

# EMBARGOED: For Release on September 5, 2019

## Prioritizing Equitable Growth Through Fare Policy

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### I. Introduction

In its 2018 report, the Governor’s Commission on the Future of Transportation stressed that Massachusetts has a unique opportunity to convert its 400-mile commuter rail network into a multidirectional regional rail system that supports more geographically balanced economic development across the Eastern half of the state.<sup>1</sup> Transit-oriented development (TOD) in Gateway Cities is key to positioning commuter rail to fuel growth in this manner. As previous MassINC research has demonstrated, realizing the potential of Gateway City TOD will require complementary changes to both development policy and transit policy.<sup>2</sup> On the transit side of the equation, a new, more equitable commuter rail fare framework should be priority number one.

A new commuter rail fare policy is important to ensuring that a regional rail network achieves equitable outcomes for low- and moderate-income households. Equity is paramount given the historical geographic disconnect between affordable transportation options, affordable housing options, and economic opportunity. This “spatial mismatch” has contributed significantly to rising income inequality in Massachusetts (see box p. 3).

A new commuter rail fare policy is also vital to ensuring that future development in Gateway Cities produces equitable outcomes. In major cities throughout the United States, rail service improvements leading to reinvestment in urban neighborhoods has often led to displacement—pushing low-income households most dependent on public transit out of neighborhoods served by the newest, fastest, and most frequently serviced lines.<sup>3</sup> Massachusetts

cannot afford to repeat this pattern in Gateway Cities. As the moniker “Gateway” implies, these urban communities play a vital function providing access to opportunity for all.

Shifting from commuter rail to regional rail will take years. However, one of the strongest arguments for pursuing more balanced regional economic development by increasing mobility on these existing rail lines is that we can make incremental progress that will yield immediate benefits. Setting fares so that they are no longer cost-prohibitive for many residents is a prime example of how we generate meaningful near-term gains as we gear up for a long-term regional rail strategy.

With current technology, it is possible to discount commuter rail fares to low- and moderate-income riders with minimal transaction cost. The commuter rail system may be able to absorb this ridership by adding coaches to current trainsets rather than adding more service. If this is the case, these additional passengers would likely produce net new operating revenue for the Massachusetts Bay Transportation Authority (MBTA).<sup>4</sup>

In the pages that follow, we explore various fare equity concepts in the context of rising income inequality, analyze the MBTA’s current commuter rail fare policies with an equity lens, expand on the connection between fare equity and equitable transit-oriented development, and offer recommendations for making Massachusetts a leader in transforming outmoded commuter rail infrastructure into a mechanism for more equitable growth and economic development.



## II. Defining “Fare Equity” in the Context of Rising Income Inequality in Massachusetts

MassINC has published numerous reports over the years documenting the steady rise in income inequality that accompanied our economy’s dramatic shift to knowledge industries. The top 10 percent of Massachusetts families now earn more than half of all income in the state, up from less than one-third in the 1970s. By this calculation, Massachusetts now has one of the most unequal income distributions among U.S. states, whereas a generation ago, we had one of the nation’s most even income distributions.<sup>5</sup>

To be sure, inequality increased significantly throughout the United States and in most developed countries over this period. While macroeconomic forces beyond our direct control have largely driven this trend, housing, land use, and transportation policies that reduce access to opportunity and the potential for economic mobility for those with limited means clearly exacerbate the problem. Any discussion of fare equity today must consider this backdrop and the long-term implications of high-levels of inequality for health and well-being, social trust and political participation, productivity, and economic competitiveness.<sup>6</sup>

Fare equity is a perennial topic of debate among transportation agencies. Whenever you charge fares for a public service, a resident’s ability to pay comes into question. In addition, public transportation generally requires some degree of public subsidy to supplement fare revenue. These considerations regularly engender healthy discussion about who benefits from the public service, both directly and indirectly, versus who pays for it.

In public finance, the basic equity framework for evaluating such tradeoffs has two dimensions—horizontal, such that all groups pay the same price for the level of service

they use, and vertical, such that those with greater means contribute proportionate to their ability to pay. Arriving at the optimal mix of horizontal and vertical equity is partially a question of values (e.g., how much does one believe government should redistribute income to increase equality) and partially a question of efficiency and effectiveness (e.g., making riding less costly can lead to transit congestion during peak periods, inhibiting mobility among those who most urgently need to get from point A to point B at these times).<sup>7</sup>

Grappling with these tradeoffs is especially difficult in transportation planning because transportation is not just another scarce resource. Transportation networks provide access to fundamentals such as employment, education, and healthcare, and are thus essential to equality of opportunity. Transportation networks are especially important in a region where land use regulations severely inhibit functioning real estate markets, driving up housing and travel costs for lower-income households.<sup>8</sup>

In the past, transit agencies relied on blunt policies like distance-based fares to increase fare equity (following the increasingly inaccurate assumption that those living further from the city center have greater means) because they lacked fine-grain information about household travel demand and the administrative burden of means-testing was high.<sup>9</sup> However, this is no longer the case. Digital technology allows agencies to perform sophisticated modeling to analyze scenarios for maximizing the number of destinations riders can reach within a given travel time under various fare structures.<sup>10</sup> Equally important, integrated databases tracking eligibility for various public programs allow transit agencies to verify income and reduce fares with minimal transaction cost.



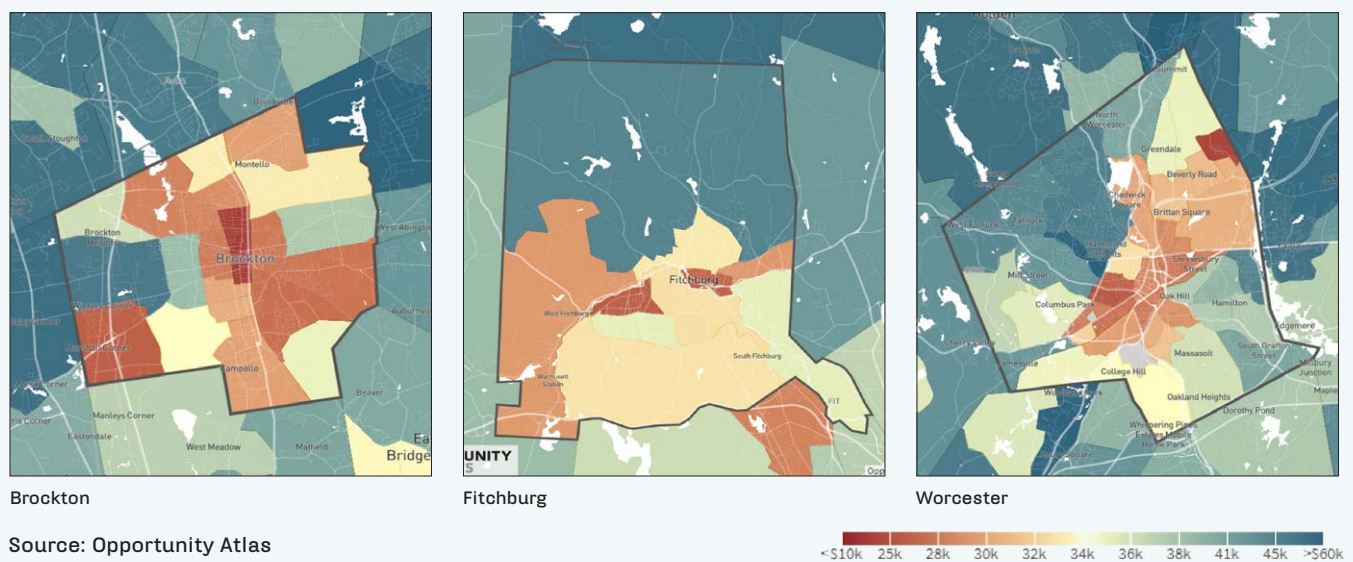
## “Spatial Mismatch” and the Growing Economic Divide

Historically, Gateway Cities played a vital role in minting a strong middle class for Massachusetts by offering low-income families affordable housing in proximity to well-paying factory jobs. But these jobs have slowly been lost to outsourcing, offshoring, and automation. Those that remain moved out of Gateway Cities into modern facilities that require larger tracts of land in suburban areas. Most of the service jobs that replaced manufacturing work have also located outside of traditional urban centers in newer commercial areas along highway exit ramps and interchanges. These office parks are mostly situated in communities with low inventories of affordable housing, which makes it much more difficult for low-income families to access employment.<sup>11</sup>

A well-established body of evidence shows that this “spatial mismatch” between urban neighborhoods and suburban job centers has reduced wages, lowered labor force participation, and distorted labor markets in other ways that have been especially harmful to communities of color.<sup>12</sup> Recent data from the Census Bureau’s Opportunity Atlas illustrate the toll this has taken on intergenerational economic mobility in Massachusetts. Low-income children raised in Gateway City neighborhoods in the 1980s earn significantly less than low-income children raised elsewhere in the region. Almost invariably, neighborhoods with the lowest mobility are the same Census tracts where commuter rail stations now operate. (Service to these cities was discontinued in the 1950s and 1960s and not restored until the 1980s and 1990s).

Until recently, few considered whether commuter rail lines might reduce the spatial mismatch between the residential locations of low-income urban families and growing suburban job clusters. However, this strategy is gaining increasing attention, as a range of new technologies make providing last-mile connections between suburban stations more practical, and job growth increasingly returns to urban centers with multimodal transportation networks.<sup>13</sup>

### Household income in adulthood for children of low-income parents







### III. Analyzing Commuter Rail Fares with an Equity Lens

Governor Baker’s Commission on the Future of Transportation called upon transportation agencies to take advantage of new technologies to maximize throughput on the state’s multimodal transportation infrastructure to increase mobility and access to economic opportunity. The Commission specifically drew attention to the need to increase economic equity by providing Gateway City residents with greater connectivity via commuter rail. Below we detail how the existing fare structure curbs rail use among low- to moderate-income residents, and raise concerns about fare policy analysis in the planning process for reinventing commuter rail.<sup>14</sup>

**1. Current Gateway City fares and fare discounts inhibit mobility for Gateway City residents.** The one-way fare from a Gateway City to Boston ranges from \$7 for Lynn to \$12.25 for Worcester (**Table 1**). For a Worcester resident working full-time, this amounts to \$4,656 yearly, or more than 13 percent of the city’s median household income. In comparison, the annual cost of commuting by train equals less than two percent of median household income for residents of more affluent suburbs closer to Boston, where incomes are higher and fares are significantly lower (**Figure 1**).

MBTA riders with greater means also enjoy fare discounts that Gateway City residents have difficulty accessing. The most common is the monthly pass, which reduces the fare by about 20 percent. For Worcester and other end-of-the-line Gateway Cities, the cost of a pass approaches \$400 per month. Most residents are unable to make this significant expenditure in a single payment—if they can afford it at all.

Tax-advantaged fare passes provide another large discount on the cost of travel. Nearly two-thirds of monthly pass sales for commuter rail occur through the Perq program (formerly the Corporate Pass). Employees at companies that offer this option can purchase monthly passes using pre-tax dollars. The MBTA’s analysis shows that the Perq program reduces fares by approximately 45 percent for commuters in the highest tax bracket.<sup>15</sup>

Because base fares are relatively high and most Gateway City residents have difficulty taking advantage of these discounts, most do not use commuter rail on a regular basis and few seek employment in Boston despite the potential to earn significantly higher wages for similar work in the urban core. Those who do commute to Boston generally connect to the city by riding buses to the end of the subway system, which lengthens their travel time and requires them to shoulder the cost of a full commuter rail fare on occasions when time is tight and they cannot avoid taking the train.

**Figure 2** demonstrates disparities in commuter rail use among Gateway City residents. For example, one-quarter of Lowell residents are low-income compared to just 8 percent of commuter rail riders boarding at Lowell’s Gallagher Terminal. Limited ridership among the city’s low-income residents is particularly notable given the concentration of low-income households in the neighborhood surrounding the station. This disconnect between proximity and utilization is particularly striking in Lynn, where two-thirds of station area residents are low-income and yet low-income riders account for just 7 percent of those boarding at the Lynn commuter rail station.

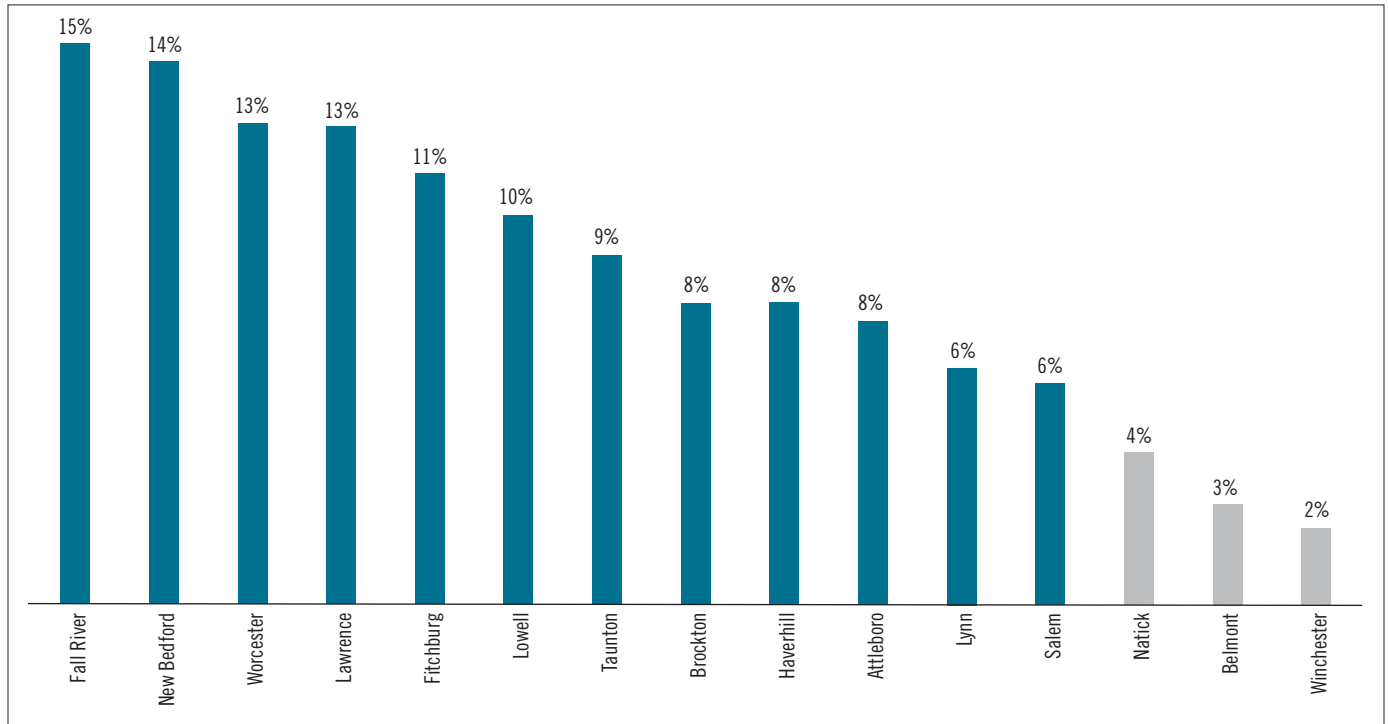
**Table 1: Gateway City commuter rail fares**

Origin/Destination	Monthly Fare Pass	One-Way Fare	Annual Cost of Monthly Fare Pass
TRAVEL TO BOSTON			
Attleboro	\$360	\$11.00	\$4,320
Brockton	\$281	\$8.75	\$3,372
Fall River	\$388	\$12.25	\$4,656
Fitchburg	\$388	\$12.25	\$4,656
Haverhill	\$360	\$11.00	\$4,320
Lawrence	\$340	\$10.50	\$4,080
Lowell	\$340	\$10.50	\$4,080
Lynn	\$232	\$7.00	\$2,784
New Bedford	\$388	\$12.25	\$4,656
Salem	\$261	\$8.00	\$3,132
Taunton	\$360	\$11.00	\$4,320
Worcester	\$388	\$12.25	\$4,656
SELECTED INTERZONE TRIPS			
Worcester to Framingham	\$139	\$4.25	\$1,668
Lynn to Salem	\$110	\$3.25	\$1,320
Fitchburg to Waltham	\$196	\$5.75	\$2,352
Brockton to Quincy	\$139	\$4.25	\$1,668
Haverhill to Lawrence	\$110	\$3.25	\$1,320

Source: MBTA

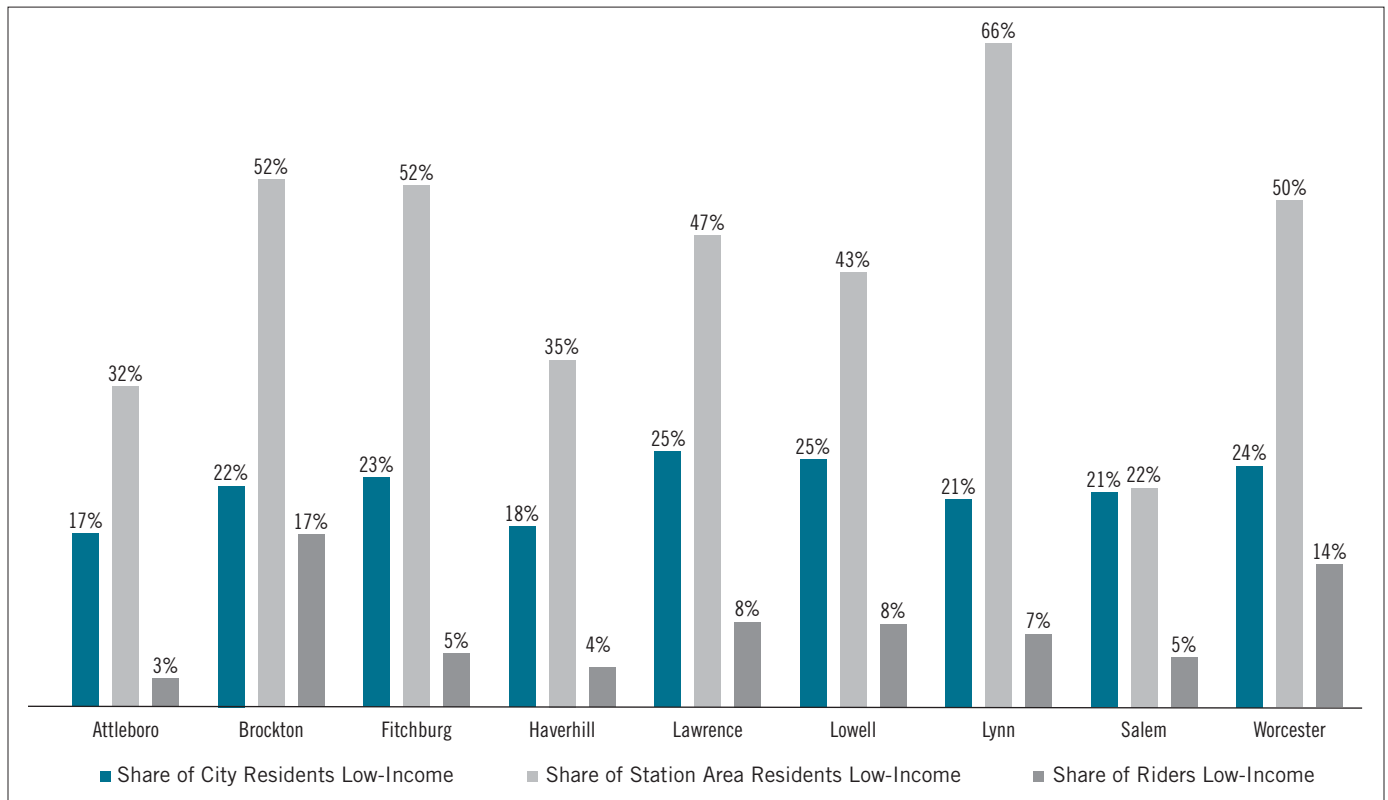


**Figure 1: Commuter rail fare as a percent of median household income**



Source: MBTA and American Community Survey, 2013-2017 estimates

**Figure 2: Low-income residents as a share of city residents, station area residents, and riders**



Source: MBTA and American Community Survey, 2013-2017 estimates



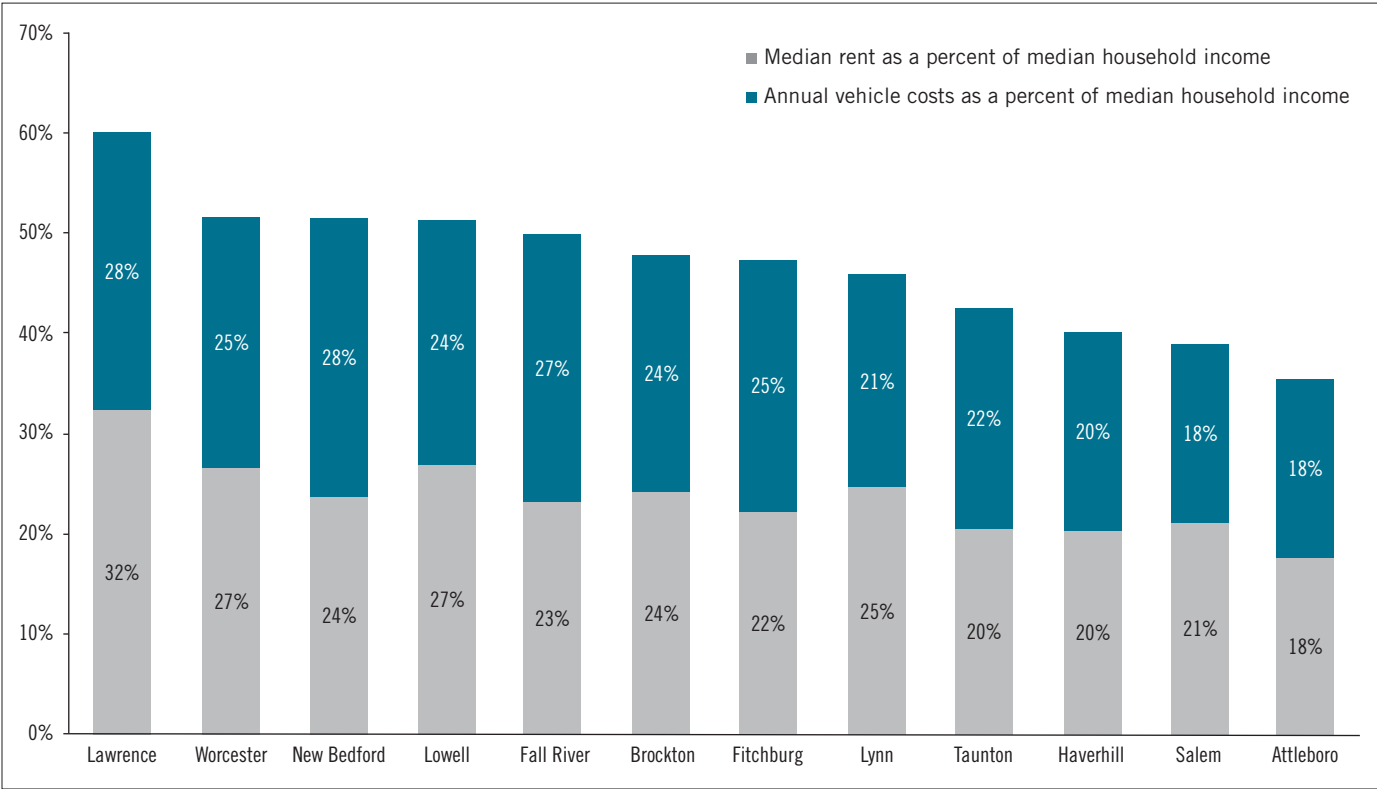
**2. High transportation costs combined with relatively high housing costs place significant financial strain on Gateway City households.** With limited access to public transportation and the movement of jobs out of cities, most Gateway City residents rely heavily on personal vehicles. Census figures show that more than 80 percent of households in the 12 Gateway Cities with current or planned MBTA commuter rail service have access to at least one car. Estimates suggest the annual vehicle costs for these Gateway City households is nearly \$12,000 a year, about 50 percent more than households in Boston expend on vehicle ownership and travel. Low-income urban drivers that depend heavily on vehicles for travel shoulder significantly higher insurance, borrowing, and gasoline costs.<sup>16</sup>

Annual vehicle costs represent about one-quarter of median household income for Gateway City residents. This creates significant financial strain. After housing, trans-

portation is generally the second largest household expense. The rule of thumb is that families should seek to limit their combined expenditures on housing and travel to 45 percent of income.<sup>17</sup> Over the past decade, Gateway City rents have risen more quickly than income. Excluding Attleboro, Haverhill, Salem, and Taunton, combined housing and transportation costs now exceed this threshold for the median-income household (**Figure 3**).

This dynamic is important to consider when evaluating transit service and commuter rail fare affordability. With limited RTA service, most Gateway City households using commuter rail for work trips have difficulty forgoing a vehicle entirely. They must be able to fit housing, a personal vehicle, and rail travel into their household budgets. While Gateway City residents who live in walkable, mixed-use downtown stations areas are better-positioned to live comfortably without owning a car, these residents are particularly likely to be low-income with high rent

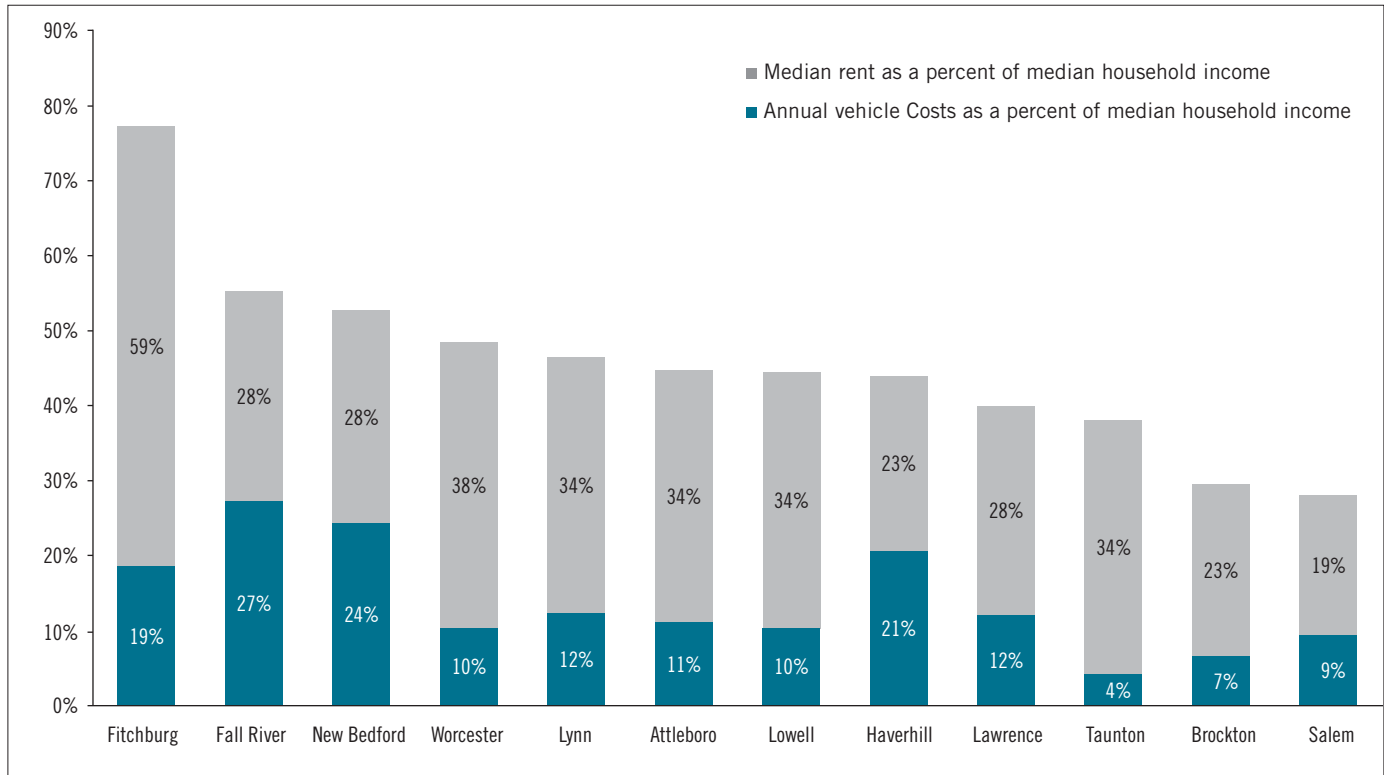
**Figure 3: Combined housing and vehicle transportation costs**



Source: Center for Neighborhood Technology and American Community Survey, 2013-2017 estimates



**Figure 4: Combined commuter rail and housing costs, station area residents**



Source: MBTA and American Community Survey, 2013-2017 estimates

burdens. Most households in Gateway City station areas would have difficulty fitting current commuter rail fares and median rents into their budgets without consuming more than 45 percent of their income (**Figure 4**).

**3. The MBTA's fare equity analysis does not take these factors into consideration.** Fare equity analysis that includes an examination of Opportunity Equity would take stock of whether residents of communities with commuter rail lines running directly through them have the ability to make use of this service. Unfortunately, the MBTA simply complies with limited federal regulations, which require agencies to determine whether proposed changes will have a “discriminatory impact” on the basis of race, color, or national origin, or a “disproportionate

burden” based on income. The MBTA meets these obligations by evaluating whether fares for riders who are low-income or belong to racial or ethnic groups that have historically experienced discrimination will increase more compared to the average rider's fare increase.

Federal regulations provide transit authorities with flexibility in this regard: they can use either population or ridership data to arrive at average ridership. To assess the equity of increasing commuter rail fares earlier this year, the MBTA chose to examine ridership data. This practice excludes from consideration Gateway City residents who cannot afford fares and are therefore not current riders. It also obscures the equity implications of heavily weighting discounts to pass holders.





**4. Limited attention to fare policy in MassDOT's "Rail Vision" planning study may bias the results and undermine equity.**

MassDOT is currently undertaking a major review of the state's commuter rail network to better meet the transportation and economic development needs of the region. While the project's stated objectives include increasing economic vitality and providing a blueprint for equitable investments, the design explicitly excludes fare policy from consideration. Ridership estimates of proposed improvements, many of which focus on significantly increasing service to Gateway Cities, will therefore undercount all of the potential passengers who would likely ride if fares were affordable to those working in lower-wage jobs. This omission is compounded by one exception: the Rail Vision study will produce ridership estimates for urban rail scenarios that provide more frequent subway-like service to inner suburbs with passengers paying a significantly lower flat fare.

This design framework is problematic for several reasons. First, households in these inner suburbs are generally wealthier and not nearly as sensitive to fare prices, so the models will likely show that the lower subway-like fare has a muted impact on ridership. This may lead some to assume that analysis of a reduced fare on outer portions of the line would likely produce similarly modest ridership gains. Second, to the extent that urban rail scenarios show healthy ridership impacts when improved service is coupled with a lower flat fare, it may lead some to believe that service improvements along the inner core stretches

of the line are more impactful than those on the outer. And third, in contrast to inner suburbs where opportunities for new TOD are limited, Gateway Cities have significant potential for infill development (and associated ridership growth), but relatively weak real estate markets make the economics of these projects extremely sensitive to fare policy.

MassDOT reasonably sought to exclude fare analysis from Rail Vision because current models for evaluating ridership impacts of transit fare changes are generally limited to situations where households are already travelling between a given origin and destination. This simplistic approach only considers whether a change in fare will lead to a shift in mode choice, not whether it will alter travel patterns. In addition, the MBTA will perform an in depth fare analysis as it moves to its new, more dynamic fare collection system, AFC 2.0.

At this juncture, integrating more complex fare policy models to an already cumbersome planning study presents a significant challenge. However, it will be extremely difficult to evaluate the various Rail Vision scenarios for upgrading commuter rail without considering Gateway City households that will be unable to make use of the improved service without significantly discounted fares. MassDOT is already referencing Rail Vision ridership estimates in policy documents without noting that these figures may significantly understate demand for upgraded commuter rail service at an affordable fare.<sup>18</sup>





## **Could Fare Discounts Generate More Revenue for the MBTA and the Commonwealth?**

Many have raised concerns that the commuter rail system is inefficient both because it has relatively low ridership relative to the expansive system's reach and because it has a comparatively low fare-box recovery ratio. Several recent sources of evidence suggest that lowering fares for low- and moderate-income riders who would otherwise not make use of the system might provide a means to increase both ridership and revenue.

The models most transit agencies employ to analyze the impacts of fare policy changes on ridership rely on outdated studies that assume travel decisions are relatively inelastic with regard to price, especially in the short-term and among transit-dependent riders who tend to be lower-income.<sup>19</sup> However, recent experimental evidence suggests that these models include inaccurate assumptions about how low-income riders respond to price changes. A 2019 MIT study examining ridership within the core MBTA bus and subway system found that low-income residents were extremely responsive to price. Those randomly provided a discounted fare pass took 30 percent more trips than low-income residents assigned to a control group.<sup>20</sup>

The emerging evidence suggests that low-income residents may also be highly responsive to changes in commuter rail fares. In 2018, the MBTA piloted a \$10 Weekend Pass that allowed unlimited travel on Saturdays and Sundays. The Weekend Pass significantly lowered the cost barrier for Gateway City residents. Riders in cities like Haverhill saved \$12.50 on a round-trip ticket to Boston. A worker with two weekend shifts in Assembly Square or a student attending a two-day workshop at Suffolk University would have saved at least \$35 for the weekend. According to the 2018 Fare Increase Proposal, 69 percent of Weekend Pass users started their trips in communities at the outer end of the system (Zones 6, 7, and 8). Among these riders, 41 percent qualified as low income—a more than 50 percent greater share than that detected in a 2015–2017 passenger survey. Weekend fare discounts generated roughly 58,000 additional ticket sales, increasing revenue by approximately \$350,000, compared with 2017 weekend ridership.<sup>21</sup>

There is also a strong likelihood that a fare discount would produce fiscal gains for the state. Many Gateway City residents receive public benefits, particularly state assistance covering healthcare costs. If commuting into Boston is economically feasible, Gateway City workers are likely to find higher wage work, which will reduce their eligibility for public assistance. Past studies have suggested it may be optimal to subsidize vehicle ownership rather than public transit to increase employment and reduce the cost of social programs.<sup>22</sup> However these studies reflect the sprawling economic geography of regions in other parts of the country. They also speak to employment patterns in decades past. As jobs centralize and investments are made to further concentrate development and improve public transit service to reduce carbon emissions, means-tested fares are likely to provide a positive return on investment for the Commonwealth, even if they are not revenue positive for the MBTA.



#### IV. Recognizing the Connection between Fare Equity and Equitable Transit-Oriented Development

Fare equity is central to a larger conversation about equitable transit-oriented development in Gateway Cities. When equity is front and center, planners and policymakers can shape development around transit infrastructure in a fashion that enables advancement for people who live, work, learn, and recreate nearby. Equitable TOD policies and practices both respond to the root causes of local and statewide disparities, and ensure that as reinvestment flows into station areas following transit-service upgrades, low-income residents and groups that have historically faced discrimination in real estate markets are well-positioned to benefit from the newly created wealth.

Unfortunately, this paradigm for equitable TOD has rarely been realized. As a result, many Gateway City residents and community-based organizations serving low- and moderate-income families are skeptical that future transit improvements and associated development will benefit disadvantaged members of the community. Opposition to

development in communities that are otherwise friendly to dense, multifamily development could inhibit the state’s ability to produce additional housing and commercial development in accessible locations served by existing transit infrastructure.

Initiating efforts to improve commuter rail service by revising fare policy so that all Gateway City residents can afford to use the service would send a strong signal that the state is committed to inclusive and equitable TOD. It would also be a smart strategy for leveraging the state’s existing stock of income-restricted affordable housing. At present, there are more than 6,700 units within walking distance of the 12 Gateway City stations with existing or planned MBTA commuter rail service (**Table 2**). Providing stronger access to employment will lead to greater economic mobility among these residents, allowing others to make use of our limited affordable housing inventory.

**Table 2: Income-restricted affordable housing units in station area**

City	Affordable Units	Total Units	Share Affordable
Attleboro	236	2,162	11%
Brockton	965	2,180	44%
Fall River	489	2,146	23%
Fitchburg	7	1,852	0%
Haverhill	221	4,034	5%
Lawrence	731	3,313	22%
Lowell	1,139	5,040	23%
Lynn	1,619	3,934	41%
New Bedford	679	2,621	26%
Salem	330	2,328	14%
Taunton	128	1,859	7%
Worcester	226	2,900	8%
Total	6,770	34,369	20%

Source: National Housing Preservation Database



## V. Pursuing New Fare Structures for Equitable TOD in Massachusetts

U.S. transit agencies are increasingly creating fare discounts to mitigate the impact of rising fares on disadvantaged residents. So far, however, this activity has been limited to bus and subway systems.<sup>23</sup> The MBTA could establish new standards for equitable mobility and, in the process, become the first to make commuter rail travel affordable for all. The argument for proceeding ahead of others is strong given the system's extensive reach to older industrial cities that have been disconnected from economic opportunity for far too long, and the Baker Administration's stated policy objective of siting more affordable housing near Gateway City rail stations.<sup>24</sup> A fare policy that leads to greater inclusion in advance of major service improvements would also help signal the agency's commitment to equitable transit-oriented development. To position the MBTA to pioneer new fare structures, we offer the following recommendations for consideration:

**1. Experiment with means-tested fares.** With housing costs rising at a much faster pace than wages throughout the region and jobs increasingly concentrating in areas of Boston that are extremely costly to reach by vehicle, Massachusetts must move with urgency to make commuter rail accessible to households under increasing financial strain. However, it is also important to develop a better understanding of how riders will respond in advance of wholesale change. This information is vital to operators, who must ensure that the system has capacity to absorb the expanded ridership, and budget makers, who need to plan for the financial implications (positive or negative) associated with transporting additional passengers.

More information about the travel behavior of households when commuter rail travel is no longer cost-prohibitive will be critical for long-term planning, particularly as policymakers evaluate the pros and cons of major upgrades to commuter rail.

The MBTA is currently conducting a limited study of means-tested fares. However, it is doing so without precedents for understanding how residents will respond to

more affordable commuter rail fares. Recent work by MIT researchers demonstrates that available technology provides transit analysts with ample means to structure rigorous experiments that generate valuable new information to evaluate reduced fares in a timely manner. MassDOT and the MBTA could partner with researchers to devise similar experiments for commuter rail.

In addition to assessing ridership and revenue impacts, researchers should carefully examine the effect of fare discounts on Gateway City labor markets. Greater access to Boston has the potential to reduce the number of workers available to Gateway City employers. Policymakers will need a full understanding of this complication so that greater connectivity does not undermine already fragile Gateway City economies in a relatively tight labor market.

**2. Lower fares for reverse commuters.** Increasing reverse commuting so that Gateway City employers have greater access to Boston's skilled labor market is one way to help ensure that lower fares do not drain workers from these local economies without providing others in return. Like discounted weekend travel, a lower fare for reverse commuters also has the potential to generate net new revenue for the MBTA, especially if it reduces costs associated with overcapacity on the core system. Just as important, reverse commuter discounts would also give developers exploring transit-oriented projects more confidence that they could market the potential to tap these commuters to prospective commercial tenants.

Because the impact of a lower fare for reverse commuting is likely to unfold more slowly over time and the increased ridership will not strain the system's capacity, the MBTA could move forward with this recommendation immediately. As with the weekend discount, current fare-vending and mobile technologies can support this change without waiting for AFC 2.0. Taking this step now could provide a public relations win for the agency at a time when it needs positive news.





**3.Reduce fares for off-peak travel.** Outside of rush hour, commuter rail trains often run with much fewer passengers. With lower fares for non-peak travel, more Gateway City residents could afford to ride the train. Connectivity during off-peak hours is increasingly important to access educational opportunities and healthcare.

For college students, transportation is both a major expense and a significant barrier to degree completion. A campus’ location and accessibility can also influence whether economically-disadvantaged students attend a two- or four-year college and the major they choose to study.<sup>25</sup> Similarly, transportation researchers have demonstrated that significantly more students use public transit when transit agencies work with schools to reduce fares.<sup>26</sup>

Lowering commuter rail fares for off-peak travel would also help Gateway City residents struggling to access healthcare. Many must travel far outside of their communities to receive specialized medical services thanks to consolidation in the industry. With lower off-peak fares, the rail network can play an important role getting Gate-

way City residents to appointments at clinics and medical centers in other cities. While some may raise concerns that easing access to appointments in other areas will take patients and resources away from community hospitals, policymakers are working diligently to restructure the health care system so that patients can receive the most cost-effective care. Moreover, lower reverse-commute and off-peak fares should allow area hospitals to access more skilled medical workers living outside of their communities, expanding the availability of services locally to prevent unnecessary leakage.<sup>27</sup>

**4. Develop a standard definition of equity and apply it consistently to all planning and policy studies.** Transportation equity is a complex concept that merits nuanced discussion whenever it arises as a subject of policy debate. One of the major findings of this report is that Massachusetts lacks thorough and accurate measures for examining fare equity through multiple dimensions. Even more broadly, MassDOT needs a standard definition of transportation equity and protocols to ensure that the design of planning and policy studies facilitate analysis that is responsive to these critical considerations.

## Appendix

### Annual vehicle costs and vehicle availability

City	Annual Vehicle Costs	Vehicle Costs as a Share of MHHI	Percent of Households with Vehicles
Attleboro	\$12,525	18%	92%
Brockton	\$12,386	24%	84%
Fall River	\$10,558	27%	80%
Fitchburg	\$12,866	25%	85%
Haverhill	\$13,107	20%	90%
Lawrence	\$10,959	28%	75%
Lowell	\$11,901	24%	82%
Lynn	\$11,376	21%	77%
New Bedford	\$11,328	28%	79%
Salem	\$11,689	18%	83%
Taunton	\$12,550	22%	88%
Worcester	\$11,485	25%	82%
Average	\$11,894	23%	83%

Source: Center for Neighborhood Technology and American Community Survey 2013-2017 estimates



## Endnotes

- 1 See: Daniel Fleishman. *Fare Policies, Structures, and Technologies*. TCRB Number 10. (Washington, DC: National Academy Press, 1996).
- 2 See: Dan Hodge and Ben Forman. *The Promise and Potential of Transformative Transit-Oriented Development in Gateway Cities*. (Boston, MA: MassINC, 2018).
- 3 Stephanie Pollack and others. “Maintaining Diversity in America’s Transit-Rich Neighborhoods: Tools for Equitable Neighborhood Change.” (Boston, MA: Dukakis Center for Urban and Regional Policy, 2010); Michael Barton and Joseph Gibbons. “A Stop Too Far: How Does Public Transportation Concentration Influence Neighbourhood Median Household Income?” *Urban Studies* 54.2 (2017).
- 4 For an analysis of capacity, see Hodge and Forman (2018), 43–50. Commuter rail ridership is increasing rapidly, which places more strain on capacity at peak hours. However, the MBTA’s most recent plan includes funds for the purchase of bi-level coaches to expand capacity. And MassDOT’s August 2019 congestion reduction strategy calls for accelerating this procurement process.
- 5 Authors’ calculations of Economic Policy Institute inequality dataset. For MassINC research comparing Massachusetts with other US states over time, see Andrew Sum and others. *New Skills for a New Economy*. (Boston, MA: MassINC, 2000); Andrew Sum and others. *Recapturing the American Dream: Meeting the Challenges of the Bay State’s Lost Decade*. (Boston, MA: MassINC, 2011).
- 6 Kate Pickett and Richard Wilkinson. “Income Inequality and Health: A Causal Review.” *Social Science & Medicine* 128 (2015); Federico Cingano. “Trends in Income Inequality and its Impact on Economic Growth.” *OECD Social, Employment and Migration Working Papers*, No. 163 (2014); Frederick Solt. “Does Economic Inequality Depress Electoral Participation? Testing the Schattschneider Hypothesis.” *Political Behavior* 32.2 (2010).
- 7 For a summary of these ethical quandaries in the fare policy context, see Brian Taylor and Alexandra Norton. “Paying for Transportations: What is a Fair Price?” *Journal of Planning Literature* 24.1 (2009); and Anne Brown. “Fair Fares: How Flat and Variable Fares Affect Transit Equity in Los Angeles.” *Case Studies on Transport Policy* 6.4 (2018), 765–767.
- 8 For example, see Amy Dain. *The State of Zoning for Multi-Family Housing in Greater Boston* (Boston, MA: Massachusetts Smart Growth Alliance, 2019).
- 9 For example, see Steven Farber and others. “Assessing Social Equity in Distance Based Transit Fares Using a Model of Travel Behavior.” *Transportation Research Part A: Policy and Practice* 67 (2014).
- 10 For example, see Matthew Conway and Anson Stewart. “Getting Charlie Off the MTA: A Multiobjective Optimization Method to Account for Cost Constraints in Public Transit Accessibility Metrics.” *International Journal of Geographical Information Science* (2019).
- 11 This trend is demonstrated though analysis of the 100 largest metro areas in the United States. However, this analysis excludes Massachusetts metros, the only state not participating in the Census Longitudinal Employer-Household Dynamics (LEHD) program. (Massachusetts only recently began submitting the required data). See Elizabeth Kneebone and Natalie Holmes. *The Growing Distance between People and Jobs in Metropolitan America* (Washington, DC: Brookings Institution, 2015).
- 12 For instance, distance to jobs lowers information about job availability and increases the cost of searching for work. As jobs in downtowns have higher skill requirements and lower-skill jobs are concentrated in the suburbs, this creates a mismatch for people of color concentrated in cities. The discrimination these workers face in suburban labor markets exacerbates the mismatch when these workers have a lower probability of obtaining jobs for which they are qualified. See Laurent Gobillon and others. “The Mechanisms of Spatial Mismatch.” *Urban Studies* 44.12 (2007).
- 13 MassINC’s 2018 Gateway City TOD report found that the share of net new jobs in communities with only highway exits and no rail service declined from 37 percent in the 1990s to 21 percent in the 2000s. See Hodge and Forman (2018), 24.
- 14 *Choices for Stewardship: Recommendations to Meet the Transportation Future, Volume I*. (Commission on the Future of Transportation in Massachusetts, 2018).
- 15 See [https://s3.us-east-2.amazonaws.com/production-perq/uploads/perq\\_product\\_offerings.pdf](https://s3.us-east-2.amazonaws.com/production-perq/uploads/perq_product_offerings.pdf) (Accessed July 10, 2019).



- 16 This figure is drawn from the Center for Neighborhood Technology (CNT), a widely cited source of information on housing and transportation cost. Some experts have criticized these data because initially the CNT model relied on figures from the American Automobile Association (AAA), which were significantly higher than annual vehicle costs reported in the Consumer Expenditure Survey. (For example, see Steven Polzin. “The True Cost of Driving and Travel Behavior.” *Planetizen*. April 30, 2012). CNT now uses data from the Consumer Expenditure Survey and models travel expenditures based on the income of households living in the area. For example, see Matt Fellowes. “From Poverty, Opportunity: Putting the Market to Work for Lower Income Families.” (Washington, DC: Brookings Institution, 2006); and “Premium Disparities Affecting Minority and Low-Income Drivers.” Attorney General Maura Healey’s Testimony to the Joint Committee on Financial Services. (February 2, 2018).
- 17 First developed by the Center for Neighborhood Technology, this 15 percent threshold has been widely adopted. For instance, see Shima Hamidi and others. “How Affordable is HUD Affordable Housing?” *Housing Policy Debate* 26.3 (2016).
- 18 See: Massachusetts Department of Transportation. *Congestion in the Commonwealth: Report to the Governor*. (Boston, MA 2019), p. 88.
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- 20 Jeffrey Rosenblum and others. “How Low-income Transit Riders in Boston Respond to Discounted Fares: A Randomized Controlled Evaluation (Preliminary Results)” (Cambridge, MA: Massachusetts Institute of Technology, 2019).
- 21 “Commuter Rail \$10 Weekends.” Presentation to the MBTA Fiscal and Management Control Board (December 10, 2018). <https://cdn.mbtta.com/sites/default/files/fmcb-meeting-docs/2018/december/2018-12-10-commuter-rail-10-dollar-weekends-accessible-minus-T-logos.pdf> (Accessed July 10, 2019).
- 22 Robert Cervero. “State Roles in Providing Affordable Mass Transport Services for Low-Income Residents.” *International Transport Forum Discussion Paper* (2011); Heidi Goldberg. “State and County Supported Car Ownership Programs Can Help Low-Income Families Secure and Keep jobs.” (Washington, DC: Center on Budget and Policy Priorities, 2001).
- 23 Regions recently adopting low-income fare discounts include the Bay Area, Minneapolis, and Portland, OR.
- 24 See: Massachusetts Department of Transportation. *Congestion in the Commonwealth: Report to the Governor*. (Boston, MA 2019), p. 94.
- 25 Jeffrey Brown and others. “Unlimited Access.” *Transportation* 28.3 (2001); Jeffrey Brown and others. “Fare-Free Public Transit at Universities.” *Journal of Planning Education and Research* 23.1 (2003).
- 26 Ruth Turley. “College Proximity: Mapping Access to Pportunity.” *Sociology of Education* 82.2 (2009); Kevin Davidand others. “Barriers to Success Predict Fall-to-Fall Persistence and Overall GPA among Community College Students.” *Journal of Applied Research in the Community College* 21.1 (2013); Tuomo Suhonen. “Field-of-Study Choice in Higher Education: Does Distance Matter?” *Spatial Economic Analysis* 9.4 (2014).
- 27 “Community Hospitals at a Crossroads: Findings from an Examination of the Massachusetts Health Care System” (Boston, MA: Massachusetts Health Policy Commission, 2016).





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The Gateway Cities Innovation Institute kicked off its TTOD Initiative in April 2018 with the release of a study quantifying the potential opportunity and impact of transit-oriented development in 13 Gateway Cities with current or planned commuter rail service. Until 2021, we will expand this foundational research to test a range of strategies that improve the transit rider experience by promoting frequent, all-day, accessible service and stimulating inclusive growth and development in Gateway Cities and surrounding communities.



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