policy decisions have often run counter to American ideals of equality, a perverse side effect is entrenched resistance to reform. Kairos Shen¹⁹ had this to say:

There continues to be this distrust of public sector-led planning. And I would say that if you compared the US, and certainly compared Boston, here private investment, private development takes longer than probably many other cities and if you look at how public sector works, how infrastructure works, that also takes a lot of vetting and re-vetting. There's always this fear.

This leaves Boston in the unfortunate position of struggling to maintain an inefficient, outdated hub-and-spoke system, planned for the most part a century ago, in order to take the

¹⁸ Massachusetts Secretary of Transportation.

¹⁹ Director of Planning at the Boston Redevelopment Authority; Executive Director and Associate Professor of the Practice at MIT's Center for Real Estate (CRE).

working class into North Station, Downtown Crossing, and South Station. This is especially true of the commuter rail, and explains, in part, its low ridership. A few of my interviewees mentioned that the system should have long transitioned to a web-type of network, strengthened by its connections, and that a circumferential line in particular is an age-old dream. (Upon checking, I found a proposal for such a line dating back to 1923 (Dutzik, 2015).)

Can housing and transit be fixed outside of an overall overhaul of systemic subsidies? Unlikely, according to Jeffrey Mullan, who thinks we should take a holistic view of development, and “merge” to the highest extent possible highway dollars into rail dollars: “So while focused on the MBTA, one of the things I would say to the transit advocates is, ‘Let’s leverage our relationship with the highway user to try to get transit funding.’”

5.10. Technological Revolution

Anticipating future developments is vital to the planning process, so I asked my interviewees which technologies they see as most impactful for transit in the 21st century. While overall they were guarded, some were hopeful about electrification and the environmental transition, autonomous transportation systems, and new building materials.

The guardedness came mostly from a past history of missed opportunities. An example would be the electrification of the commuter rail system, talked about for many decades, and still not on the drawing board. The MBTA commuter rail relies mostly on legacy diesel locomotives, which are more expensive to buy, far less reliable and far more polluting than electric engines, as well as significantly slower. A recent report found that an MBTA diesel engine breaks down about once every 5,000 miles, whereas electrical

locomotives tend to fail every 150,000 to 450,000 miles, a difference in reliability of 1:30 to 1:90 (TransitMatters 2021, p. 10); breakdowns reverberate through the system, greatly adding cost and decreasing convenience. But as of March 2022, even after significant public pressure over many years, there was still no plan to do anything about it, “given the high costs involved and a budget squeeze looming in coming years” (Mohl 2022).

There is still some hope that innovation and private initiative may be able to fix some systemic problems. In the words of John Renne:²⁰

You look at the things that they predict are going to be revolutionary. One is obviously electrification of cars and battery technology [...] five to ten years down the road, maybe fifteen years, but certainly in the nearish future we have autonomous transportation systems that are going to begin to impact us.

Richard Davey²¹ was most hopeful about ”the ways to reduce the costs of construction - I actually think that that’s probably where things are moving a bit.” Some of the most important developments have to do with new building materials, especially Glass Fibre Reinforced Gypsum (advertised reduction in construction costs: 20% on average), and better planning tools (advertised reduction: 10-40%, depending on processes) (ACR News, 2020).

²⁰ Professor of Urban and Regional Planning and Director of the Center for Urban and Environmental Solutions, Florida Atlantic University.

²¹ MBTA General Manager, Massachusetts Secretary of Transportation, and as of 2022, President of the New York City Transit Authority.

5.11. Free Market Trends and Demographic Changes

For the first time in a century, the US is undergoing a strong revitalization of dense urban cores. Like many other American cities, after a thriving 19th century, Boston had a very troubled 20th century, hit hard in particular by post-war urban policies and white flight to the suburbs. At its population peak in 1950, Boston had just over 800,000 residents, whereas by 1980 only around 582,000 remained, a collapse of almost 30% in just 3 decades. Since then, the population stabilized, then began to go up in the 21st century, reaching roughly 675,000 by 2020, although the pandemic may have reduced this number in 2021 and 2022 (Stout and Finucane 2022).

However, except for the two years of pandemic-fuelled flight to suburban isolation, the trend towards densification has been very strong. Real estate prices have gone up enormously since the 2008 crisis, with John Renne noting:²²

The price of real estate has gone up significantly, but where has it gone up the most? What is going up faster? Is it in the drivable suburbs or is it in the walkable neighborhoods? I'm seeing it's in the walkable neighborhoods. That's where the prices are really skyrocketing the most. [...] There is a lot of unmet demand in the housing market for sure and for the kind of walkable neighborhoods that people really want.

A regional director for a large developer illustrated this dramatic shift with multiple examples, decrying the fact that zoning requirements are completely divorced from current

²² Professor of Urban and Regional Planning and Director of the Center for Urban and Environmental Solutions, Florida Atlantic University.

demand, and also describing how the shift towards fewer cars surprised, in some cases, even the developers:

But [name of development] is an interesting case study because we did 235 apartments there in a first phase and we just finished 180 apartments in a second phase there. It was a mix. We had town homes there, kind of garden style, but then we had one mid-rise building. And at the time the rule of thumb was two cars per apartment. That's what you wanted to park. So we built that and it's a very suburban feel to it, very affluent. We just assumed, yeah, everyone is going to have cars, it's [name of small Boston suburb]. We came in and I think it was like one and a half cars per apartment. And so the TOD aspect really did play a factor. People don't appreciate that as much, as I think the reality is. And so even in an affluent suburban location you're going to see fewer cars.

The [name of other development], perfect example. We built that deal and our garage is half empty. [...] if the city would have said, "You don't have to build one to one", we would have saved a lot of money and built half the size of garage and it would have been fine.

5.12. Water and Sewer Upgrade Costs as Sprawl Incentives

Water and sewer line upgrades tend to fly under the radar in urban development debates, even though they represent a very sizable financial component of densification projects. Similar to road infrastructure, suburban water infrastructure is very costly and subsidized by all taxpayers; but perversely, developers of apartment buildings are usually expected to upgrade the local network at their own expense.

The low-density development pattern explains why the federal government spends very large amounts on water infrastructure, and yet the needs are so enormous that the backlog of repairs remains endless. One-time measures are sometimes taken to supplement infrastructure funding, such as the \$50 billion earmark for water mains in the Infrastructure Investment and Jobs Act of 2021 (Massachusetts Municipal Association, 2022). Invariably, the spending falls short of the needs of a “sprawled-out” nation, when it could be better targeted at more efficient projects, and thus serve larger numbers of people. John Renne²³ described the situation in these terms:

In infiel development situations you often have to upgrade the infrastructure to meet the needs of infiel development increasing densities, bigger water pipes, bigger sewer pipes. And my experience has been that a lot of those cost burdens fall on the shoulders of infiel developers whereas they do not fall on the burden of the developers in suburban locations.

A lot of infiel developers, they’re building a relatively small project. It could be 10 or 20 acres. They’re expected to pay very significant costs for upgrading the infrastructure and to me that’s a major disincentive for infiel development. And I could see a role where state and federal government can help local governments meet that imbalance.

[...] And so you get cheaper housing in the suburbs because you have significantly lower infrastructure costs as a factor into the overall construction cost that’s then passed onto the buyer.

²³ Professor of Urban and Regional Planning and Director of the Center for Urban and Environmental Solutions, Florida Atlantic University.

5.13. Conclusion

This chapter has reviewed the most important national influences on MBTA institutional characteristics and performance: to a large extent, the forces that have made Boston's transit agency what it is have come from outside the borders of the Commonwealth. I described an overall landscape driven, in recent decades, by the effects of nation-wide deindustrialization and the longstanding lack of a national transit and housing strategy, and compounded by relative disinvestment in transit infrastructure. However, there has been a strong move recently in the opposite direction, towards densification and greater urbanization, driven, in the long term, by significant cultural changes, and in the short and medium-term by a federal-level shift towards large investments in public transit.

My interview data led me to important insights, most notably with regard to the relative importance of federal funding to the future of the MBTA, or with regard to the cost of water and sewer infrastructure upgrades within the densification process. I use these insights to make a number of recommendations in Chapter 7.

But for now, we move to Chapter 6, which focuses on describing and understanding the local landscape: the Massachusetts institutional set-up, the political forces at play, and the evolving nature of the constituencies involved in the transit and housing debate.

CHAPTER 6

THE LOCAL LANDSCAPE: THE CONFLICTING PRIORITIES OF STATE POLITICS

6.1. Introduction

The previous chapter examined the influence of national trends on the functioning of the MBTA; it is now time to look at the local factors at play in the agency's institutional setup. The following sections cover the role and functioning of the legislature, considerations of bicameralism, and transparency in the Commonwealth, followed up by a close look at the MBTA's legal set-up, and an exploration of what role local constituencies have to play.

I begin by arguing that the bicameral nature of the state legislature can sometimes lead to delays in reforms, due to disagreements between the leaders of the House and Senate. Despite the Democratic Party dominating local politics, significant intra-party schisms occur, and when the Democratic party is evenly split, Republican votes can decide the outcome of political fights. I identify the previous MBTA funding reform as one such occurrence, and further point out that as a percentage of the state's expenses (or tax receipts), the MBTA's operating costs had remained in a relatively narrow range throughout the 1990s, while ridership levels increased significantly. A key insight of my research is that the MBTA was punished with a restrictive funding reform after a period of *improvement* in service delivery, at the same overall levels of relative cost.

Further on, I find that that it is non-partisan factors, such as state-specific regulations and the constraints placed on transit authorities, that most significantly affect policy outcomes (notably, the MBTA lacks land-use authority that other US transit agencies possess). Importantly, this happens on a background of (1) opaque decision-making (as the state government is one of the least transparent in the U.S.), (2) remote management (as most powerful individuals in the state, including MBTA managers, don't use public transit) and (3) voting priorities which only rarely include public transit at the top.

6.2. Conflict Between the House Speaker and the Senate President

My interviewees thought that the extent to which bicameralism protracts deliberation, and delays legislative reforms, is underappreciated in Massachusetts; to the extent that some thought that the difference of opinions between the President of the Senate and the Speaker of the House was *the* most important factor responsible for gridlock in the state.

Because the Democratic Party dominates local politics, in any given year, 80% to 90% of legislative members are Democrats, but important intra-party schisms develop. In states with political party competition, there may be more intra-party unity, but Massachusetts Republicans have not been competitive in the local legislature since the 1950s, meaning that all important fights between interest groups play out between Democrats, with some groups having more influence in the House, and others in the Senate.

The Republicans do have a role to play, however, when the Democratic party is evenly split, and the few Republican votes can carry the more conservative Democrat to the leadership post. This is precisely what happened in the late 1990s, and what facilitated an MBTA fiscal reform along neoliberal lines.

The MBTA Forward Funding reform took place while Thomas Finneran (House Speaker, 1996–2004) and Tom Birmingham (Senate President, 1996-2003) largely ran the state, a duo characterized by “sharp disagreements” on policy matters (Aucoin 1997). As an illustration of their conflict, in both FY 1999 and FY 2001 the state had to operate without a budget - in the former year, for almost 5 months - because the two Democrats could not agree on what budget to submit to the governor. Two issues above all delayed the 1999 budget: the MBTA reform and help for seniors in buying pharmaceuticals (Boston Globe Editorial Board, 1999). The duo took the fighting as far as they could:

“By now the almost-daily meetings between the two legislative chieftains have achieved cult status on Beacon Hill. It's either ‘Waiting for Godot,’ or Alphonse and Gaston, frozen in inaction while waiting for the other to make a move. A chess match without a time clock...

Birmingham, the most liberal of the Big Three on Beacon Hill, argues for spending and investing in the traditional progressive areas. Finneran, elected speaker with a surprising combination of conservative House Democrats and the entire Republican minority, argues for fiscal discipline, long-range planning, and cautious decisions on taxpayer money.

Waiting offstage, like a waiter anticipating a summons to bring on the next course, is a substantially diminished Governor Paul Cellucci, whose administration seems to be playing only a bit part in the Finneran-Birmingham confrontation.”

(David Nyhan, *Boston Globe*, October 3, 1999)

In the end, Finneran won on the MBTA completely, while giving Birmingham concessions on education spending, senior aid and more.

But there was a problem with Finneran's insistence that MBTA spending was running out of control: the agency's spending did not actually increase in absolute terms between 1980 and 2000 (or since). See below a table comparing MBTA and state financials over the previous four decades: MBTA operating expenses have stayed in a relatively narrow range, as a percent of state expenditures or taxation, over this period. The increase in nominal numbers can be eye-catching (e.g. MBTA expenses at around \$500 million in 1990, and \$1 billion in 2000) and one can see how out of context, these figures could have provided impetus to a media campaign pushing for fiscal reform. But the percentages tell a different story.

Table 5: Massachusetts Total Revenue, Personal Taxes, Total Expenditure and MBTA Operating Expenses.

Year	MA Total Revenue	MA Total Taxes	MA Total Expenditure	MBTA Operating Expenses (thousands)	MBTA Operating Expenses as % of MA Total Expenditure	MBTA Operating Expenses as % of MA Total Taxes
1980	\$12,595,831	\$7,133,186	\$12,479,769	\$269,364.00	2.16%	3.78%
1990	\$26,068,621	\$14,195,746	\$27,666,407	\$521,000.00	1.88%	3.67%
2000	\$46,102,672	\$24,042,067	\$44,361,795	\$965,484.00	2.18%	4.02%
2010	\$76,099,979	\$33,366,231	\$76,678,608	\$1,646,100.00	2.15%	4.93%
2019	\$97,922,872	\$50,572,217	\$98,926,618	\$2,248,016.00	2.27%	4.45%

Furthermore, ridership levels have gone up markedly since the MBTA's worst (pre-pandemic) year of 1975. There was an increase of 24% between 1975 and 1990 (Gomez-Ibanez 1996, p. 34), and a very large 280% increase between 1990 and 2019, from 129 million to 362 million unlinked passenger trips (MBTA 1990, p. 22; MassDOT 2019, p. 18).

Most of this increase, from 129 to around 300 million yearly unlinked trips, happened between 1990 and 2000. This means that Forward Funding was an attempt to “right the ship” at an agency that was delivering more than double what it had a decade prior, at the same relative cost. In my opinion, given the invalid assumptions (on run-away spending), the reform should never have happened. I cannot see how Finneran’s narrative can be reconciled with the fact that MBTA operating expenses remained at roughly the same level, as a percent of state revenue, while its serviced customer base doubled.

One of my interviewees - an MBTA general manager – agreed that the entire premise of the reform was flawed. He characterized the MBTA fiscal reform as a neo-liberal ideological exercise, part and parcel of the late 1990s wave of privatization, deregulation and austerity. He insisted that the MBTA did not have at that time a spending problem, that it was in no way an outlier among US transit agencies, and that isolated incidents were blown out of proportion in order to drum up support for the reform.

In brief, my research on Forward Funding indicated an imbalance present in the institutional set-up of the legislature: all-powerful chamber leaders who can move legislation fast – or block it successfully – regardless of facts on the ground. The former Senate President I interviewed saw no change in the basic institutional set-up since the days of Finneran and Birmingham:

It's just a general fact that the speaker and the senate president have so much power because they have veto proof majorities. At the end of the day, when it comes to lawmaking they really do have the authority to act without the governor. Which has made it very difficult for the governor to force conversation on the legislature. [...]

You have to have agreement between the speaker and the president to get things done. And I think that's been difficult. It's been difficult to move forward.

Matt Stout of the Boston Globe identified the problem as being mostly on the House side; he thought the system is set up to empower the speaker to be the most powerful person in the state. Apart from that, he saw issues of institutional culture:

There's just such a culture in the House that when the speaker says 'Go' everyone in the house is saying, 'Okay, let's go.' He - always he for the last few decades - has just had a very tight grip on the House [...] The Senate is not totally disorganized but it's a little bit more decentralized I would say. Whereas in the House, whatever the Speaker wants to do happens, and happens on the Speaker's timeline.

[...] One other thing about the Massachusetts legislature that I picked up on is they do not like people telling them what kind of legislation to do. If you were to bring the speaker of the Massachusetts house model legislation on any issue they would say, "Thank you very much." and throw it in the trash. They like to put their own Massachusetts spin on it and usually it will go through a committee process and then it will disappear into a very non-transparent bucket for six months, and then it will come out the other side.

Since the days of Finneran and Birmingham, the disagreements between the House and the Senate may have moderated in tone, but continued in substance. For example, House Speaker Robert DeLeo and Senate President Stan Rosenberg disagreed on the issue of MBTA privatization; it took weeks of negotiation to arrive at a compromise in 2015, when the MBTA got a 5-year reprieve from certain provisions of the Pacheco antiprivatization law (Boston Globe, 2015). Another example would be the sharp disagreement on who should

appoint the General Manager of the MBTA (the House voted to keep the Governor in charge of the process, the Senate voted to make him an appointee of the MBTA oversight board) (Mohl 2020). On MBTA funding as a whole, there has been no attempt of reform since 2000.

6.3. Party Labels in Massachusetts

Not one of my interviewees thought that party affiliation matters much at the state and local levels. Those who were lifelong Democrats - and had built a career inside the Democratic party - showed the least inclination to engage in the party-label conversation. When asked about the merits and demerits of the two parties, a former MBTA general manager (and a Democrat) had this to say: "What we've accumulated is very bi-partisan. I call it non-partisan. The condition we've gotten ourselves in did not happen overnight. We're talking decades."

A previous President of the Massachusetts Senate - reacted in the same way, when I suggested that perhaps the Republican philosophy of shrinking the government may have something to do with infrastructure disinvestment:

I don't think so. I really don't think so. I mean I'm a Democrat, as you know. And [Governor] Baker is a Republican. And the chairs of both the Housing Committee and the Transportation Committee are Democrats [...] I think they want to solve the problem. There is representation from the Republican Party on each of the committees. The will to be strong enough to deal with the special interests has just not been there.

I initially found this surprising, since my historical research suggested that much of the MBTA repair backlog dates to the pre-Deval Patrick era, to governors Mitt Romney, Jane

Swift, Paul Cellucci, and Bill Weld (all Republicans). Furthermore, I had had an earlier conversation with John Renne (one of the authors of the study quoted in the second paragraph of this section), which had left me with the impression that by and large, culture war labels still matter at the state level. Renne thought that labels broke down completely only at the local level:

I think you would find that at the state level the places that are Republican have tended to invest more in highways and tried to prevent funding of transit systems by and large. That paradigm I think does get reversed, as I mentioned, at the local level... I think at the local level you find conservative elected officials, even in places like Denver, Colorado, and in Dallas, Texas and places like that, you do find conservatives that do get behind transit-oriented development, and rail.

Renne, however, was referring to his impression of most US states, and not to Massachusetts in particular, a state on which he confessed to have little detailed knowledge.

On the other hand, Michael Duncan, a Professor of Urban and Regional Planning whose career closely mirrors Renne's, placed the blame for the relative underdevelopment of past decades squarely on both sides of the political spectrum, not just in terms of politicians, but most importantly, on their constituents. There is no doubt, he said, that many Republican voters are extremely pro-suburban, to the extent of even conflating car use and highways with patriotism: "they feel like the UN is coming in and trying to force us to have a European-style urban environment in the United States." But Duncan did not think that Democrat NIMBYISM was any less egregious than the Republican version, and went through a number of anecdotes about "a lot of otherwise very progressive, very liberal people that are entirely opposed to having any buildings that are over three stories tall built in the

city - and they couch that as preserving the character of their city - or they even couch it as being an environmental issue.”

6.4. MBTA Legal Set-Up

One important reason for which the MBTA cannot do transit-oriented development is the fact that it is not legally allowed to do so. Unlike other transit agencies (e.g., Metro Portland, PSRC Seattle), the MBTA does not have land-use authority: the land it owns is regulated under municipal zoning laws. If a Massachusetts town decides that a large MBTA plot next to a rail station must be used as a parking lot exclusively, then there is nothing the MBTA can do - even if that parking lot sits half empty year-round.

But granting transit agencies land-use authority is a key tool in coordinating transit and housing, and one of the main recommended governance reforms for increasing transit policy efficiency throughout the US (Margerum et al., 2011, p. 11-14). Several of my interviewees began with mentioning this issue, for example a previous MBTA General Manager: “Not too long ago there were only four transit agencies I’m aware of in the country that had land-use authority, so on zoning and all that kind of stuff like that. [...] I respect what they do in Asia and other parts of the world, but once again, they have totally different structures. Totally different government structures.” Kairos Shen developed this line of thought further:

There are very specific laws and regulations [...] on how [the MBTA] must dispose of land. So first of all, the law requires them to have a public bid and they have to take the highest bid. So if George comes along and says, ‘I bid this, this is the cash.’ and it’s higher than Kairos who comes in and says, ‘Well, I can only pay you one tenth of

what George pays you now, but if you sign this deal with me I can pay you over time, twice as much as George.' I think the law requires the agency to sell it to you and not to me.

Kairos Shen emphasized that the first priority is to change the laws, in order to recognize the fact that the MBTA's role should be the maximization of the value of the transportation system, as opposed to a narrow mission of moving vehicles from point A to B.

In recent years, there has been an increase in the number of transit agencies gaining land-use authority; for example, after many years of debate, the California housing crisis eventually convinced lawmakers to grant this authority to Bay Area Rapid Transit in San Francisco, which plans to use it for 20,000 new housing units (Wenter, 2018).

However, the conversation in Massachusetts on MBTA land-use authority has been muted, with the legislature attempting to solve the existing crisis in a more circuitous way: by including Section 3A in the Economic Development Bond Bill of 2021, which requires the 175 municipalities served by the MBTA to have at least one district, within half a mile of an MBTA station, where multifamily housing is permitted (Executive Office of Housing and Economic Development, 2022). At the time of writing, the consequences of this were still unclear.

Apart from the politicians, all of my interviewees thought that the MBTA suffers from poorly written, highly constrictive regulations. John Renne was particularly emphatic in describing what he saw as a national crisis:

In fact, if you look at US transit agencies, we are way more socially controlled or socialized than Asian transit agencies - which are way more entrepreneurial and

market driven. So American transit agencies, I find them to be way more socialist than most transit agencies in ‘socialist’ countries.

Renne went on to explain that the problem with the American way of doing things - inflexible, top-down structures doling out billions of dollars, in accordance to laws usually out of date by a few decades - is a lack of both efficiency and responsiveness to the public needs.

A second important point is that there is a systemic problem with the way the federal Department of Transportation (DOT) operates: too much funding of car-centric, oil-dependent infrastructure. This may be theoretically mitigated, to a large degree, at the state level. As an example, there is the federal gas tax, which provides the DOT with about \$40 billion per year, to maintain existing infrastructure and invest in new projects. Historically, most of this money has gone to more highway lanes, overpasses and interchanges, with little co-funding of public transit systems, when compared to other industrialized countries. (DOT officials would likely point out that in their defense, projects are designed at the local level, and if a state only submits car-centric infrastructure projects, that is what they will get.) Nonetheless, taxpayers in Massachusetts - a net contributor state - pay federal gas taxes, which get redistributed throughout the country, often to highway projects that go against the environmental sensitivities of most Massachusetts voters. This may constitute a problem of democratic representation.

Could the MBTA be granted more powers - and could it leverage its new powers into attracting more federal funding? Kairos Shen was pessimistic: "The reason why this legislation is unlikely right now is because that would make the transportation agency the most powerful agency - which would scare a lot of politicians. That's what I believe."

Michael Duncan also stated that the main problems have to do with institutional setup and incentives, meaning that the people in charge have no wish to rock the boat, even though the public interest might seem to indicate otherwise.

Among the people in charge, the most important are the House Speaker and the Senate President - far more than the governor, since they control the legislative process, including the purse strings. Since Massachusetts is effectively a one-party state, with overwhelming Democratic majorities (at the time of writing, approximately 80% of the House and 92% of the Senate was Democratic), inter-party politics is not an issue; it's rather obscure, intra-party disputes which tend to determine outcomes. Unlike the Federal Congress, the Massachusetts legislature doesn't have much in terms of recognizable wings or outspoken causes; most Democrats - and Republicans - describe themselves as "moderate".

Adam Vaccaro put it this way:

I think that most House members in positions of power, they'd probably use the word pragmatic. Someone else might use the word moderate. [...] The Democrats have dominated politics here aside from the governorship [...] so the fault lines are within the party itself. And so there is a progressive wing that isn't very powerful but can chisel out some victories here and there, and then there's a conservative wing of it too. But I guess it's the more moderate one that tends to win out.

Matt Stout described the few Republicans along the same lines: "The republicans that are elected, they have always been this mold of a New England Republican [...] moderate, not too ideological, socially liberal on certain issues."

The term "moderate" could be a misnomer, given what happened during the most recent elections: in November 2022, Massachusetts voters approved an amendment to the

state constitution to increase taxes on residents making more than \$1 million per year, with the revenue dedicated to education and transportation.²⁴ The new constitutional amendment, adopted at the end of a very protracted process, was projected to raise \$1.3 billion/year in new revenue (Center for State Policy Analysis, 2022), with the measure impacting transit funding in FY 2024. In brief, Massachusetts voters allocated substantial new funding to schools and transportation infrastructure on their own. At the time of writing, it was too early to tell what impact this would have on MBTA finances.

6.5. Legislative Gridlock

The two most highly ranked politicians I interviewed for this project were a previous Senate President - and Will Brownsberger, President pro tempore of the Massachusetts Senate at the time of writing, on the record. The degree of confidentiality may have mattered, since the expressed attitude towards the collegiality and the productivity of the legislature differed markedly.

Mr. Brownsberger chose to not take a position on the issues raised in the previous section, notably on legislative politics, or increased MBTA independence; on the whole, he was appreciative of the status quo and complimentary of those in charge: "I believe [the MBTA] has approximately the right level of independence right now [...] overall I think we've had pretty independent management that's tried to navigate its way among competing interests pretty well."

²⁴ The new amendment modifies Article XLIV of the constitution, explicitly targeting the new funds: "To provide the resources for quality public education and affordable public colleges and universities, and for the repair and maintenance of roads, bridges and public transportation, all revenues received in accordance with this paragraph shall be expended, subject to appropriation, only for these purposes." (WCVB 2022).

On the other hand, the previous Senate President was almost scathing in their evaluation of the Commonwealth's transit and housing policy, especially the latter. Speaking of the legislature's gridlock prior to the 2021 Act Enabling Partnerships for Growth, they said:

Housing has been almost neglected. Not almost, it has been neglected. For 10 years we have done nothing, we have not produced a single major bill in housing other than a moratorium on evictions [...] getting work done in housing has meant a tremendous number of obstacles to deal with.

Nonetheless, highlighting both the genteel manners characteristic of today's state legislature, and the obscurity of its proceedings, the Senate President was very careful in not naming any individuals or institutions as responsible. I tried repeatedly to solicit more information, but every answer given was along these lines: "Well, we have very strong interests. We have pressure groups with very strong interests, interest groups that have blocked things one way or the other on both sides."

I pointed out to the Senate President that in theory, the House Speaker and the Senate President could do almost anything they wanted, if they agreed on a particular agenda, as they easily have the votes to overturn a governor's veto; all I could get in return was a wry smile, which I interpreted as suggesting that the two top Democrats, generally, do not agree on much of anything.

There is considerable reporting on the inner dealings of Massachusetts politics up until a dozen years ago, especially of legendary leaders like William Bulger - (President of the Senate for nearly 20 years, and brother James "Whitey" Bulger), Charles Flaherty (House Speaker 1991–1996, forced out because of felony tax evasion), Thomas Finneran (House

Speaker 1996 –2004, forced out post conviction of perjury and obstruction of justice) and Salvatore DiMasi (House Speaker 2004-2009, forced out post conviction of conspiracy, fraud, and extortion). Throughout the 20th century, and into the early 21st, the conflicts of top Massachusetts politicians were quite visible; as an example, the newspaper reporting typical of the times of Gov. Dukakis or Gov. King was explicit. Consider the pithy conclusion of a New York Times article on a gubernatorial election lost by the former: “Governor Dukakis made few friends and thousands of enemies with his rigid stand against cronyism and corruption, in a state in which cronyism and corruption are popular and legendary” (Knight, 1979) - this is from a front-page report (not the opinion section), with ample quotes from the then-leaders of the House and Senate, who did engage, more often than not, in naming particular individuals and institutions for blame.

But it has been a long time since newspapers other than the *Boston Globe* had coverage of State House politics. I interviewed Matt Stout, of the *Globe*’s State House bureau, who thought politics in the building is ”its own animal sometimes, regardless if everyone has a D next to their name.” He didn’t think it was less personality-driven than in the old days, but he also thought it was remarkably obscure. Stout himself, although covering State House politics for a living, was mostly in the dark about how exactly the political sausage-making occurred.

My interviewees were not an exception in calling Massachusetts legislators particularly secretive; there is in fact wide coverage of a crisis of transparency. To give two examples of recent coverage, Gleason (2022) thinks that “today the Commonwealth is arguably the least transparent state government in the entire United States” citing, among others, Paul Craney of the Massachusetts Fiscal Alliance”: “There is no legislative body in

America as opaque as the Massachusetts Legislature [...] Massachusetts legislators exempt themselves from the state's public records and open meeting laws."

Wilson, Stanford and Trowbridge (2022) also remind their readers that national rankings list Massachusetts as one of the least transparent states, and quote Justin Silverman of the New England First Amendment Coalition:

We have this reputation of being this great liberal state, a lot of transparency, but that's just not the case. In fact, we are the only state in the country that has the governor's office, the judiciary, and the legislature exempt, or claiming to be exempt, from the public records law.

Adam Vaccaro of the Boston Globe also offered a purely sociological explanation of the MBTA's travails, that the men and women in power are largely unaware of the agency's problems:

We did a survey with the Globe a couple years ago of I think like 100 lawmakers, the governor, the mayor, and the whole Boston City Council, and 20 mayors around Boston. I forget the exact details because it was a few years ago but it was very, very few who rode the transit system.

In the wake of recurring management scandals, Governor Healey promised, in early 2023, that at least MBTA managers would have to live near the MBTA system (Estes and Stout, 2023). There had been widespread public outrage in the wake of a Boston Globe report detailing how some top managers were working remotely, from vacation homes in Florida or Hawaii, even while the MBTA was lurching from one crisis to another (Estes 2023). But while MBTA employees can be made to take the T, the solution to the wider sociological

problem - that almost none of the most powerful people in the state take the T - is much more elusive.

Furthermore, most Massachusetts representatives cater to voters who do not take public transit – and many live in communities not served by the MBTA. The state has about 5.1 million voters, whereas the system has less than a million committed customers, who probably vote at lower-than-average rates; the implication is that the House Speaker's base is formed mostly by representatives who don't count the MBTA among their top 5 issues (see Bates 2022 for an example of poll results on voters' main issues of interest).

6.6. Local Politics: Who Blocks Development?

Given the difficulty of figuring out exactly what happens inside the state house, I turned to my interviewees to attempt to understand what interest groups outside it affect the policies within.

A Newton City Councilor, when asked about the situation in his city, said that only a minority of city councilors and a very vocal minority of citizens in Newton are opposed to new development, but that these groups have formed formal organizations, such as Right Size Newton, to campaign against any change. These groups argue that they are not against development, but that they simply do not like the specific developments that have been proposed (though in the councilor's opinion, this was disingenuous).

As mentioned in section 5.5, a senior vice-president for a large national developer nuanced the city councilors' opposition by talking about their perception of the effects of adding children to the community, as well as needed infrastructure upgrades. He had seen local officials express concerns often about the impact of multi-family development on

schools, traffic, infrastructure, and the local economy. But he said that these concerns are most often based on misconceptions, and he described in detail how barriers remain even after a project is approved; overall, he called it difficult to build in Massachusetts, because of the NIMBYism, the rules, and the entrenched interests, which all but makes it impossible to address the problem of housing affordability.

Jeffrey Mullan, a previous Massachusetts Secretary of Transportation, agreed that local elected officials are often hesitant to approve tall buildings, mixed-use projects, mixed-income housing, and apartment buildings, because of a concern about the negative reactions of NIMBYs and single-family residents, who tend to be wealthier and often fight against anything that is not single-family housing. But in his experience, elected officials are more likely to approve these types of projects in transit-oriented locations, where they can argue that they are necessary to increase density and provide more housing options. Mullan thought this gave political cover to the officials' own personal opinions, which may be pro-development.

I mentioned earlier, in section 5.5., how Kairos Shen, a former Director of Planning at the Boston Redevelopment Authority, emphasized the effect that Big Dig litigation had on the MBTA. According to him, the agency began avoiding private land taking at almost all costs, this being one of the reasons why the agency has been hesitant to undertake bold new transit projects over the past 20 years. His example of the new Green Line connection to Union Square, which in his opinion would have been very different if it had been done before the Big Dig, was highly illustrative of this new mindset – and he thought this is a trend likely to continue in the years to come.

I also asked my interviewees about the meaning of party labels at the municipal level, and as in the case of the state house, my interviewees saw some relevance, but not all that much. Matt Stout of the Boston Globe saw zoning reform in particular as a complex issue that is not easily divided along ideological lines. Some people (both Republicans and Democrats) believe that zoning reform is necessary to increase housing affordability and address the growing problem of homelessness; others (again, irrespective of party affiliation) believe that zoning reform will lead to the destruction of neighborhoods and the loss of community character. Overall, however, he emphasized the opposition of some of the self-labeled progressives, simply because of their numerous presence in the Boston region: "It was really funny last summer to see signs on people's lawns. I'm not the first person to say this. You've probably seen it. To see a big "Black Lives Matter" sign last summer right next to a "Don't let this development get built" sign. It's like this person doesn't even realize how full of [redacted] they are." In his view, much of this constituency is primarily concerned with property values, with social justice concerns being voiced only as a cover for property interests.

Whether the concerns of NIMBYs are sincere or disingenuous, Kairos Shen also emphasized that they receive too much deference. In his opinion, the democratic process in Boston has gone to an extreme, where even in matters of urban planning and public spending there is a belief that experts should not be given the latitude to make decisions on behalf of the general public. Shen thought this was a mistake, and that more work should be done to reestablish the role of experts in decision-making, although he recognized the lingering effects of the 1960s "urban renewal" trauma. Nonetheless, he argued that Massachusetts in

particular, and the United States in general, has a shorter tradition of understanding the role of good bureaucrats.

6.7. Conclusion

This chapter examined some of the local factors influencing the functioning of the MBTA. The first section pointed out the vital importance of one of the more unusual features of Massachusetts Democratic Party politics, which is the usual adversarial stance between the House Speaker and the Senate President. The next section then looked at the importance - or lack thereof - of party labels in the state, followed by considerations of transparency in the State House (which also form a large part of section 6.5.)

The MBTA legal set-up - seen by some of my interviewees as inadequate - is both a cause of the agency's problems, and an effect of its lack of political power. Changing the incorporation statutes is therefore likely to prove a crucial element in any attempt at reform (see recommendations in following chapter).

In terms of wider, sociological issues, I pointed out in this chapter two outstanding problems, which seem important but the treatment of which lies outside the scope of this study. First of all, the purely sociological explanation of the MBTA's problems: the state's powerful officials do not take the T - or generally have any acquaintances that take the T - and so they remain both unaware and uncaring of the agency's difficulties, outside of times of acute crisis triggering political pressure. Secondly, the relative marginalization of experts, and the corresponding empowerment of NIMBYs, seen by some as an "extreme" version of democracy.

CHAPTER 7

IMPLICATIONS FOR REFORM

7.1. Introduction

The previous two chapters detailed the most important challenges facing the MBTA, by means of both interview data and archival research. Often times, my interviewees volunteered their own ideas on how to solve certain problems, or at least mitigate them. As such, I thought it appropriate to include a chapter detailing possible paths ahead for housing and transit policy.

The material in this chapter is derived from my conversations, although it has a considerable personal contribution as well. At the end of my research process, I have attempted to carefully consider all available information, weigh different arguments and options, and make thoughtful decisions on which problems should be considered a priority, and which solutions have a better chance of success. Overall, I think it is the legislature that is key to solving the MBTA's most pressing problems, and I consider state representatives to be the primary audience for the following pages, which detail my suggestions for reform.

7.2. MBTA Funding Model Reforms and Institutional Power Prerequisites

The present study argues that the MBTA would be in better shape if it were to return to either one of the funding models it had during its two “golden ages”, the first one through real estate, during the late 19th and early 20th century, and the second one as non-capped reimbursement through the general state budget, a model used during the second half of the 20th century. One must recognize that different historical stages of development come with different sets of constraints, and within a specific era, there are also shorter boom-bust cycles, with peaks and troughs of activity which make certain models look more attractive at certain times, and less so at others. Notably, funding through real estate would likely work best during periods of economic growth, and various supporting measures might have to be instituted in periods of retrenchment. The source of land transferred to the MBTA’s holdings could prove equally concerning, if originating from marginalized populations, or if it results in the displacement of an important number of small and medium-sized legacy businesses. In brief, no model is perfect, and any model can be poorly implemented.

Nonetheless, as previously argued, funding through real estate has two large advantages. Firstly, as compared to the present reality, it encourages greater economic efficiency: under the proposed transition, there would be some connection between the agency’s product and its revenue stream. The second advantage has to do with institutional politics, and with strengthening the political bargaining position of the agency. As it stands, the MBTA is a “wimp” institution (a term used by one of my interviewees), which is easily pushed around, with top management that rotates on a short-term basis, and with no top politician that has its protection as a main priority. This is one of the reasons for which the MBTA may be particularly vulnerable to abuse, e.g. the transferring of some Big Dig

construction debt to its books (debt with which it had nothing to do). My impression from the interviews was that this kind of abuse would be unthinkable at a more politically powerful agency, as an example, MassPort; if an attempt was made to transfer a few billion in highway construction debt to MassPort, its leadership is probably well-connected enough to stop that.

An important question is whether the MBTA's relative lack of legislative champions can be addressed within the current institutional structure. One may indeed imagine, on one hand, the MBTA leadership, as well as unions, developing a political strategy of influencing state representatives, beginning with those in districts closer to "home" (meaning districts which host large MBTA facilities). On the other hand, the MBTA could potentially develop a legal strategy of fighting legislative mandates it does not like: as an example, perhaps it could have used the Civil Rights Act to challenge Big Dig debt, a project which has perhaps improved the lives of more middle class residents, at the expense of some of the poorer citizens. But both these strategies would necessitate the presence of strong, influential, secure leaders at the helm of the MBTA, an agency which has had only short-term managers since the 1980s. This is a chicken-or-the-egg problem: the MBTA is in a weak position at least in part because it has weak leaders – but they are politically weak because their agency is highly constrained (meaning, weak).

A comparison between the MBTA and MassPort - two transit-focused agencies - could be instructive on its own, and should be the subject of further research. A priori, there is no obvious reason why the agency running seaports and airports should be doing so well, and the one running rail and bus transit should be doing so poorly. Some advantage could be expected on MassPort's side, since MassPort serves more powerful economic and political sectors, and the MBTA serves poorer citizens, who are almost by definition less well

organized. But my review of both MBTA and MassPort finances going back four decades has revealed that the financial performance gap between the two has never been larger.

I will mention two of the differences between these two agencies that seem to be particularly relevant. First of all, the leadership: MassPort top ranks tend to be staffed with well-connected officials, and they have a much longer tenure than their MBTA counterparts. The current MassPort CEO, Lisa Wieland, is the 19th most important Bostonian according to Boston Magazine (2023), which compiles every year a list of the top 150 most influential people of the Commonwealth. She has been ranked at positions between 15 and 20 in other years, much the same as the previous CEO, Thomas Glynn (2012-2018); this means MassPort CEOs are roughly equal, in influence, to some of the Commonwealth's greatest personalities: Senator Warren is ranked 15th, US Attorney Rollins 20th, and MassMutual CEO Roger Crandall 22nd. As of 2023, Lisa Wieland had been with MassPort for 18 years. Contrast this with MBTA top managers, often out of their jobs within two years, nearly always within 4, and of much less influence: I could find none included in Boston Magazine's Top 150 over the previous decade. One has to go back to the 1980s to find, at the MBTA, a general manager of relatively long tenure: James O'Leary, who served for nearly 8 years, between 1981 to 1989. In my opinion, this trend is explicable on both an individual and on an institutional basis, and is reinforcing: Lisa Wieland and Thomas Glynn became MassPort CEOs because they were extremely well connected, and leading MassPort is highly coveted; in turn, the leadership of high-profile individuals made MassPort even more powerful. By contrast, there is no rush to become the MBTA's General Manager, and those who have led the agency were powerless to stop its decline over the past two decades.

Secondly, MassPort has emphasized real estate revenue, even though it owns very little real estate, compared to the MBTA (essentially, its holdings consist of Logan International Airport in East Boston, and most of the Port of Boston facilities in South Boston). Its financial statement for FY 2022 recognizes \$62.4 million in lease revenue and \$36.7 million in lease interest revenue. Compare this to the MBTA's total of \$7.7 million for the same fiscal year, for lease receivables including lease interest. (As an indicator of the comparative size of the two agencies, note that MassPort's operating expenses are in the range of \$500 million per year, with staff at around 1,300, while the MBTA's operating expenses are of approximately \$2.2 billion per year, and its staff at around 2,750.) To be fair, the spatial location of the two agencies' holdings is relevant, and plays to MassPort's favor, since changes to MassPort's facilities – airport and harbor buildings – are much less likely to be contested by outside groups. On the other hand, the MBTA's holdings are in dense areas, subject to pressure from most types of government and interest groups. Nonetheless, the MBTA has not worked to improve its holdings even when the hosting community welcomed change: as an example, the (very large) Alewife station has not changed since its opening in 1985, even while the neighborhood around it saw near-total redevelopment, with the Cambridge City Hall pushing a very ambitious neighborhood plan.

Regardless of its eventual funding model, if the assumptions undergirding the set of bureaucratic politics theories have any value, then the MBTA's political power must be increased for the agency to be able to improve. Specifically, I am thinking of the bureaucratic bargaining model, which views policy-making as a bargaining process between different state agencies with differing preferences: this model emphasizes the importance of negotiation and coalition-building among bureaucratic actors in shaping outcomes. But top

MBTA managers and advocates have little room to engage in politics at the present time, from their relatively low position in the Commonwealth's pecking order.

One other alternative to improving the MBTA's political position which should be mentioned is the bottom-up, citizen action model, which has seen success in New York City and Los Angeles. In New York, the New York Public Interest Research Group (NYPIRG) began a "Straphangers Campaign" in 1979, after a decade of falling ridership on the background of disinvestment, vandalism and crime. They used a dual-prong strategy of protests and litigation, informed by their own transit research since the late 1990s: the campaign's first two reports, on subways and buses, were released in 1997 and "represented the most comprehensive review by any non-governmental organization of the performance of a major public transportation system", which "gave riders, communities and officials information they would need to press the transit authority for better service" (Holzer and Yang 2004, p. 24). The campaign successfully lobbied for increased funding, transit improvements, and better customer service, notably the introduction of unlimited-ride MetroCards.

In Los Angeles, an NGO called the Bus Riders Union focused on a litigation strategy to improve transit service. The group sued the Los Angeles County Metropolitan Transportation Authority (LACMTA) in 1994, alleging discriminatory use of federal funds for public transit under Title VI of the Civil Rights Act: the plaintiffs argued that the transit agency disproportionately allocated federal funds towards suburban-oriented rail service and its wealthier, primarily white ridership, while the bus system serving a larger, lower-income ridership, predominantly people of color, received less funding. A resulting consent decree

mandated LACMTA to implement a series of improvements, e.g. reducing pass prices, purchasing new buses, and establishing new services (Grengs 2002).

With the previous two examples in mind, I think a Boston citizen-action campaign has significant potential to improve customer service quality, and perhaps it could even boost the MBTA's political power – via increased funding, if successful.

However, outside campaigns can only accomplish so much, given a dysfunctional funding model, a questionable management and oversight structure, and a legal status that largely nullifies initiative. As previously explained in Section 6.3., the MBTA does not even have the legal authority at present to engage in transit-oriented development (probably a must-have for implementing most meaningful reform). Beyond the funding model, the agency's entire legal structure needs to evolve in order to better serve the transit and housing interests of the Commonwealth's people.

7.3. Board Supervisory Reforms

Section 1.5 outlined the current MBTA organizational scheme, which seems complicated and top-heavy. There is a general manager and a deputy general manager, which are informally named by the Governor, and formally appointed by the MBTA's main governing body, the Massachusetts Department of Transportation (MassDOT) Board of Directors. The MassDOT Board of Directors consists of 11 members appointed by the Governor of Massachusetts, with the advice and consent of the Governor's Council.

Confusingly, the MBTA has its own 7-member board of directors, all but one appointed by the Governor. It also falls under the purview of the MBTA Advisory Board, which has certain approval powers over budgeting and the capital plan; and other ad-hoc

boards, which may be assembled and dismissed by the Governor, such as the 5-member Fiscal and Management Control Board (all appointed by the Governor), most recently in operation from 2015 to 2021. Finally, certain functions of the MBTA fall under the supervision of other state departments, and yet other boards; e.g. safety supervision falls under the Department of Public Utilities and its board.

As detailed in the previous section, the agency is generally run by politically weak managers; but it is also supervised by too many people, sitting on four or five boards, for many of whom this role may not be a priority (seeing how it is low-paid or unpaid, depending on the board). The typical board member has 6 or 7 other functions, nearly always more prestigious. As an example, Thomas Koch, who is on the MBTA Advisory Board, the MBTA Board of Directors, and the MassDOT Board, is Mayor of Quincy since 2008; he has also served in various other prominent roles concomitantly, such as President of Quincy College.

It is unclear why there should be so many boards, with significant overlapping membership. More importantly, the role of a board of directors is to provide high-level oversight of performance; but a look at the membership of the various MBTA and MassDOT boards of the previous two decades will show staffing mostly by insiders, sometimes with an apparent conflict of interest. For example, as of 2023, the MassDOT Board of Directors is chaired by the Secretary of the DOT, even though theoretically, the chair of the board sets the agenda on evaluating the performance of the secretary's administration. Other states (e.g. New York, California) avoid having the two roles filled by the same person.

The most recent institutional reorganization of the New York MTA could serve as inspiration to both MBTA reformers and advocates. The MTA had been formed as a holding

company in 1965 in order to coalesce five separate transit corporations, but to a surprisingly large extent, management layers remained separate and redundant until 2019. Recognizing long-existing failures, the New York State Legislature directed the MTA to develop a personnel and reorganization plan by June 2019 (the "MTA Transformation plan"). This plan recommended to entirely remake the MTA: most notably, to consolidate over 40 independent functional groups into just 6 new departments, led by an entirely new management team, including the new roles of Chief Engineering Officer, Chief Operating Officer, and Chief Transformation Officer. In addition, the reform proposed a centralization of all HR functions, all maintenance and support functions, and all capital-related functions (AlixPartners 2019). The MBTA could presumably use an equally clear-eyed report on its management structure.

7.4. A Need for Regional Planning

Chapter 4 estimated social welfare savings from a proposed increase in TOD communities in a range of \$2 to \$5 billion per year (in 2022 dollars), if the number of TOD households in the Boston area increases by 80,000 to 200,000. Needless to say, such an increase would necessitate a significant revision to local town plans in many (or even most) of the 175 MBTA communities. In fact, the change would be so significant that it could not reasonably be done in the absence of a regional plan: with no region-wide coordination, newly built infrastructure would run the danger of being either insufficient or redundant. Furthermore, coordination has the potential of increasing economies of scale on most categories of expenditure, from transportation to water supply and sanitation systems. After many decades of inaction, leading to a severe housing crisis in Massachusetts, the legislature

took action recently to encourage denser, transit-oriented developments, through the 2021 Act Enabling Partnerships for Growth, Section 3A:

Section 3A. (a)(1) An MBTA community shall have a zoning ordinance or by-law that provides for at least 1 district of reasonable size in which multi-family housing is permitted as of right; provided, however, that such multi-family housing shall be without age restrictions and shall be suitable for families with children. For the purposes of this section, a district of reasonable size shall: (i) have a minimum gross density of 15 units per acre, subject to any further limitations imposed by section 40 of chapter 131 and title 5 of the state environmental code established pursuant to section 13 of chapter 21A; and (ii) be located not more than 0.5 miles from a commuter rail station, subway station, ferry terminal or bus station, if applicable.

(b) An MBTA community that fails to comply with this section shall not be eligible for funds from: (i) the Housing Choice Initiative as described by the governor in a message to the general court dated December 11, 2017; (ii) the Local Capital Projects Fund established in section 2EEEE of chapter 29; or (iii) the MassWorks infrastructure program established in section 63 of chapter 23A.

But there has been considerable pushback to this Act, from dozens of communities, including threats of station closures. At least some of the complaints had merit: as an example, Woburn officials said that they had approved 2,600 multifamily housing units over the past decade, most of which were near a rail station, but these wouldn't count under the Act as currently written, "because they were approved through special permits, not standard town zoning" (Carlock and Chesto 2022). Other complaints had to do with geography - some cities and towns may not have developable space within half a mile of a commuter rail stop,

because of the presence of the ocean, a natural reserve, or other factors. As an initial response, the Executive Office of Housing & Economic Development recognized the validity of many of these concerns and changed the Act's implementation rules, with the result that the goal of multifamily units to be developed state-wide was scaled back by around 18%, from 344,100 down to 283,500 (Chesto 2022). Legal wrangling continued at the time of writing.

Perhaps some of these mistakes can be avoided if the Commonwealth benefited from the existence of a high-quality regional plan. I am suggesting, in particular, commissioning a plan inspired by the practice of Patrick Geddes: recent attempts to incorporate Geddes into current planning efforts (e.g. Young 2017) emphasized his relevance to our age. For Geddes, planning should begin with a comprehensive study of a region that considers its geographical, social, economic, and historical features in a holistic manner (this includes topography, climate, vegetation and wildlife, population, economy, culture and more):

... a comprehensive study of a locality in all its aspects and features, making use throughout of scientific methods, and presenting the results in relation to one another and, as far as possible, in graphic form. The area for such a study is usually a natural region, i.e., a region distinguished by natural features and communication, and including a civic centre (village, town, or city), to which the rural surroundings are related....

(Patrick Geddes, “The Character and Content of a Regional and Civic Survey”, quoted in Young (2017), p. 6)

Geddes believed that a regional ”survey movement” could then lead to revitalized civics, not least by harnessing local knowledge: he believed that local residents and

stakeholders should be actively involved in the planning process, as they have a unique understanding of their community's needs and resources. The end goal of this lengthy process would be an improvement in quality of life through sustainable development, again seen holistically, and including economic, social, and environmental sustainability. This vision is in contrast to the 2021 Act Enabling Partnerships for Growth, which attempts to push through relatively large transit and housing reforms in few paragraphs, with little holistic view of Boston metro area problems or local production of knowledge.

I am suggesting here that piece-meal attempts at transit and housing reform could be less effective than reforms inspired by a landmark, regional planning study, perhaps along the lines of the historic - and partly Geddes-inspired - 1929 "Regional Plan of New York and Its Environs", one of the oldest and most influential studies in the country. This was a comprehensive, ambitious, groundbreaking plan that attempted to solve all problems at once - which makes sense, given how interconnected social, economic, and environmental factors are in a rapidly changing society. Land use, transportation, housing, and parks received lavish, expert treatment in three large volumes, one of which was entirely devoted to maps and illustrations.

Another main source of inspiration of the "Regional Plan of New York and Its Environs" was of course Daniel Burnham's 1909 Plan of Chicago, as highlighted by Johnson (1995). Burnham could not get all his ideas published, particularly on social and housing needs, given the political inclinations of his patrons (prominent Chicago businessmen); but his plan was otherwise an extremely valuable, comprehensive look at the region's needs.

These two historical documents can be contrasted with the most recent regional plans we have in Massachusetts, which come from the Metropolitan Area Planning Council: the

Metro Future 2030 (published in 2008) and the Metro Common 2050 (published in 2022), with the latter being a continuation and a restructuring of the former. But these documents are policy papers rather than urban planning exercises, and they are strikingly different, in both content and presentation, from what Burnham or Geddes produced.

To be sure, the MAPC produces extremely valuable work, and it has gone to great lengths to engage the public. However, Metro Common 2050, in 433 pages, does not have a single drawing or original illustration, other than a few maps: its proposals are punctuated by stock images, and the authors seem to take the existing built landscape as a given. The plan contains many housing policy proposals, for example as a strategy for retrofitting suburbia, but all this in the absence of references to local geography, visual elements, or even particular examples. By contrast, the 1909 Plan of Chicago contained much original artwork, notably by highly regarded illustrator Jules Guérin: this anchored the plan, gave substance to its proposals, and engaged the public.

Boston too was able to produce notable, high quality urban plans in the days of Frederick Law Olmsted; a return to the roots, with an emphasis on Geddes-style regionalism, could be productive. I am suggesting we need a Burnham-style foundational study of the region to better focus the current policy debates and engage the public.

Of course, there are many current examples of effective regional planning, and the practice has evolved over the past century. In the context of a foundational regional plan, current best practices should be implemented (or at least examined) such as popular budgeting, local control of resources, an emphasis on car-free neighborhoods, and participatory processes.

The concept of popular - or participatory - budgeting is a practice that was initiated in Porto Alegre, Brazil, in 1989. The idea was to involve ordinary citizens in the decision-making process about how to allocate a portion of the municipal budget: this shifted power to a certain extent away from traditional political elites, and democratized budget allocations. The process began with neighborhood assemblies where residents discussed their priorities and elected delegates to represent their interests. These delegates would then meet in regional and citywide assemblies to negotiate the distribution of resources. The popular budgeting process in Porto Alegre has been credited with numerous positive outcomes, including enhancing transparency in local government, fostering active citizenship, improving the equity of public spending, and improving public services (De Sousa Santos 1998).

In the MBTA context, residents already elect delegates, who then meet periodically to discuss agency issues: this is the MBTA Advisory Board, formed from representatives of the 176 cities and towns in the MBTA service area. But the Advisory Board has no real powers beyond advising, although it has certain implied powers by virtue of the fact that some of its members also sit on the Boston Region Metropolitan Planning Organization board, which decides the allocation of federal Regional Target Funds. Perhaps the Advisory Board should have a meaningful degree of control over the MBTA budget.

Another example of recent best practices has to do with a renewed interest in urban mobility beyond cars, particularly relating to cycling and pedestrian policies. A foremost example is the activity of PeopleForBikes, a U.S.-based advocacy group that aims to promote bicycling and improve bicycling conditions in the United States, and their Big Jump Project, an initiative aimed at helping 10 U.S. cities rapidly increase their bicycling rates in certain targeted neighborhoods. To this end, cooperation would need to be strengthened between the

MBTA and walking and biking NGOs, such as BlueBikes or WalkMassachusetts. Currently, the MBTA has enough trouble operating its own transit modes and does not have a holistic mobility planning mindset. Ideally, this should be remedied.

7.5. Electoral Reforms

To a certain extent, MBTA problems are electorally-driven in the sense that only a small minority of House and Senate members have constituencies who care greatly about public transit quality. The MBTA only has about 700,000 frequent users, the vast majority of whom live in Boston and a few nearby satellite cities (Cambridge, Somerville, Brookline, Newton and Quincy), in a state with a population of nearly 7 million. In other words, frequent users are outnumbered by infrequent or non-users 9 to 1.

If the MBTA were an agency run by the City of Boston, its problems would presumably be at the top of the Mayor's agenda; but it is run by an executive and financed by a legislative branch with many other superseding priorities. My interview data suggests that at most times - when the agency is not in acute crisis - the MBTA is a middling priority at best for both Governor and House Speaker, as well as for the vast majority of members of the legislature.

One possible solution, implemented elsewhere in the world (e.g., Greater London), would be to commingle the metro area under one urban administration (and then the MBTA would fall under the Mayor of Boston). But there is a large consensus that this is unfeasible in Massachusetts. The movement to unite adjoining suburbs with Boston stopped in the late 19th century, probably forever, with the admission of Brighton, Hyde Park, and Charlestown.

But absent that, some interviewees mentioned the implementation of ranked-choice voting (RCV) as a measure of wide-ranging positive effects, including with regard to transit policy (as well as their hope that there will be other attempts, in the future, to transition the state to ranked-choice voting, after the defeat of a related proposition in 2020).

There are two main reasons to think that transit policy would be among the areas most affected by a change in voting systems. First of all, ranked-choice encourages positive campaigning: under RCV, candidates have an incentive to reach out to voters beyond their base, since they need to be the second or third choice of voters who support their opponents. This would encourage more legislators to adopt the MBTA as one of their priorities. RCV also reduces negative campaigning: candidates are less likely to engage in negative campaigning when they need to appeal to a broader range of voters, who may support their opponent as a second or third choice. For an in-depth discussion, see Tolbert et al. (2014).

Secondly, RCV eliminates the need for costly primary elections or runoffs by consolidating them into a single election, often increasing both voter turnout and the number of candidates. This may lead to more turnover in politicians than first-past-the-post (FPTP) voting systems, and may induce a different behavior by encouraging them to appeal to larger constituencies, although this is an issue of much debate. For an overview, see Clark (2022).

Essentially, under the current system, most house legislators have very small but dedicated bases of support: the typical house representative wins elections with around 10,000 votes total, and a much smaller winning margin if the election is contested (on the order of a few hundred). A transition to RCV may incentivize them to campaign with an eye on a broader constituency, and this could include working on MBTA issues.

7.6. Subcontracting and Supply Issues

As detailed in Section 5.3., the MBTA has had great pains subcontracting over the previous two decades, most notably with regard to vehicle purchases. In 2008, the MBTA hired Hyundai to manufacture 75 cars in Massachusetts, but delays and technical problems were so severe that Hyundai was booted from future contracts. In 2014, the agency contracted the China Railway Rolling Stock Corp (CRRC) to build a factory from scratch in Springfield, find welders, and deliver a product; it took three years to build a factory, and another three years to deliver the first train car, for an accumulated delay of 2 years by 2020. Then the CRRC trains had to be pulled from service repeatedly throughout 2021, 2022 and 2023, some of them for months at a time. Manufacturing issues continued at the time of writing.

Transit is a customer-focused, time-sensitive business; in addition, rail transit differs from some other types in that each malfunction can trigger a cascading chain of events, including system-wide delays, with very large eventual costs. For an investigation into the effect of MBTA delays and service interruptions on the wider economy, see for example Nanos (2022), who provides many vivid illustrations of cascading failures, e.g.:

She pulled into the Canton Junction commuter rail stop, climbed to the platform, and held her breath. Then she waited. And waited. At 7:37, she called work. ‘The train still isn’t here,’ she sighed. ‘And I don’t know when it’s going to get here.’

Rabinovitz runs a Head Start day care in Roxbury, near the Ruggles MBTA station. Running late means she’s not there when parents arrive. It means her early shift employee — the one she hired to be there in case she’s late — has to check in the children alone. That means parents end up crowding into the lobby, anxiously

watching the clock. Many work jobs with hourly wages, so if they miss the T and are late to work, their pay can be docked.

(Janelle Nanos, "Boston doesn't work if the T doesn't work," *Boston Globe*, December 21, 2022)

To my knowledge, there has been no comprehensive study of the cost of MBTA failures that can be traced to subcontracting and supply issues; my personal opinion, especially given the length and breadth of some recalls, is that they are in the hundreds of millions of dollars, and possibly in the billions, over two decades. This may be contrasted to the benefits of requiring suppliers to set up shop in Massachusetts, for example, the CRCC factory in Springfield will have created approximately 300 jobs between 2014 and 2024 (McDonald and Vaccaro 2019). (Another detail is that these jobs will disappear for certain after 2024, as CRCC - a Chinese state-owned company - has been targeted for expulsion from the United States.)

There is understandable political pressure to manufacture in Massachusetts, as opposed to "importing" vehicles from another US state; but it is unclear what the costs and benefits of this political pressure actually are. The story of both the Hyundai and the CRCC presence in Massachusetts suggests that overall costs could be higher than benefits.

As an example, Alstom has delivered over 12,000 new and renovated train cars to US customers, mostly from factories in New York and Pennsylvania. Its long-established facilities presumably benefit from much deeper expertise and significantly higher economies of scale than the Springfield operation, set up to manufacture a total of 404 train cars over 10 years, from the ground up, unlike any other train cars in the US, and for which purpose it had to acquire new buildings, new machines, and train local labor.

Perhaps it would make sense for Massachusetts to acquire its MBTA vehicles from right across the border, in New York State? A cost-benefit analysis would seem to be in order.

7.7. Federal-Level Lobbying Efforts

Section 5.2 explained how US transit agencies, including the MBTA, see relatively little funding from the federal government (7.1% of the total as of 2019). But this does not have to remain so, and Massachusetts infrastructure in particular has greatly benefited, in the 1990s, from very aggressive - and very effective - federal-level lobbying efforts.

Lobbying for the “Big Dig” could be a very useful case study. The Big Dig was the most expensive highway project in U.S. history, even though Boston is not among the top 20 cities by population (or the Boston metro area among the top 10). In 2020 dollars, it is estimated to have cost around \$22 billion, of which around 80% came from the federal government, including a considerable amount during the administrations of Reagan and Bush Sr. This could happen because of the stellar Massachusetts congressional delegation during the Big Dig years, as well as sustained efforts from other Bostonians of national influence.

First of all, the Big Dig was one of the top priorities of Tip O'Neill, the Massachusetts Democrat who served as Speaker of the House from 1977 to 1987 (now commemorated through the Thomas P. O'Neill Jr. Tunnel under downtown Boston). Secondly, it was also a top issue for Ted Kennedy, Massachusetts Senator from 1962 until 2009: someone who had already amassed two decades of seniority by the early 1980s (the Rose Fitzgerald Kennedy Greenway now commemorates Ted Kennedy’s mother, in recognition of the Senator’s work). Thirdly, the junior Massachusetts Senator during the Big Dig era was also someone of

unusually large influence: John Kerry, who served in the Senate between 1985 and 2013, and actively supported the Big Dig by using his position on various Senate committees, most notably the Committee on Commerce, Science, and Transportation. Fourthly, Michael Dukakis, Governor of Massachusetts from 1983 to 1991, had national influence as well. Finally, their effort was compounded by innumerable other lobbying efforts from House members, with Joe Moakley, Barney Frank, and Edward Markey among the more effective ones, and also by the MassDOT, as well as various industry and trade groups.

While the alignment of such stars is to a certain extent fortuitous, I am suggesting that Massachusetts should still have a state-wide strategy for lobbying for federal dollars (to mitigate the disappearance of the ad-hoc alliance which happened during the Big Dig era). A large federal disbursement is required to make any large improvements in the Commonwealth's infrastructure, and this is unlikely to come in the absence of 1) specific, iconic projects, with legislation attached to them, such as the Big Dig; and 2) a formal or at least informal agreement between most Massachusetts figures of national influence. The state cannot afford large projects on its own: there needs to be widespread recognition of this fact, and a lobbying strategy devised to mitigate it.

7.8. Cost Sharing on Water and Sewer Upgrades

Finally, section 5.12. detailed the increasing importance of the cost of water and sewer upgrades in financing developments. Even in the wake of the 2021 Act Enabling Partnerships for Growth, which compels cities to zone certain districts of multi-family developments, the expected units may not arise due to private developers being unable to assume the cost of water and sewer infrastructure.

Beyond cost reduction, there are three other strong arguments that can be made for developing a state-wide strategy for cost-sharing water and sewer upgrades. First of all, this infrastructure is extremely expensive, with water or sewage treatment plants costing tens if not hundreds of millions of dollars, and pipeline distribution systems in the millions even at relatively small scales. As such, efficiency is paramount, and coordinated planning should optimize resource allocation and maximize economies of scale. Secondly, doing this work under a state-wide framework could streamline the approval and permitting processes, thus reducing potential delays. Thirdly, water and sewer systems can be seen as public goods no less than public transit systems: they represent essential public infrastructure that benefits the entire Commonwealth, not just individual developments, in the same way that the MBTA benefits the entire state economy, even though only 10% of state residents are frequent users.

Consequently, I am suggesting that the state needs to study where it makes the most sense to allocate (or increase) resources for water and sewer upgrades. This work could be done as a part of the regional plan mentioned in section 7.3.

7.9. Conclusion

This chapter wraps up my research project, by suggesting either certain reforms, or certain studies to be done prior to considerations of reform.

I have listed the areas in need of attention in roughly decreasing order of priority, at least by my reckoning. I have argued strongly, throughout this study, and explicitly in section 7.2., for changing the MBTA's funding model to one that relies in large part on real estate revenue - pointing out that this would be in a way a return to the roots, since private transit

agencies were often funded through real estate during the 19th century. More importantly, this would improve the MBTA's bargaining position on the local political scene.

I have then pointed out, in section 7.3., that the presence of multiple MBTA oversight boards is problematic, because of overlapping membership and potential conflicts of interest. While overall very appreciative of the 2021 Act Enabling Partnerships for Growth, I suggested in section 7.4. that this act gives rise to challenges and conflicts which could have been avoided if the legislature had been in possession of a comprehensive regional plan. But it is never too late to commission one.

Section 7.5. reminds the reader that in Massachusetts, state representatives mostly rely on very small - but highly dedicated - constituencies for re-election. Transitioning from first-past-the-post to ranked-choice voting may incentivize more legislators to campaign with a broader constituency in mind, potentially leading to increased efforts towards addressing MBTA issues.

Also important is the apparent absence of a cost-benefit analysis done in advance of decisions as to who should be MBTA suppliers and subcontractors. I suggested in section 7.6. the consideration of alternatives, such as acquiring MBTA vehicles from neighboring states like New York, where more established facilities and deeper expertise exist.

Finally, I suggested that two new strategic initiatives would be worthwhile, one for lobbying for federal funds, the other for subsidizing water and sewer upgrades. I pointed out that the Commonwealth's largest infrastructure project and greatest engineering triumph - the Big Dig - was funded, in majority, by the federal government, in a period when our elected officials in Washington proved remarkably effective at sending money home. The two could be related: a new housing boom, ideally in proximity to MBTA stations, could be spurred by

the state covering water and sewer expansion costs, with federal dollars. This, in my view, would go a long way towards solving transit and housing challenges in the Commonwealth.

CHAPTER 8

FINAL THOUGHTS

I remember vividly a discussion that took place in the classroom right at the beginning of my doctoral program. As we were waiting for the professor to arrive and the class to start, we students - none of us from Boston - somehow started talking about the MBTA (more often called “the T”), Boston’s transit agency.

“It’s really great, it goes everywhere I need it to go, and it’s so much better than anything where I’ve lived before!”, someone started, to the surprise - and perhaps even dismay - of most of those present. “Really? I can’t think of a *worse* transit agency than the T”, countered someone else in disbelief, and the tone went up from there.

I didn’t speak much that day, but my interest had been piqued, and it developed into something akin to fascination in the intervening years, as I’ve realized what a paradoxical institution the T really is. Beyond the obvious - descriptors of the balance sheet, the workforce, the backlogs - few things can be said about it with certainty, or perhaps not with the confidence that characterizes much of the research on institutions.

For instance, is the MBTA rich or poor? The local press has often described it, during the past three or four decades, as teetering on the verge of bankruptcy - mostly because of a landscape of chronic financial losses, and an inability to fund, in some years, even basic

maintenance. But of course, as a fully integrated division of the Massachusetts Department of Transportation, and a key actor of the Massachusetts economy, the MBTA *cannot* go bankrupt: dismantling it is politically impossible. Furthermore, it is sitting on real estate that must be worth a sizable amount almost no matter the method of appraisal, as the second-largest land holder in the state (after only the Department of Conservation and Recreation, which owns the state parks). The agency is thus asset-rich, cash-poor and perennial: its institutional wealth - or poverty - is in the eyes of the beholder.

Another perpetual question has to do with the fees charged to the end user: are tickets too pricey, too affordable or just about right? A strong argument can be made for each of those three answers. Consumer groups generally call fares too high, citing historical data (current fares are higher than ever, in inflation-adjusted dollars). But some reformists point out that on the national stage, the MBTA stands out as particularly affordable, when thinking in terms of fares charged as percent of the average transit user's income, or when looking at the relatively low percentage that user fees contribute to the agency's revenue (only around 35%). Finally, reasonable adjustments (e.g. fares charged per mile travelled) may result in ranking the MBTA as squarely in the middle of US transit agencies. It is thus difficult to state something about MBTA fares without implicitly endorsing a political project as to what the agency should be.

I began my research focused on a simple question: how can the MBTA best leverage its real estate holdings into diversifying its revenue stream? Some public transit agencies, throughout the world, have been successful at adopting a real estate developer mentality - could this happen in Boston, and more widely in the US? What difference would this new funding model make, in terms of dollars spent, transit time, and carbon emissions?

However, the more I attempted to make sense of the public transit landscape as it exists in Boston, the more it became obvious that nearly all transit problems are “wicked problems”, characterized by complex interdependencies, the presence of multiple solutions (with widespread political resistance to all of them), socially contested and with “no determinable stopping point”: that is, “wicked” precisely as described in the planning literature (e.g. by Tonkinwise 2015). My interviewees had very different ideas as to what is desirable or achievable for the MBTA, for the Boston area, or for the nation as a whole, and represented, within a microcosm, the cleavages in opinion that characterize contemporary American politics.

Consequently, this work did not propose *one* overarching solution to America’s public transit financing difficulties (at least not one that would be politically viable). However, it described some possible paths ahead, and it contributes significantly, I hope, to the research on the politics of transit-oriented developments (TODs). Generally speaking, research on TODs falls into specific, relatively narrow categories: traffic optimization, zoning, environmental impact studies, real estate financing, community development, equity and inclusion. Holistic studies - incorporating elements from all of these fields, and aggregating them within an institutional research framework - are very rare because of their innate difficulty, for example in terms of accessing key players.

Fortunately, I have had one “key” player on my side, whose tireless advocacy has carried me through seldom-opened doors: my dean, David Cash of the McCormack Graduate School of Policy and Global Studies here at UMass. With his help, I was able to engage in detailed conversations with decision-makers who had served at all levels of the state administration, with the sole exception of the Office of the Governor. This means I could

interview at least one person who had served as President of the Senate, Speaker of the House, representatives on the joint committee on transportation, Secretary of Transportation, CEO of the MBTA, etc., and for that I am enormously grateful to Dean David Cash.

I could also not hope to finish this study without the tireless support of my committee, Christian Weller, Mark Warren and Kenneth Reardon. I am very grateful for their thoughtful comments and careful edits, which have greatly improved this research project.

APPENDIX A: INTERVIEW INSTRUMENT

Introduction:

Hello, I'm George Chichirau. Thank you for taking the time to meet with me. Before we start I'd like to show you some information about the interview and check to see whether you have any questions about my work. Essentially, I am investigating state policy on transit and real estate. I will go through some essential information, then I will ask you a few questions about your background and experience, and then on your understanding of state policy.

The primary goal of this study is to understand how political and social actors relate to each other and how the informational flows they generate result in transportation policy.

1) Could you tell me what your role has been in setting transportation policy?

2) Could you describe the major issues with implementing good transportation policy in Boston?

3) What have you been able to accomplish? What would you say is your largest frustration?

4) Let's talk about the politics of transportation. Who has the power to change the rules of the system? Who has the power of veto? Who has the most/least actual power in your view? What would change if the Governor's office/the Legislative was controlled by the other party?

5) Can you tell me something about the communication between the legislative and the executive staff? What is the role of the Transportation Secretary, the MBTA CEO and the MassDOT Board? Are there unusual delays or conversely, particularly efficient shortcuts?

6) What interest groups do you think the MBTA is most influenced by? Real estate interests? Environmental & other public interest groups (e.g., Conservation Law Foundation)? What is your impression of contractors and consultants as they relate to the MBTA?

7) What is your opinion about the role of the unions and the bargaining process? Are unions an obstacle to real estate development? What could get them out of the way - what forces would have to get together?

8) Looking at the map, who has the most information? Who has the least? What kind?

9) Could you name the incentives and the constraints for the actors on the board?

- 10) In your view, what goals does the current leadership of the MBTA attempt to achieve? What goals should it aim for?
- 11) How do you see the MBTA's future? (Finances, assets, personnel, mindset, culture.)
- 12) What do you think are the opportunities for my proposed plan of generating revenue through real estate? What would be the main sources of opposition?

Thank you!

APPENDIX B: MASSACHUSETTS LAND PARCEL DATABASE - MBTA SYNONYMS

One cannot easily locate MBTA properties through a simple search of either the owner name, or the owner address; for tax assessing purposes, at a minimum, the MBTA has been listed as:

METROPOLITAN TRANSIT AUTHORITY
MBTA C/O REAL ESTATE ACQ.
MBTA C/O REAL ESTATE
MBTA - MASSACHUSETTS BAY
MBTA C/O REAL ESTATE ACQUISIT
MBTA
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS BAY TRANSPORTATION
MASSACHUSETTS BAY TRANSPORTATI
MASSACHUSETTS BAY TRANSPOR
MASSACHUSETTS BAY TRANS AUTHOR
MASSACHUSETTS BAY TRANS AUTH
MASSACHUSETTS BAY
MASSACHUSETTS BAY
MASS. BAY TRANSPORTATION AUTHORITY
MASS. BAY TRANS. AUTHORITY
MASS BAY TRANSPORTATION AUTHORITY
MASS BAY TRANSPORTATION AUTHOR
MASS BAY TRANSPORTATION AUTH
MASS BAY TRANSPORTATION AUT
MASS BAY TRANSPORTATION
MASS BAY TRANSP AUTHORITY
MASS BAY TRANSIT AUTHORITY
MASS BAY TRANS. AUTHORITY
MASS BAY TRANS,AUTHORITY
MASS BAY TRANS, AUTHORITY
MASS BAY TRANS AUTHORITY
MASS BAY TRANS AUTH
M B T A
COMMONWEALTH OF MASS MBTA
COMMONWEALTH OF MASS AND MBTA

While the owner address - shared with the Department of Transportation, at 10 Park Plaza in Boston - has been listed as:

"10 PARK PL"
"10 PARK PL RM 6720"
"10 PARK PL SUITE 1370"
"10 PARK PL SUITE 4160"
"10 PARK PL."
"10 PARK PLAZA"
"10 Park Plaza"
"10 PARK PLAZA"
"10 PARK PLAZA 5TH FLOOR"
"10 PARK PLAZA - RM 6160"
"10 PARK PLAZA - ROOM 6160"
"10 PARK PLAZA - SUITE 3170"
"10 PARK PLAZA - SUITE 5170"
"10 PARK PLAZA -SUITE 5170"
"10 PARK PLAZA #8450"
"10 PARK PLAZA RM 5750"
"10 PARK PLAZA RM 5750"
"10 PARK PLAZA RM 6160"
"10 PARK PLAZA RM 6160"
"10 PARK PLAZA RM 6720"
"10 PARK PLAZA RM 6720"
"10 PARK PLAZA RM #6160"
"10 PARK PLAZA RM6160"
"10 PARK PLAZA ROOM 3510"
"10 PARK PLAZA ROOM 3510"
"10 PARK PLAZA ROOM 5750"
"10 PARK PLAZA ROOM 6160"
"10 PARK PLAZA ROOM 6160"
"10 PARK PLAZA ROOM 6720"
"10 PARK PLAZA STE 4160"
"10 PARK PLAZA STE 5170"
"10 PARK PLAZA STE 5720"
"10 PARK PLAZA STE 5720"
"10 PARK PLAZA SUITE 1370"
"10 PARK PLAZA SUITE 3170"
"10 PARK PLAZA SUITE 3910"
"10 PARK PLAZA SUITE 4160"
"10 PARK PLAZA SUITE 5720"
"10 PARK PLAZA SUITE 5720"

"10 PARK PLAZA SUITE 6160"
"10 PARK PLAZA SUITE 7760"
"10 PARK PLAZA SUTIE 6160"
"10 PARK PLAZA-REAL ESTATE DEPT"
"10 PARK PLAZA-RM 6160"
"10 PARK PLAZA-RM3170"
"10 PARK PLAZA, REAL ESTATE DEPT"
"10 PARK PLAZA, RM 5750"
"10 PARK PLAZA, RM 6160"
"10 PARK PLAZA, ROOM 6160"
"10 PARK PLAZA, SUITE 1370"
"10 PARK PLAZA, SUITE 4160"
"10 PARK PLAZA, SUITE 5170"
"10 PARK PLAZA/LEGAL DEPT"
"10 PARK PLZ"
"10 PARK PLZ #5750"
"10 PARK PLZ #6160"
"10 PARK PLZ RM 5750"
"10 PARK PLZ RM 6160"
"10 PARK PZ"
"10 PARK PZ RM 6160"
"10 TEN PARK PLAZA"
"MHD FISCAL MANAGEMENT DIV 10 PARK PLAZA RM 5510"
"ROOM 6720 10 PARK PLAZA"
"TEN PARK PLAZA"
"TEN PARK PLAZA - SUITE 3170"
"TEN PARK PLAZA RM 5750"
"TEN PARK PLAZA ROOM 5750"
"TEN PARK PZ"

APPENDIX C: AUTOMATED LAND VALUATION IN THE MBTA CONTEXT

A majority of automated pricing methods use multi-parametric models that fall in one of two families, either based on statistical techniques (multiple regression analysis, neural network, genetic algorithms, kriging etc.) or on mathematical processing (e.g. structural equation systems, set theory) (Manganelli et al. 2016). There are also new computational methods being developed, such as image-based appraisal (in which recurrent neural networks analyze visual content to predict prices) (You et al., 2017). The cutting edge of research is on how to combine various techniques in order to improve reliability; e.g. Manganelli et al. (2016) built a model with an average percentage error of 7.13 % in predicting sale values (but on a dataset of only 148 residential units, and in a highly homogenous area).

Given the nature of my data (a map of estimated property values), I attempted kriging on the MBTA's real estate portfolio (I did not have data to consider any other method - for instance, classical linear regression models require data on dozens of variables, from finished living area and lot size to air conditioning). Kriging is a family of spatial interpolation methods that works best in homogeneous spaces (see Helbich and Griffith 2016, p. 1-2 for a recent overview); in the end, I concluded that my exercise has low chances of success, given the idiosyncratic nature of MBTA lots (often large, oddly shaped, subject to various constraints, e.g. legacy easements).

In brief, I began my study with the main (null) hypothesis that there is no significant discrepancy between MBTA property values and the values of adjacent properties. In order to test this, I converted a sample dataset into geostatistical layers and created a prediction map in Geostatistical Analyst with kriging techniques. Kriging uses one variable of interest (in our case, property assessment value) to make estimates at unsampled locations; essentially, I deleted MBTA property values from the dataset and used interpolation to re-estimate them based on neighboring property values.

The kriging method, named after Daniel Krige, a South African statistician and gold prospector, uses spatial correlation algorithms to create interpolated maps. There are many variants, widely used by mining companies, banks, meteorologists, or appraisal companies, to draw up probability maps from a partial dataset. In terms of real estate valuation, kriging maps reflect patterns in the price distribution within a city.

There are two main assumptions underlying the application of kriging: stationarity and isotropy. Stationarity means that the observed parameters (e.g. the overall mean of the values, the range of the variogram) do not vary across the study space: "the same variogram model is assumed to be valid across the study space" (Columbia University Mailman School of Public Health, 2019). A variogram is a function that describes the spatial continuity of the data. Isotropy is the property of uniformity in all directions. A good overview is given by the ESRI ArcMap textbook (ESRI ArcMap, 2019):

“In general, statistics rely on some notion of replication, where it's believed estimates can be derived and the variation and uncertainty of the estimates can be understood from repeated observations.

In a spatial setting, the idea of stationarity is used to obtain the necessary replication. Stationarity is an assumption that is often reasonable for spatial data. There are two types of stationarity. One is mean stationarity, where it's assumed that the mean is constant between samples and is independent of location.

The second type of stationarity is second-order stationarity for covariance and intrinsic stationarity for semivariograms. Second-order stationarity is the assumption that the covariance is the same between any two points that are at the same distance and direction apart no matter which two points you choose. The covariance is dependent on the distance between any two values and not on their locations. For semivariograms, intrinsic stationarity is the assumption that the variance of the difference is the same between any two points that are at the same distance and direction apart no matter which two points you choose.

Second-order and intrinsic stationarity are assumptions necessary to get the replication to estimate the dependence rules, which allows you to make predictions and assess uncertainty in the predictions. Notice that it is the spatial information (similar distance between any two points) that provides the replication.”

Unfortunately for my exercise, the MBTA portfolio consists of many properties that distort the local market on their own (very large, or very oddly shaped). In simple terms, software cannot estimate with any degree of accuracy the value of a large lot (e.g., 10 acres) within a dense urban neighborhood: the eventual value is almost entirely driven by the nature of the project (shopping mall, office buildings, luxury residential, mixed-income residential, or any mixed use). A large development can also have a large impact on neighboring values (positive if successful, negative if not). This means that appraising large properties cannot be automated through the above-mentioned mainstream data science approaches. I had to content myself with ballparking estimates in a more traditional way.

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