

PREPARING FOR THE FUTURE OF WORK IN THE COMMONWEALTH OF MASSACHUSETTS

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This report draws on extensive fact-based analyses, research and interviews conducted by McKinsey & Company.

01 EXECUTIVE SUMMARY

The Commonwealth of Massachusetts has experienced vibrant economic growth in recent years, propelled by a talented workforce and good overall quality of life. The state has become a global leader in many disciplines, including healthcare, biotechnology, sciences, engineering, higher education, technology, and finance.[1] It is ranked as one of the most attractive states for citizens to live, and its per-capita personal income is the third-highest in the nation.[2] Among all 50 states, Massachusetts is ranked first in patents per capita, first in venture



capital funding per GDP, and fifth in the number of company headquarters per capita.[3] Bloomberg's annual State Innovation Index ranked the state as "the most innovative state in America," thanks to its growing concentration of entrepreneurial start-ups over the past decade.[4] Access to top-notch educational institutions and to highly skilled labor pools has attracted employers of all sizes and served as an important driver of Massachusetts' growth. Massachusetts benefits from a moderate tax regime and is ranked 21 in terms of overall tax burden by state.[5] The state's public-school students place in the nation's top tier for academic performance,[6] and the Commonwealth is home to 122 institutions of higher education.[7]

Despite these competitive advantages, the effects of COVID-19 have profoundly challenged the Commonwealth. COVID-19 was not only the worst public health crisis of the last hundred years, but also an economic calamity that caused 560,000 residents to become unemployed,[8] and half of all small businesses to close at the pandemic's height in April 2020.[9]

As we emerge from the pandemic, the study outlined in this report, Preparing for the Future of Work in the Commonwealth of Massachusettes, explores what work could look like in Massachusetts in both the near term (to 2025) and the longer term (to 2030). It explores what the implications might be for the Commonwealth and its residents across its regions, economic sectors, commercial centers, local downtowns, transportation, and public spaces.

This work aims to provide a fact base and assessment of current and future trends to inform any workforce and economic interventions that might be needed to address recent challenges and to prepare the state and its citizens for a successful future. Extensive research was conducted, including more than 60 analyses, discussions with business leaders, resident and business surveys, and expert interviews across a broad range of topics and regions within the Commonwealth to inform perspectives in this report. In addition, an Advisory Council[10] was convened, comprised of fourteen business and education leaders from the Commonwealth across diverse geographies and industries, to provide input and feedback on the emerging future of work impacts.

Many of the factors impacting the future of work (such as rising income levels and an aging population) are not new. However, COVID-19 and the substantial shifts in how Massachusetts residents work over the past year have accentuated and accelerated many of these factors (such as the use of e-commerce and the pace of adoption of automation). Moreover, new factors have emerged (such as the spread of remote and hybrid work at-scale and a reduction in business travel). The degree of change and resulting shifts in how Massachusetts residents live and work vary across regions, industries and occupations in the Commonwealth – as well as across gender and race.

To complicate matters, how these factors will evolve has real uncertainty; it is difficult to determine, for example, how structural the decline in business travel will be, or whether there will be a surplus of commercial real estate in urban areas, or how deeply the adoption of hybrid, work from home models will decrease public transportation ridership. With these uncertainties in mind, three potential scenarios were considered for how these factors may impact the future of work in the Commonwealth. Furthermore, the Commonwealth is not homogeneous, and this report explores seven regional archetypes to assess how the challenges and opportunities arising from the future of work could be experienced differently across the state.

This report is anchored in eight core insights that could cause the most critical shifts impacting the future of work in the Commonwealth. These are: (1)

reduced demand for office real estate as workers spend more time in residential areas due to hybrid work; (2) the need for affordable, flexible, childcare options that cater to the needs of the future; (3) ridership declines in public transit (particularly commuter rail) (4) reduced business travel; (5) a need for reskilling at an unprecedented scale and pace; (6) slowing population growth; (7) greater equity challenges; and (8) capacity-constrained housing options that meet the requirements of all. These eight insights are summarized into the four overall themes for the Commonwealth in the future that we highlight below.

First, changing ways of working – such as hybrid and remote work – may shift the center of gravity away from the urban core, further reinforced if business travel decreases.

Our analysis shows that around a third of Massachusetts residents can work remotely – a higher percentage than in most other US states, since the Commonwealth has a high share of jobs in sectors that lend themselves to remote work, such as technology and professional services. Surveys and interviews indicate that many remote workers could continue with hybrid work in the future. The impact to urban cores will depend on the extent of this hybrid work: a day of remote work per week could have modest impact, while an average of three days or more of remote work per week would have more significant impact. Previously, the urban cores in Massachusetts had a large commuter population (for example, approximately 245,000 workers traveled into Boston from surrounding areas in 2019[11]). A shift to remote/hybrid work and spending more time closer to home could have far-reaching implications on transit, urban vitality, housing (both where housing is needed as well as types of options on housing), local congestion and childcare needs. For example, parents in hybrid work models may need more sporadic, part-time childcare that is closer to home, requiring the childcare business model to change and adapt to the new flexibilities in work schedules Reduced business travel would also strongly affect Boston, as approximately 40 percent of Logan Airport traffic comprises business travelers[12] (compared to about 20 percent nationwide)[13]. Hybrid work and reduced business travel may also have second-order effects on businesses (and their employees) that depend on commuter and business travel– particularly in the retail, food and hospitality sectors. Our analysis suggests a significant challenge for commuter rail, which could experience a 15 to 50 percent loss of its pre-pandemic ridership base, depending on the extent of remote work adoption. Additionally, this analysis expects demand for office real estate to decrease by as much as 10 to 20 percent if remote / hybrid work trends continue. On a positive note, this shift could create more vibrancy in local downtowns, with more people working from home creating opportunities for businesses in these downtowns as well as inspire placemaking efforts that would improve the attractiveness of areas outside the urban core (placemaking defined as planning, design and management of public spaces such as creation of community parks and art installations).

Second, the pace, scale, and breadth of reskilling needed for job transitions must be much greater than before the pandemic; creating the workforce of the future will require extensive, thoughtful preparation.

COVID-19 accelerated automation, e-commerce and digitization as residents and businesses found these interventions useful as they worked to curtail physical proximity. If these trends continue, up to 400,000 job transitions may be needed by 2030, with 75,000 employees having to jump

multiple wage levels. This would require one of the largest reskilling efforts that the Commonwealth has ever undertaken. If done correctly, the effort could lead to a vibrant Massachusetts economy with new job creation absorbing the workforce released by automation trends. In particular, there could be substantial growth in healthcare (which could produce 210,000 to 235,000 more jobs by 2030) and in new economy sectors like artificial intelligence (AI), clean energy, and biotechnology. This growth could be held back, however, if reskilling is unable to supply sufficient talent of the right capability, or if population growth and in-bound migration slows growth in the available workforce.

Third, the pandemic has already exacerbated pre-existing inequities for many and as we look ahead the future of work will not be experienced equally across the Commonwealth.

For example, while many white-collar workers enjoyed the benefits of remote work, many women, ethnic and racial minorities, the relatively less educated, and younger populations experienced significant disadvantages. Unemployment in the Commonwealth peaked in April 2020 at 16.4 percent – more than 5.4 times pre-pandemic levels[14] – and remains at 6.4 percent (2.1 times pre-pandemic levels) as of April 2021 with more than 240,000 workers unemployed in the Commonwealth.[15] Black workers in Massachusetts faced unemployment rates that were approximately 13 percentage points higher than rates among other racial groups in 2021.[16] Nationally, job recovery for women coming out of the pandemic is expected to occur about 18 or more months later than for men, and for those with less education or income, recovery could happen one to two years later.[17] The picture is expected to be no different for the Commonwealth, and a lack of access to affordable, flexible childcare – a challenge even before the pandemic - will likely exacerbate these problems. Beyond a slower economic recovery, as we look ahead, automation and reskilling needs are likewise expected to have greater impact on women, young people, people of color and people for whom English is a second language. For example, the automation of office work will likely affect women disproportionately, given that women represent about 85 percent of administrative occupations such as assistants, secretaries, payroll clerks and receptionists in the Commonwealth. Hispanic workers are more strongly represented in the food and hospitality occupations, which by 2030 are expected to experience significant job losses due to future-of-work trends.[18] The Commonwealth maybe able to take advantage of opportunities to transition people into higher-paying jobs, and to address some of the longstanding inequities across the state – but without focused action it's likely that inequities will deepen.

Fourth, the risk of future job growth moving outside Massachusetts is rising due to the high costs of living and doing business in the state.

Remote work enables greater mobility for both employers and employees, thus lowering the barrier for jobs and residents to leave the state or for companies to place jobs and recruit talent elsewhere. To remain attractive, Massachusetts must double-down on the fundamentals, as validated in numerous surveys and conversations with residents and business leaders. In interviews with business leaders, regulatory burdens, the high cost and complexity of doing business, and access to talent came up consistently as key challenges that impact Massachusetts' competitiveness. Interviewees went as far as to say that they were considering looking at other states to expand their businesses or had heard of other peer, Massachusetts-based companies that were seeking to move their businesses to other states with a lower-cost of doing business. To capture new job growth, then,

the Commonwealth will likely need to address these challenges while also working to remain the nation's top hub for talent. In particular, the cost of living in the state is seen as a potential barrier to retaining and attracting talent. In our surveys, residents highlighted affordability as the top determinant when deciding where to live, especially in the context of remote and hybrid work. Massachusetts is among the lowest-ranked states for affordability and has some of the highest housing costs[19] and most expensive childcare services[20]. Our analysis highlights need for up to 125,000-200,000 additional housing units by 2030 to bring Massachusetts up to national vacancy benchmarks and 25,000-30,000 additional childcare workers to provide sufficient and flexible childcare. By investing in these fundamentals, addressing the challenges that businesses believe to be impeding Massachusetts' competitiveness, and continuing to maintain access to top-notch educational institutions and to highly skilled labor pools, Massachusetts can continue to win the fight for job and talent growth.

With vaccination well underway, the worst of the COVID-19 pandemic may soon be behind us. Massachusetts (like many states) now face a host of serious challenges – and opportunities - as residents and businesses adapt to the future of work. Remote and hybrid work offers employers and employees greater mobility in choosing where they want to work, but it raises the imperative for Massachusetts to remain competitive. This means leaning into its strength as a bastion for world-class talent by reskilling and equipping residents with the skills needed for future occupations and retaining them with improved affordability and meeting the fundamental needs of housing and childcare. It means ensuring Massachusetts remains an attractive state for employers to create future jobs. It means adapting to where people will spend time in the future and ensuring offices, business, leisure and retail adapt to these as well. And it means addressing head-on the rising inequalities that many of these trends are fueling. Without proactive and focused action, Massachusetts risks losing population and job growth to more cost-competitive states. But if Massachusetts can rise to the challenge and accomplish these goals, the opportunity to create an inclusive economy that provides opportunities for everyone and remains an attractive place for businesses and residents could become the next chapter for Massachusetts.



02 CONTEXT AND APPROACH

COVID-19 posed profound challenges for the Commonwealth. The significant job losses resulting from COVID-19 have deeply affected Massachusetts' economy. Coming out of the pandemic, the Commonwealth now turns to the question of what the future of work in Massachusetts might look like and what the implications might be for the Commonwealth and its citizens across its regions, economic sectors, commercial centers, local downtowns, transportation, and public spaces.

It is critical to examine which COVID-related disruptions could endure, which trends have accelerated or shifted, and what that might mean for maintaining the Commonwealth's competitiveness as an attractive place to work. Sound research and an assessment of current and future trends can form the basis for workforce and economic interventions that will both address the challenges of the past 15 months and prepare the state and its citizens for a successful future.

The study outlined in this report, Preparing for the Future of Work in the Commonwealth of Massachusetts, explores what work could look like in Massachusetts, in the near term (to 2025) and the longer term (to 2030). This work aims to provide the fact base and an assessment of current and future trends to inform workforce and economic interventions that might be needed to address the challenges of the past ~15 months and prepare the state and its citizens for a successful future. To achieve this end, this report draws on more than 60 analyses (Exhibit 1) from publicly available data as well as data and assumptions from Commonwealth agencies, discussions with experts and business leaders, and surveys of business and consumer communities across the Commonwealth. The objective is to help the Commonwealth determine where and how interventions may prove most effective considering the challenges and potential opportunities resulting from COVID-19. As such, this report is meant to provide insights based on currently available information and does not seek to provide specific advice or policy recommendations. Its content is not intended to be a forecast or prediction, and many of the factors considered are subject to change.

Exhibit 1: Tabulation of the analyses informing the future of work in the Commonwealth.

Module	Supplemental analyses
Employment	• Employment by sector by scenario to 2025-30, including sizing of trends for business travel, remote work, automation, e-commerce, rising incomes, aging population, etc. • Employment change by occupation by scenario to 2025-30 • Workforce Development Area (WDA) -level analysis of employment (by scenarios and sectors) to 2025-30 • Transition gap analysis by scenario, by county to 2025-2030 • Wage quintile transition analysis by scenario, by county 2025 – 2030 • Time spent using skill in each skill category by wage quintile in MA • Labor demand transitions made from 2007-2019 by minor standard occupational classification (SOC) code • MA net payroll employment gains and losses by detailed SOC code 2007-2019 • Breakdown of occupation transitions for sample occupations by 2030 • Displacement analysis by scenario and WDA to 2025-30
Migration	• Historical domestic migration analysis by state • Historical international migration analysis by country and sector • Historical net change in MA population by domestic, international, and birth rates • COVID-19 migration analysis for all US cities with 350k+ residents using USPS data • COVID-19 migration analysis for Massachusetts cities and towns using USPS data • COVID-19 migration state analysis inflows and outflows using ADP data • COVID-19 migration intrastate analysis using ADP data, including by income bracket and age • MA resident survey of 500+ respondents regarding working styles, migration, reskilling, childcare barriers • Scenario modeling of migration by WDA for 2025 and 2030 based on University of Massachusetts Donahue estimates • Intra-state remote work potential based on sector employment analysis • Analysis of commuter movement by WDA from American Community Survey data

Module	Supplemental analyses
Equity	• MA COVID-19 unemployment rate versus US national rate • MA COVID-19 unemployment by types, reason • MA COVID-19 unemployment analysis by ethnicity, education level and gender • MA COVID-19 long-term MA employment trajectory by gender, education and wage level • Job transition impact of COVID-19 by gender, age, educational attainment and race/ethnicity
Transportation	• Historical recovery rate analysis by travel and logistics subsectors • Historical analysis of vehicle miles traveled relative to U.S. average using Massachusetts Departmentof Transportation data • COVID-19 transportation analysis of rural/urban traffic recovery relative to U.S. average • Comparative analysis of changing commuter patterns in urban areas (hours lost and cost to city) • Freight logistics demand analysis by scenario to 2025-30 • Historical passenger travel to Logan airport and comparative analysis of business-heavy routes from Logan Airport • Comparative analysis of travel recovery across multiple US airports using publicly available data • Analysis of Logan Airport revenue and other Massachusetts Port Authority airport conditions (closing routes, revenue decline) throughout 2020 using Massport data • Scenario modeling of future business air travel to 2025 and 2030 • COVID-19 transportation analysis of transit versus driving trips using MBTA, Mass Turnpike data • Public transit ridership analysis by mode (e.g., commuter rail, subway, bus) • Scenario modeling of public transit ridership to 2025 and 2030 • Analysis of shift to auto from public transit ridership changes to 2025 and 2030 (including parking capacity, emissions, congestion, fatalities) • Comparative analysis of work versus non-work trips
Commercial real estate	• COVID-19 commercial real estate analysis of rents by property type (including retail, office, industrial) using CoStar Group data • COVID-19 commercial real estate analysis of delinquency rates by property type using CoStar Group data • Analysis by granular geography and asset class (A,B,C-type office space) using CoStar Group data • Scenario modeling of commercial real estate demand by property type (including retail, office, industrial) to 2025 and 2030 using CoStar Group data • Office year over year rent/occupancy rate growth by city using Yardi data • Comparative analyses of various surveys (UpWork, EY, PwC) assessing office space trends after COVID-19
Housing	• Housing pre-COVID-19 gap, benchmarked to national occupancy levels • Historical analysis of regional home values from 2005-2021 using Zillow Home Value Index • Historical analysis of regional housing occupancy rates using ACS data • COVID-19 housing analysis of MA housing rents by municipality using Zillow Observed Rent Index • COVID-19 housing analysis of home value prices by housing type using Zillow Home Value Index • Scenario modeling of housing supply, demand, gap by WDA to 2025 and 2030
State revenue	• Scenario modeling of withheld income, sales tax, motor fuel tax to 2025 and 2030 using DOR revenue data and previous model results • Scenario modeling of regional property tax (including commercial, residential, industrial) to 2025 and 2030 using DLS property tax data and previous model results • Historical tax revenue growth by category, in constant USD using Department of Revenue data, deflated using Bureau of Labor Statistics data • Historical budgeted tax composition analysis, using DOR data

Many of the drivers impacting the future of work (such as rising income levels and an aging population) are not new; however, COVID-19 and the substantial shifts in how Massachusetts residents work over the past year have accentuated and accelerated many of these trends (such as e-commerce and the pace of adoption of automation). Moreover, new drivers have emerged (such as spread of remote and hybrid work at-scale and reduction in business travel). The degree of these shifts varies across geographies, industries, and occupations in the Commonwealth – as well as across gender and race. Also, the evolution of many of these drivers is uncertain; it is difficult to determine, for example, how structural the decline in business travel is or whether there may be a surplus of commercial real estate in urban areas or how deeply the adoption of hybrid work from home models will decrease public transportation ridership. With these uncertainties in mind, three potential scenarios were considered based on how these drivers may impact the future for the Commonwealth (Exhibit 2). The scenarios are built on a wide variety of inputs from a vast array of sources and include surveys conducted with business leaders as well as citizens in the Commonwealth to gauge likelihood of adoption of trends as well as validated in interviews with a cross-geography and cross-industry set of business leaders through an Advisory Council established for the purposes of this work.

Exhibit 2: Scenarios studied with assumptions by scenario and sources of assumptions.

Trends		Assumptions by scenario **Scenario A:** Return to pre-COVID-19 levels	Sources informing our models and analyses
1. **Adoption of automation and AI**	Extent of adoption and displacement (varies by occupation)	Midpoint automation adoption scenario (~20% of workers displaced)	• McKinsey Global Institute Automation adoption model leveraging US Labor Department O*NET database • Survey of 800 executives on intention to accelerate automation adoption post-COVID
2. **Shift to ecommerce**	E-commerce adoption	Euromonitor projections, pre-COVID-19 for the same time periods (~30%)	• Euromonitor retail value (Retail Selling Price) projections
3. **Reduced business travel**	Business travel growth recovery	Return to pre-COVID-19 travel growth rates	• Oxford Economics-modeled recovery until 2022 • Oxford Economics historical travel growth rates
4. **Future of office work (for those who can work remotely)**	Incremental office space reduction assumption	0% - return to pre-COVID-19 office space use	• Bureau of Labor Statistics data, Morgan Stanley estimate
	Days eligible workers spend working remotely	1 day per week on average	• Multiple reports including MA Future of Work resident survey, PWC US Remote Work Survey, Real Estate Survey • Refined by MA Future of Work business survey conducted with 223 businesses of different sizes and industries throughout the Commonwealth

Trends		Assumptions by scenario		Sources informing our models and analyses
		Scenario B: Trends continue at levels seen during COVID-19	**Scenario C:** Remote work becomes more permanent	
1. **Adoption of automation and AI**	Extent of adoption and displacement (varies by occupation)	COVID-accelerated automation adoption scenario, 139 occupations with increased automation due to COVID-19 (~25% of workers displaced)		• MGI Automation adoption model leveraging US Dept O*NET database • Survey of 800 executives on intention to accelerate automation adoption post-COVID
2. **Shift to ecommerce**	E-commerce adoption	25% e-commerce adoption by 2024, and 38% e-commerce adoption by 2030		• Euromonitor retail value (Retail Selling Price) projections
3. **Reduced business travel**	Business travel growth recovery	Business travel growth reaches 75% of pre-COVID-19 travel by 2023, and resumes at pre-COVID-19 trends afterwards		• Oxford Economics-modeled recovery until 2022 • Oxford Economics historical travel growth rates
4. **Future of office work (for those who can work remotely)**	Incremental office space reduction assumption	15% incremental reduction in office space due to increase work from home		• Bureau of Labor Statistics data, Morgan Stanley estimate
	Days eligible workers spend working remotely	2 days per week	3 days per week	• Multiple reports including MA Future of Work resident survey, PWC US Remote Work Survey, Real Estate Survey • Refined by MA Future of Work business survey conducted with 223 businesses of different sizes and industries throughout the Commonwealth

The three scenarios considered include: **Scenario A**, in which the trends return to their original trajectory prior to the COVID-19 pandemic; **Scenario B**, in which the trends continue to accelerate as they did during the pandemic; and **Scenario C**, in which hybrid and remote work become more permanent, while the other trends continue to accelerate as they did during the pandemic. Our approach was not to look at every possible scenario, but rather to focus on three viable scenarios and their associated implications for the Commonwealth of Massachusetts.

Informed by business surveys and discussions with experts and business leaders, this analysis also identifies eight insights that are most likely to have a meaningful impact on the Commonwealth. These include (1) reduced demand for office real estate as workers spend more time in residential areas due to hybrid work; (2) the need for affordable, flexible, childcare options that cater to the needs of the future; (3) ridership declines in public transit (particularly commuter rail) (4) reduced business travel; (5) a need for reskilling at an unprecedented scale and pace; (6) slowing population growth; (7) greater equity challenges; and (8) capacity-constrained housing options that cater to the needs of a diverse population.. In the following sections, this report explores each of these insights in detail. Furthermore, the Commonwealth is not homogeneous and the challenges and opportunities from the future of work will be experienced differently across the state. The report explores how each implication may differ regionally across the Commonwealth, categorized across different regional archetypes.



03
TOP EIGHT INSIGHTS FOR THE COMMONWEALTH

Based on more than 60 analyses, multiple surveys of business leaders and consumers in the Commonwealth, and discussions with Commonwealth leaders, eight insights stand out as most likely and significant, regardless of scenario. These eight insights can be categorized into several themes.

Changing ways of working – such as hybrid and remote work – may shift the center of gravity away from the urban core, further reinforced if business travel decreases.

1. More time will be spent in residential areas as per our modeling up to 32% of workers in the state could shift to remote work 1-3 days per week, impacting the need for office space, surrounding infrastructure, and creating placemaking opportunities in residential areas. This will also impact housing – where it is needed, as well the type of housing options available to cater to a diverse population.

2. Changing childcare needs (including location of childcare and type of childcare) will require childcare programs to rethink their business models in order to adapt to the changing needs of working parents from hybrid and remote work. Available childcare that is accessible, flexible, affordable and high quality will become even more acute – both for the state's attractiveness as a place to live and for enabling parents, particularly mothers, to rejoin or enter the workforce.

3. Transit usage is likely to decrease as commuters opt to increasingly work from home in a remote/hybrid world. Modes that rely heavily on work-trips (particularly commuter rail), will be most affected and see their business models challenged.

4. Reduced business travel is expected to impact Massachusetts' food, accommodation and hospitality sectors, as well as other businesses reliant on business travel. Boston Logan is expected to be particularly hit, due to the higher proportion of business travelers compared to the national average and discretionary funding from airport parking may be severely diminished.

The pace, scale, and breadth of reskilling needed for job transitions must be much greater than before the pandemic; creating the workforce of the future will require extensive, thoughtful preparation.

5. There is an urgent and unprecedented need for reskilling, as accelerated automation and digitization and demand for talent from growing sectors reshape workforce needs.

6. Similarly, there is a need to anticipate and prepare for potential slowing of population growth, as international immigration is reduced by the pandemic and domestic migration shifts to lower cost locales.

The pandemic has already exacerbated pre-existing inequities for many – and as we look ahead the future of work will not be experienced equally across the Commonwealth.

7. In particular, unemployment created by the pandemic could intensify existing inequities for women, those at lower income levels, people of color and those with less education. These segments are expected to fully recover later than the rest of the population and will also likely be disproportionately affected by future of work trends such as automation and digitization.

The risk of future job growth moving outside Massachusetts is rising due to the high costs of living and doing business in the state

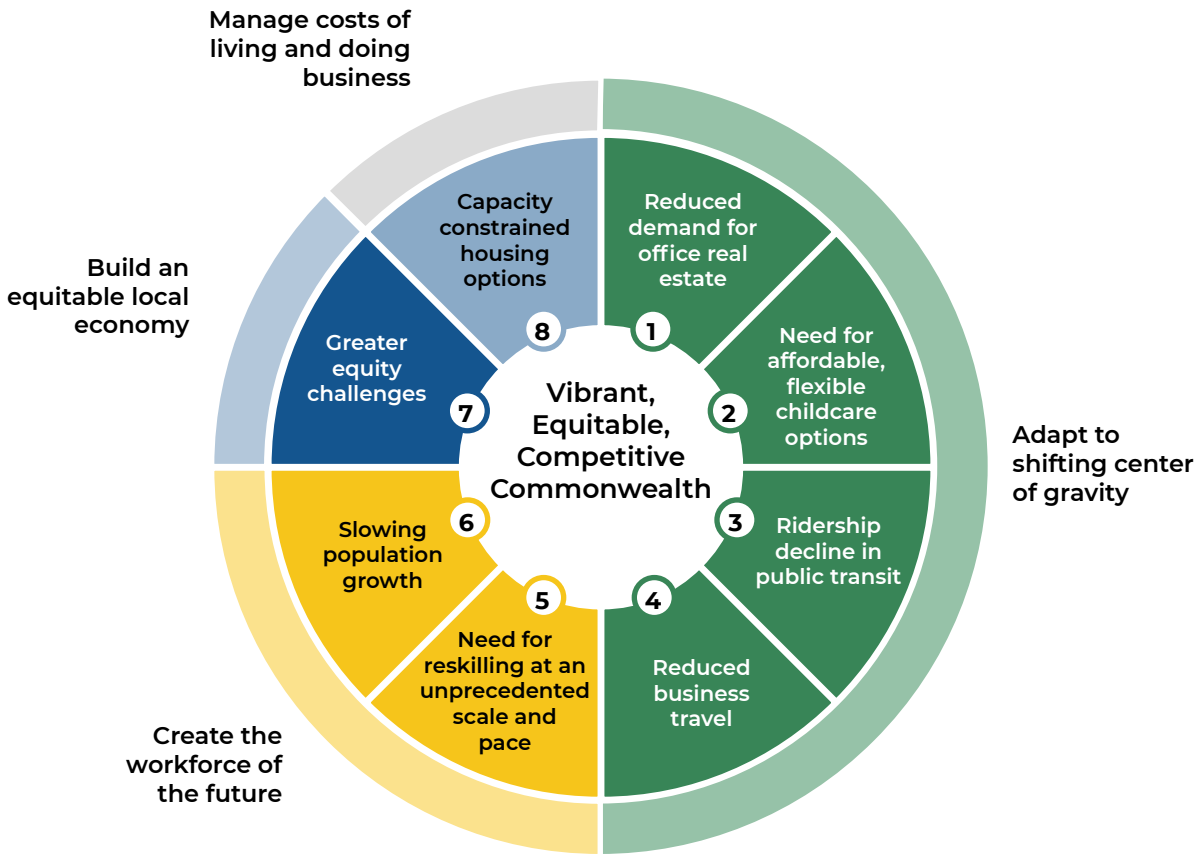
8. A challenge even before the pandemic,

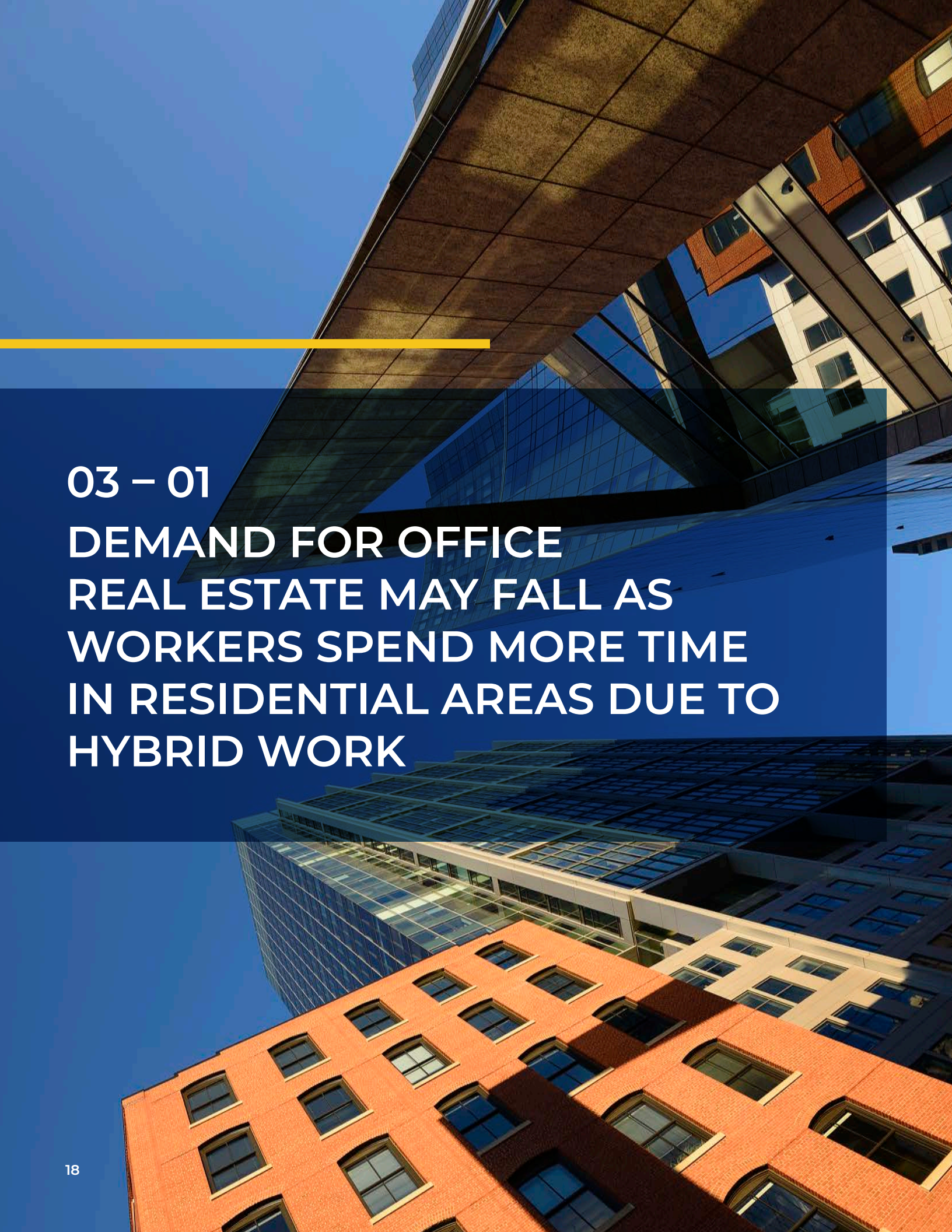
creating housing that is accessible and affordable becomes even more an imperative as hybrid and remote work expands and allows workers to move farther away from their places of work. This will also lead to employers competing in a wider geographic scale on expansion and new business building.

While costs of doing business were not explored in detail in this report, business leaders raised the high costs of doing business (through increased taxes, regulations, and operating costs) especially when hybrid and remote work offers additional flexibilities to employers and talent as a potential significant barrier that could discourage future business growth in the state.

While these eight insights touch many different aspects of work across the Commonwealth, they may also be opportunities to invest in creating a more vibrant, equitable, and competitive Commonwealth to sustain prosperity in the decade to come. Each of these eight insights, and their differing impacts across regions, are explored in the next sections.

Exhibit 3: Eight insights shaping progress toward an equitable, vibrant Commonwealth





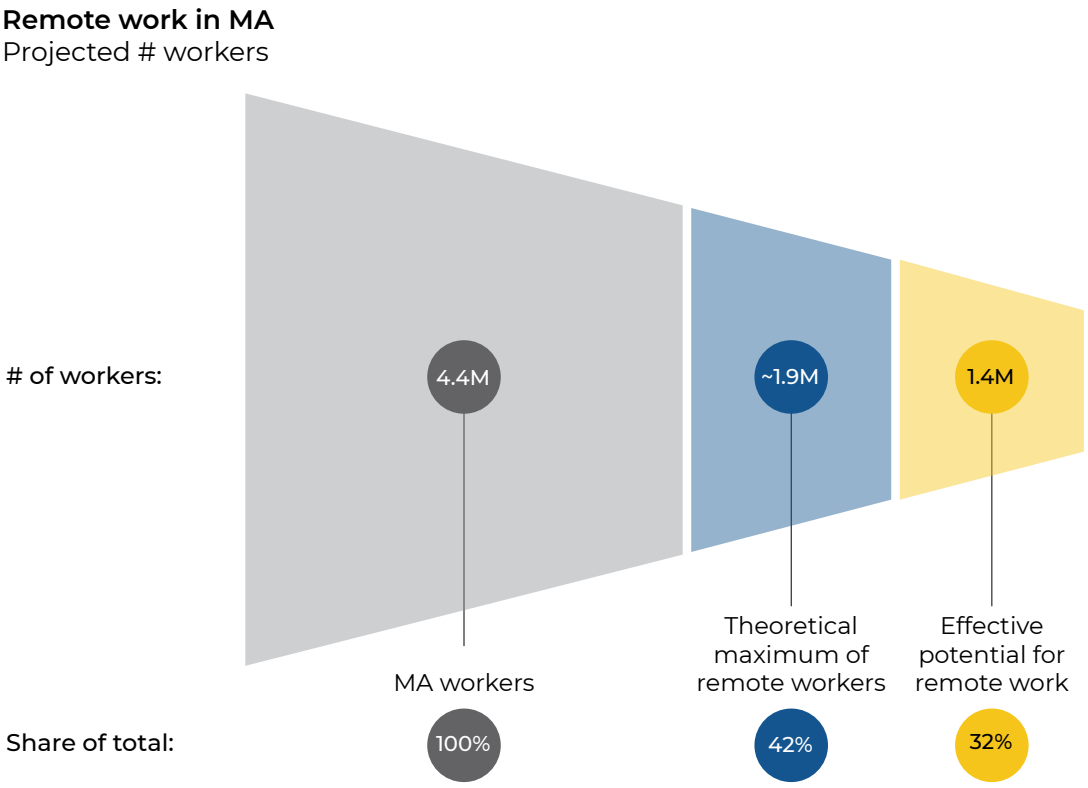
03 – 01

DEMAND FOR OFFICE REAL ESTATE MAY FALL AS WORKERS SPEND MORE TIME IN RESIDENTIAL AREAS DUE TO HYBRID WORK

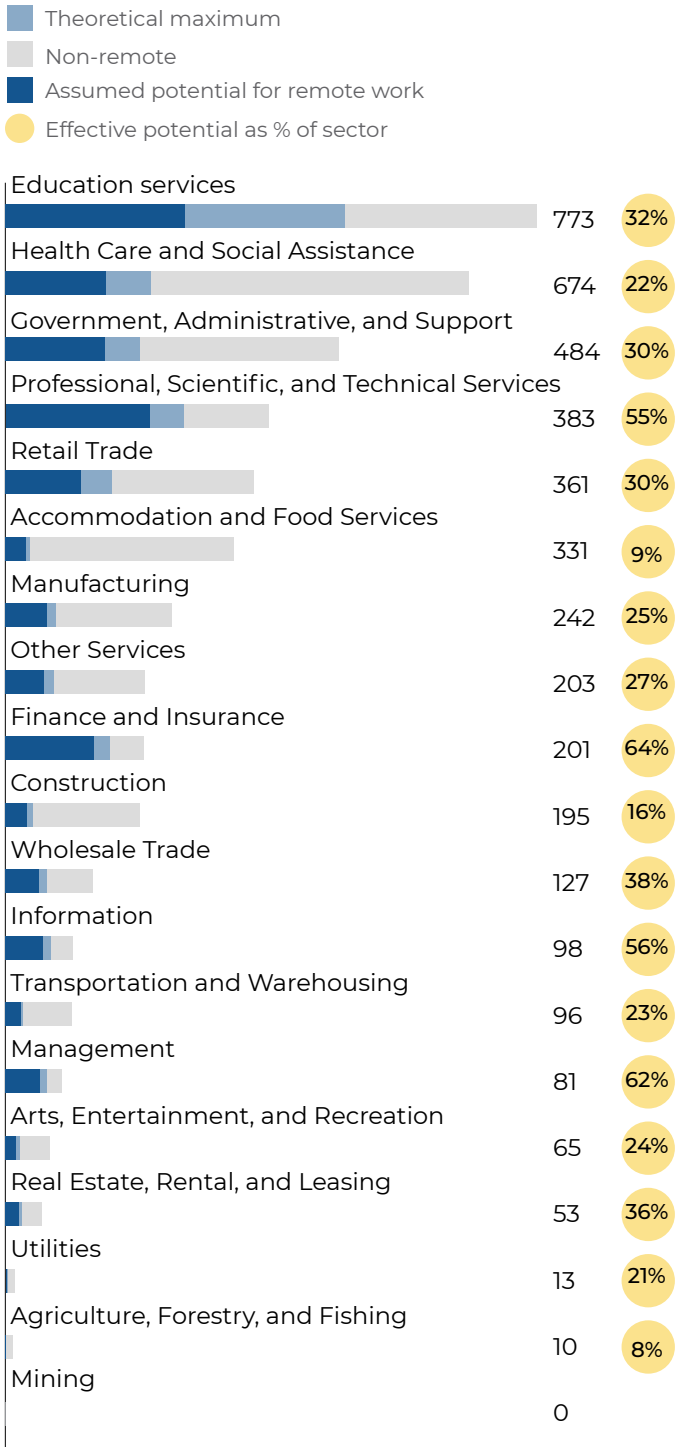
Nine out of ten organizations will be combining remote and on-site working, according to a global McKinsey survey of 100 executives across industries and geographies as employers and employees return from the pandemic.[21] On similar lines, 52% of employees globally would prefer a more flexible working model after the pandemic is over.[22] Massachusetts has been one of the top states for remote/hybrid work, as approximately 40 percent of adults live in households with at least one adult who worked remotely due to COVID-19 as of April 2021.[23] A task-time analysis and examination of Massachusetts sectors and occupations reveal that up to 32 percent of workers, or 1.4 million, could effectively work remotely[24] (Exhibit 4). If the trend toward remote and hybrid work continues, it will likely affect the commercial real estate market, as well as geographic retail demand and employment. Small businesses that rely on commuter foot traffic could be particularly hard-hit.[25]

Hybrid and remote work models may drive down demand for office real estate. Office rent in Boston declined by 2.5 percent during the pandemic, and vacancy rates increased by 2.4 percent year on year in March 2021 , about a 30% increase.[26]

Exhibit 4: Up to 32% of Massachusetts' workforce may be able to work remotely



Remote work potential by sector in MA
projected # workers, '000s



Job types most likely to work remote include: **Computer** and **Mathematical** occupations, **Business and Financial** Operations, Management, Office and **Administrative support,** and legal occupations

Remote education services includes **university administrative staff** occupations; analysis does not assume that effectiveness and quality will remain comparable with a greater shift to remote

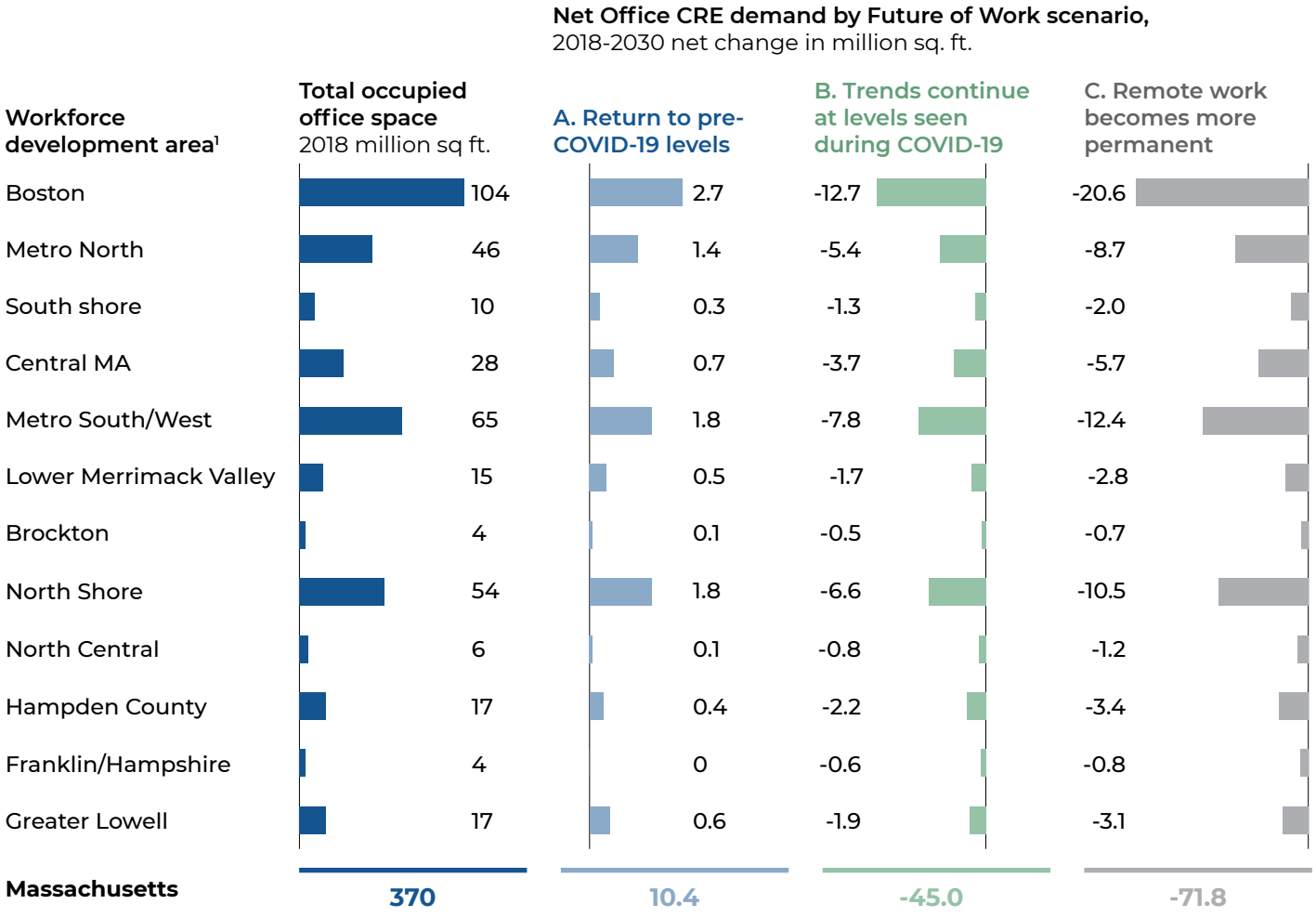
1. 23% of remote workers said they would relocate in next 12 months

Source: McKinsey Global Institute analysis, "The Future of Work after COVID-19", April 2021

Additionally, about 36 percent of respondents to the Massachusetts Business Survey indicated that they expect to reduce their owned or leased real-estate footprint over the next two years. But how hybrid and remote work will play out in practice is still uncertain; there is expected to be a period of experimentation and learning before this trend becomes clear. Our analysis shows that office real estate demand could fall by 10 to 20 percent by 2030 (Exhibit 5) if the trends toward hybrid and remote work as well as de-densification continue (Scenarios B and C), with Class B and Class C office space likely experiencing the biggest impact. This effect may be partially offset by changes in real estate use – for example, the expansion of lab conversions as companies concentrate on in-person uses for existing commercial space.

Reduced foot traffic from office commuters may negatively affect surrounding areas. Office-adjacent sectors (such as food services, retail and entertainment services catering to office workers) may see demand decline, impacting their businesses. In a survey of Massachusetts businesses, 26 percent responded that they may need to move to a different area, and 13 percent said that they may need to close their business if remote work continues.[27] This pattern will most likely affect smaller businesses; such businesses in Boston Financial District, Seaport, Beacon Hill, Back Bay, and Cambridge were facing revenue losses of about 40 percent in May 2021, for example, when compared to their revenues in January 2020.[28] Whether COVID-19 patterns related to remote and hybrid work actually result

Exhibit 5: Net demand for office real estate could drop by as much as 20% in 2030 if remote/hybrid work trends accelerate



1. Berkshire, Bristol, Cape & Islands, and Greater New Bedford WDAs not covered in CoStar data

Source: CoStar Data, ADP data Jan 2021 to Jan 2020, UMASS-Donahue Population projections, McKinsey Global Institute analysis, "The Future of Work after COVID-19", April 2021

in reduced foot traffic and increased office-space vacancy is still unclear, so this trend should be monitored further to understand its longer-term implications on the Commonwealth.

Conversely, with more people spending time in residential areas, some spending and retail activity may move to residential areas. Before the pandemic, about 250,000 commuters flowed into Boston from surrounding metro areas daily (Exhibit 6). If 32 percent of these commuters curtail their commuting habits, then some 80,000 workers may spend more time in their local residential areas.[29] This change could potentially push about 5,000 retail jobs out of the Boston area while increasing vitality and business activity in residential areas and local downtowns.

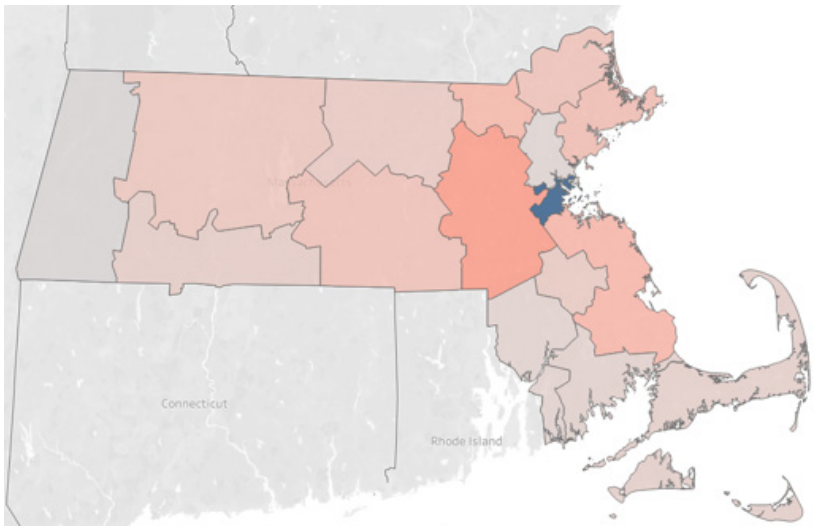
Additionally, the rising popularity and feasibility of remote work may allow employers and employees to have more flexibility in where they choose to locate. A Massachusetts Business Roundtable survey found that after COVID-19, members expected that almost three times the previous proportion of their employees affiliated with Massachusetts-based operations or locations

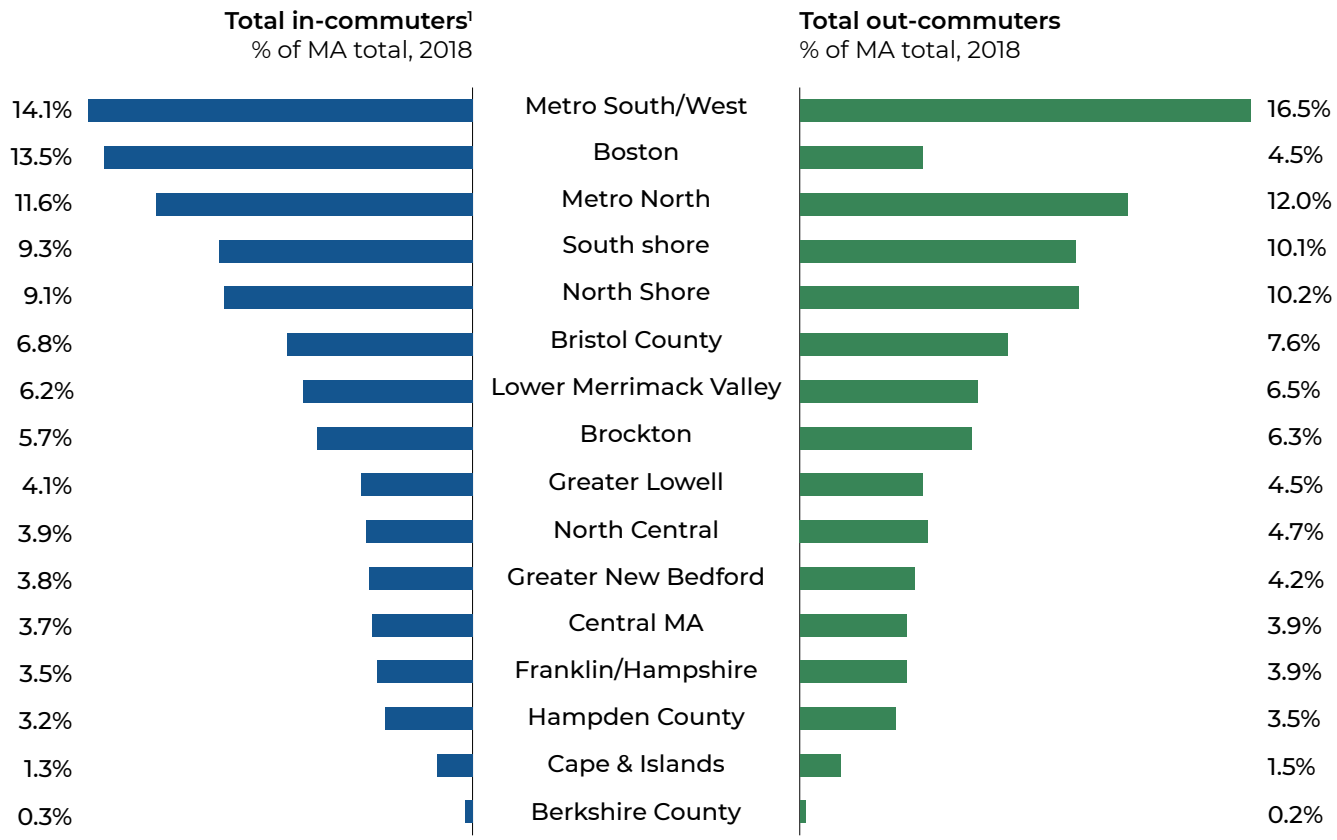
would work out of state (an increase from 5 percent to 15 percent).[30] Moreover, members of the Advisory Council noted that increased opportunities to work remotely have lowered barriers to moving or expanding operations and employment into other states. This potential shift away from Massachusetts could disrupt employment growth and business vibrancy.

Exhibit 6: Boston receives ~250,000 net commuter inflows from surrounding metro areas, particularly Metro South

Net receivers vs senders of commuter flows
2018 inflows – outflows, thousand worker

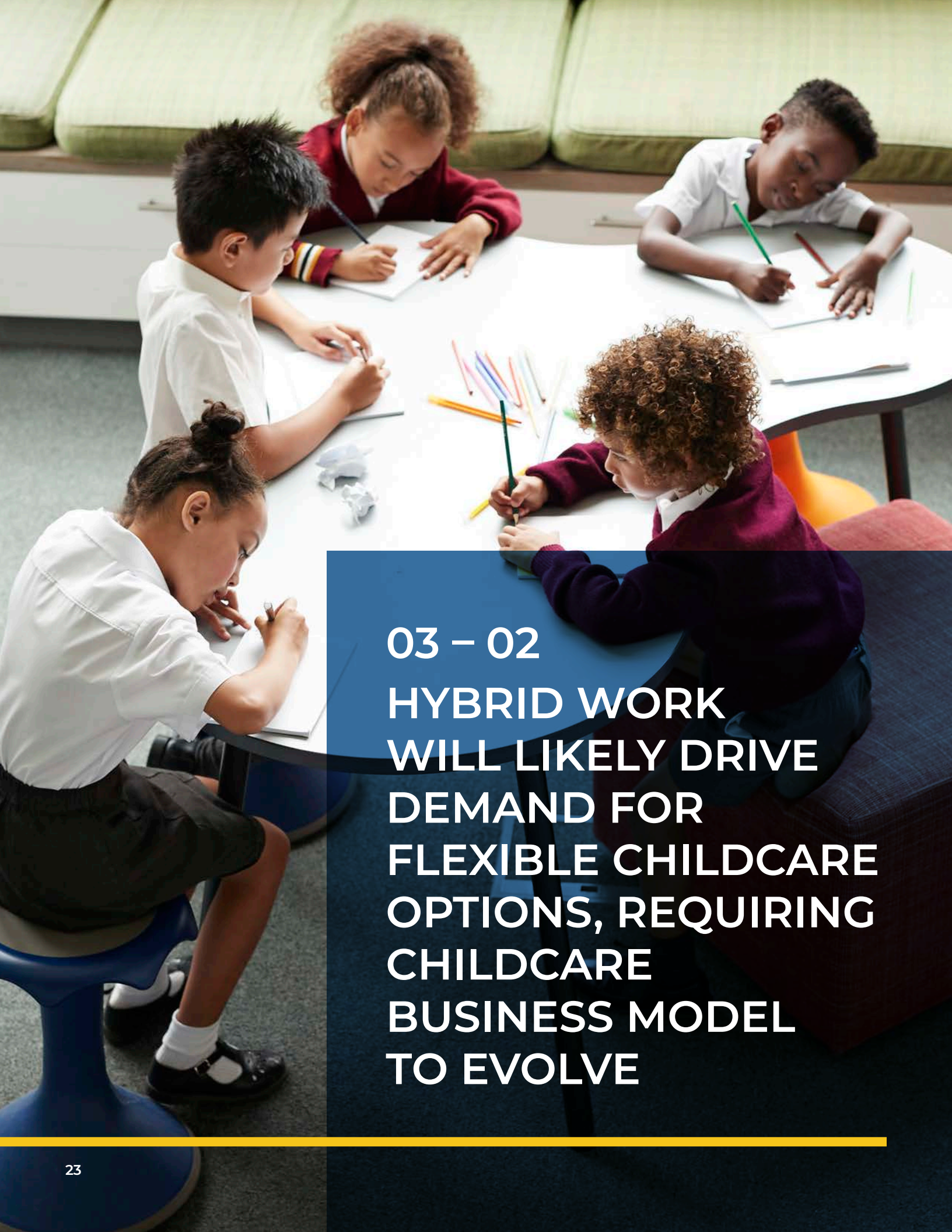






1. Includes in-commuters from other states. Bases between in and out-commuters are different

Source: American Community Survey 5-year estimates for 2018



03 – 02

HYBRID WORK WILL LIKELY DRIVE DEMAND FOR FLEXIBLE CHILDCARE OPTIONS, REQUIRING CHILDCARE BUSINESS MODEL TO EVOLVE

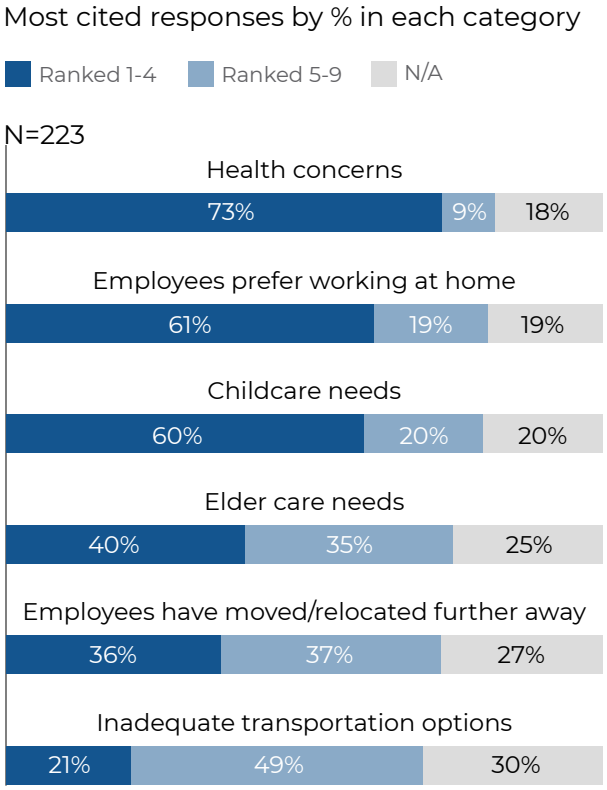
The type of childcare needed may change after the pandemic. Early surveys done by the Massachusetts Department of Early Education and Care (EEC) show that parents in hybrid work models may need more sporadic, part-time day care for the one to two days per week when they go into the office and that not as many families will seek five days of full-time care as they had before the pandemic. Per our surveys with Commonwealth business leaders, most employers (in occupations capable of supporting remote work) are planning to adopt a hybrid model and employee preferences have shifted since before the pandemic, with 63% of employees now preferring hybrid or remote work models compared to just 38% pre-COVID-19 and greater than 10 percentage more than what is observed in global surveys. The location of childcare needs may shift; employees may seek childcare close to home rather than close to the workplace as they spend more days working from home. Increased demand for part-time childcare and changes in location preferences may further challenge the sustainability and viability of existing childcare models. Addressing this challenge will be critical as the lack of available, adequate childcare is one of the top barriers to getting workers back to work (Exhibit 7). Childcare is also more relevant to getting more women back to work. Decades of research show that women do significantly more housework and childcare than men—so much so that women who are employed full-time are often said to be working a "double shift."[31] Increased childcare burdens from the pandemic have impacted women disproportionately.[32] Innovation will be critical to meeting the evolving needs of families and ongoing workforce challenges in delivering affordable childcare. EEC is planning to use part of the federal stimulus funds for grants to childcare providers to foster innovation to meet the evolving needs of working families in Massachusetts.

In addition, in 2019, Massachusetts ranked amongst the most expensive states in childcare costs, yet also ranks as having the highest quality childcare programs.[33] In an independent assessment of state childcare, Massachusetts was ranked amongst the top states on quality based on percentages of National Association for the Education of Young Children (NAEYC) and National Association of Family Child Care (NFCC) accredited facilities.[34] As of 2020, the average cost of childcare for a Massachusetts family with two children ages four or below was about 39 percent of the average household income.[35] In 2019, the state faced a severe shortage of childcare supply, with an estimated workforce gap of 25,000 to 30,000 workers to care for children ages zero to five.[36] To compound matters, childcare center capacity was reduced by 13 percent in 2020 due to COVID-19. EEC estimates that in 2021, childcare capacity will return to ~90 percent of pre-COVID-19 capacity levels. Our modeling shows that in order to eliminate the childcare availability challenges facing working parents in Massachusetts through 2030, a large influx of childcare workers will be necessary.

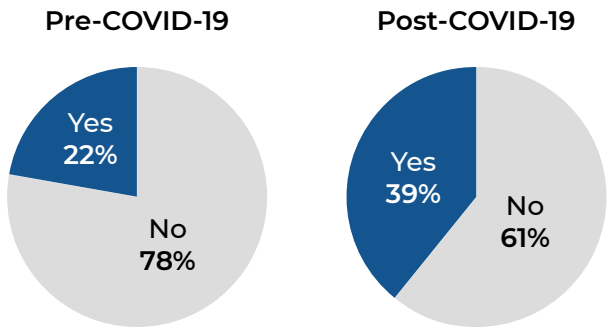
Employers are beginning to recognize the need to support workers in finding flexible, affordable childcare options. In the Massachusetts Future of Work business survey, the number of respondents considering offering childcare support in the future increased by 72 percent from pre-COVID-19 numbers (from 22 percent to 39 percent of respondents).[37] While helpful, such benefits and programs alone will not solve today's gap in childcare capacity or shortage of childcare workers. There is a unique opportunity for a) EEC to help childcare programs rethink their business models to adapt to the changing needs of working parents (given hybrid work and a move from spending time in urban cores to more residential areas) and b) employers to also innovate and redesign the workday in ways that provide parents more flexibility, such as shifting away from the standard 9-5 workday and enabling working parents to plan around school drop off and pick up times. Doing so could create a more inclusive work

Exhibit 7: Childcare needs are a top barrier to getting workers back into the office, according to survey respondents

Top perceived barriers to get employees back in the office[1]



Employers offering or considering to offer childcare (N=223)[2]



1. If you have employees working remotely and would want some or all to return to working on location/in an office for at least some of the time vs. remotely, what do you believe to be the biggest barriers that your employees would face in returning to work in person?
2. Childcare support - Check yes if you have any of the following benefits pre-COVID or if you are anticipating offering them to some or all employees post-COVID

Source: MA Business Survey, April 2021

environment that encourages greater workforce participation, especially amongst women who historically have disproportionately left the workforce due to childcare concerns.

As of April 2021, in Massachusetts, the labor force of female workers dropped by 5.1 percent relative to pre-pandemic levels, compared to 1.7 percent for male workers. Female employment recovery to pre-COVID-19 levels is expected to lag behind males' recovery rates by 18 months.[38] This could potentially contribute to workforce shortages in high-growth jobs that tend to be staffed more by women (such as nurses, home health aides and teaching assistants) and may exacerbate existing inequities. Female employment recovery is expected to accelerate once K-12 schools go back to being full time in-person, yet access to affordable childcare for ages 0-5 and before/after-school care for school-aged children is likely to still remain a barrier to workforce participation. In the Massachusetts Future of Work Survey, 13 percent of respondents with children said they might resume working or enter the workforce if they had access to additional childcare.[39] Conversations with business leaders revealed that the combined challenges of childcare and housing affordability make it more difficult for employers to attract talent to Massachusetts.

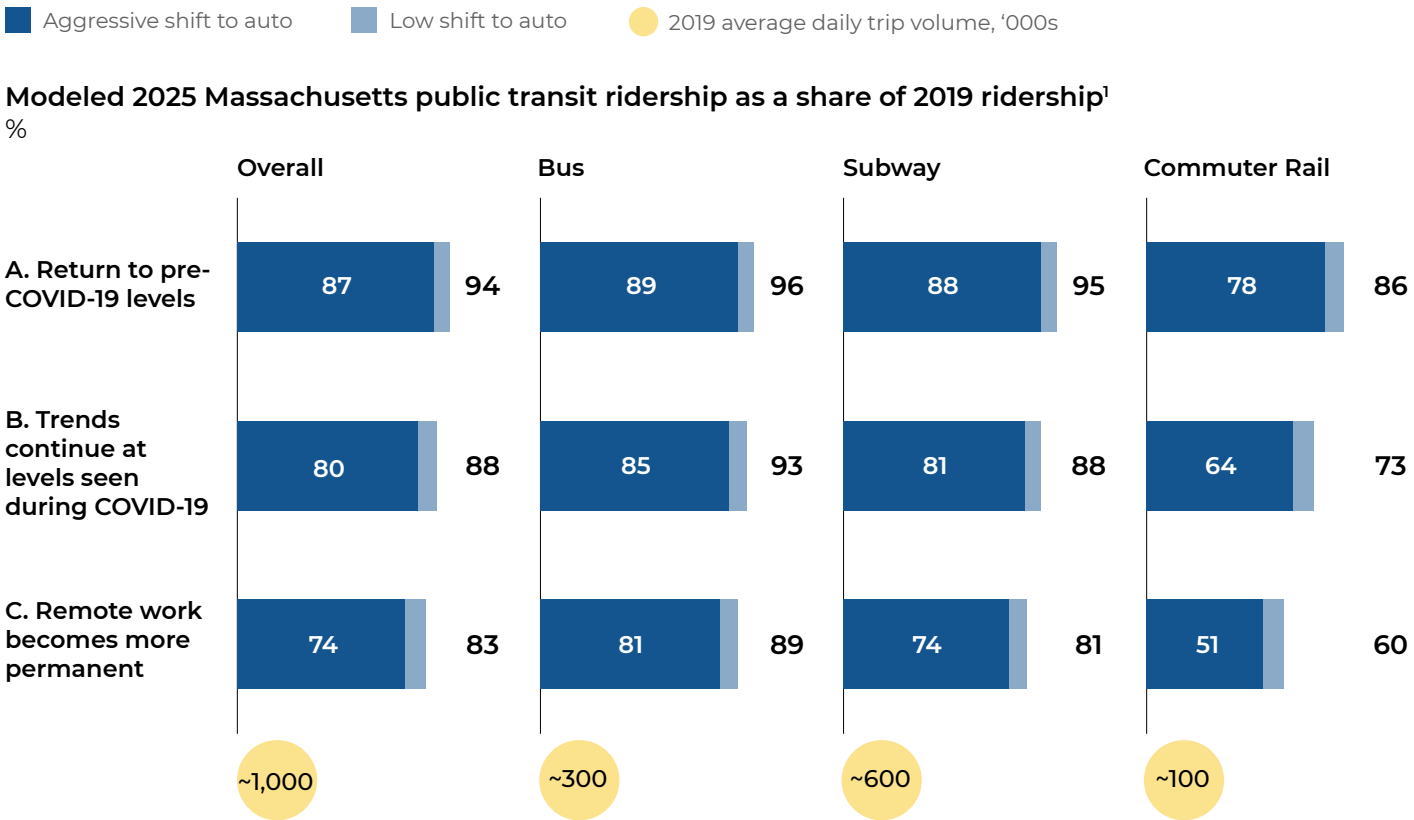


03 – 03

PUBLIC-TRANSIT RIDERSHIP IS EXPECTED TO FALL, WITH THE STEEPEST DECLINE LIKELY IN COMMUTER RAIL

Across US transit systems, ridership declines have been steepest in systems that have a higher share of work trips, and whose ridership base has a higher share of riders who are able to work from home. As a result of these two factors, commuter rail ridership has fallen more and has been slower to return than subway ridership, which in turn has been slower to return than bus ridership. This pattern is seen in the Boston metropolitan area as well: in January 2021 ridership was down to about 15 percent of pre-pandemic levels (versus around 45 percent for bus ridership and about 20 to 30 percent for subway ridership).[40] Public transit ridership recovery by 2025 has been modeled based on two core changes, 1) the amount of lost trips (for example, trips that are no longer happening) for both work trips (due to increase in work from home) and non-work trips (for example, e-commerce replacing a shopping trip), as well as 2) mode shift to either automobiles or non-automobiles (for example bicycle trips and walking) from lapsed transit riders using alternatives they have grown accustomed to using during the pandemic. This modeling shows that commuter rail will be most strongly affected by such changes; some 15 to 50 percent of its pre-pandemic ridership base could be lost over the long-term, depending on the scenario and the percentage of commuters who continue to work from home (Exhibit 8). Less impacted will be bus ridership, with a potential loss of 5 to 20 percent; followed by subway ridership, which could sustain a loss of 5 to 25 percent.

Exhibit 8: Up to 50% of commuter rail ridership may be lost by 2025 if remote/hybrid work becomes more permanent and commuters sustain shift to transportation by auto



1. Methodology and definitions detailed in appendix

Source: American Community Survey, National Transit Database

Commuter rail represents 31 percent of Massachusetts Bay Transportation Authority's (MBTA's) operating revenues ($239 million in 2019). A 15 to 50 percent fall in ridership, therefore, could mean a 5 to 17 percent decline in overall MBTA operating revenue, and an overall decrease in farebox recovery ratio, from 44 percent to 36 percent.[41] Services and contracts for commuter rail were already challenged prior to COVID-19 due to operating losses and slow growth in ridership. Future-of-work challenges could further compound these issues and pose additional challenges to the commuter rail business. The sustainability of the current business model for commuter rail may then come into question, as it relies on selling monthly passes to a narrow market of riders who are headed to either North or South Station, during peak hours.

According to our modeling, remote/hybrid work could decrease peak-hour automobile vehicle miles traveled by around 2 to 9 percent (Exhibit 9). However, these effects may be counterbalanced by less efficient "trip-chaining" (i.e. making multiple single-purpose trips, versus linking work and non-work trips) and an increase in home deliveries (as e-commerce is expected to make up 38 percent of total retail spend by 2030).[42] Additionally, the Massachusetts Port Authority ("Massport") observed a return of regional traffic in the Sumner Tunnel and Ted Williams Tunnel, with traffic at or exceeding pre-pandemic 2019 levels for non-airport traffic. Massport is also seeing an increase in vehicle trips per passenger post-pandemic, due to reduced transit and shared-ride use. The peak time of day and concentration of travel may also change, with hybrid work leading to reductions in peak-hour congestion on the arterials leading to Boston Central Business District. Specifically, congestion may move from being concentrated in the peak, headed into and out of Boston, to remaining steady all day, and increasing in suburban areas.

As more commuters choose to use automobile for the 2-3 days a week when they go into the office instead of using public transit, there may be a shift from ridership across all modes to transportation by automobile representing 12-14 million additional annual auto trips. This may drive up congestion, pollution (including NOx, CO2 and PM2) and fatalities, while also intensifying pressure on downtown parking. These effects not only have safety and non-mobility implications but also could threaten the state's ability to reduce greenhouse gases and emissions.

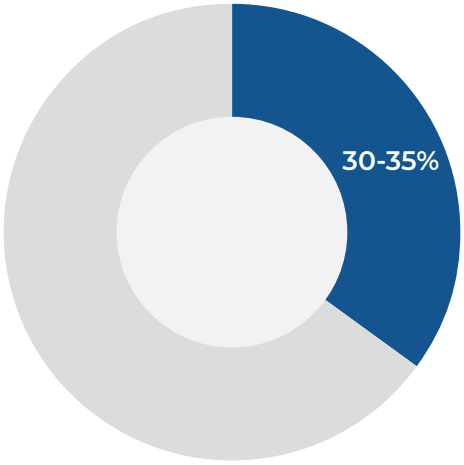
Additionally, road traffic has proven more resilient than transit ridership throughout the pandemic. Road trips, according to the Massachusetts Department of Transportation, have recovered to 85 percent of pre-pandemic levels, while public transit (subway, commuter rail and bus) remained at about 30 percent of pre-pandemic levels in February of 2021.[43] This may be because work trips represent a smaller share of road trips than transit trips (about 17 percent[44] of road trips versus an estimated 50 percent of transit trips). Further, the pandemic engendered negative views of transit among consumers,[45] and e-commerce and the associated freight traffic increased.[46]

A final finding has been that the number of vehicle miles traveled (VMT), a measurement of traffic volume, has recovered more strongly in suburban areas; for example, traffic recovery on the western section of the Massachusetts Turnpike has been more robust than on the Boston extension. This may increase over time as arterial commutes are replaced by more localized, residential traffic as remote and hybrid workers stay closer to home for shopping and entertainment.

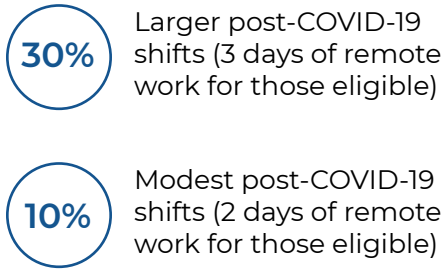
The shift of traffic to local surface roads has additional implications. The "15-minute city" concept (defined as an ideal geography in which most human needs and desires are located within 15 minutes of travel) may become increasingly attractive as communities seek to mitigate surface

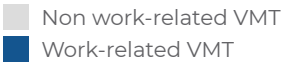
Exhibit 9: A 2-9% reduction in vehicle miles traveled is possible due to remote and hybrid work trends, but other factors could counterbalance this shift

Work-trips as a percentage of vehicle miles traveled, 2017



Work commute trips that could be lost due to remote work[1]





~2-9% potential reduction in total vehicle miles traveled from remote work impact (all else equal)[2]

1. Based on commuter industries
2. Decrease in auto usage for commuting likely to be be larger than any mode shift from transit to auto, however does not include other behavioral change impacts like increased travel from road trips or visiting family

Source: ACS, National Report on Commuting Pattern and Trends in America, MA Resident Survey April 2021

road congestion. Similarly, placemaking (defined as planning, design and management of public spaces such as creation of community parks and art installations), suburban retrofitting (such as redevelopment/urbanization to increase density and walkability), and downtown densification will likely take on new importance, making land use and transportation design increasingly interdependent. Demand for bike/pedestrian/anywhere-to-anywhere infrastructure will rise.

An increase in suburban congestion and VMT could likewise lead to an increase in CO2 emissions and accidents on surface roads, thus eroding residents' quality of life and safety. Finally, the demand for electric vehicles (EV) and charging stations may rise as EV costs decrease, and residents shift to short-range trips (since EVs often have only short ranges of travel) and charge their vehicles closer to home.



03 – 04

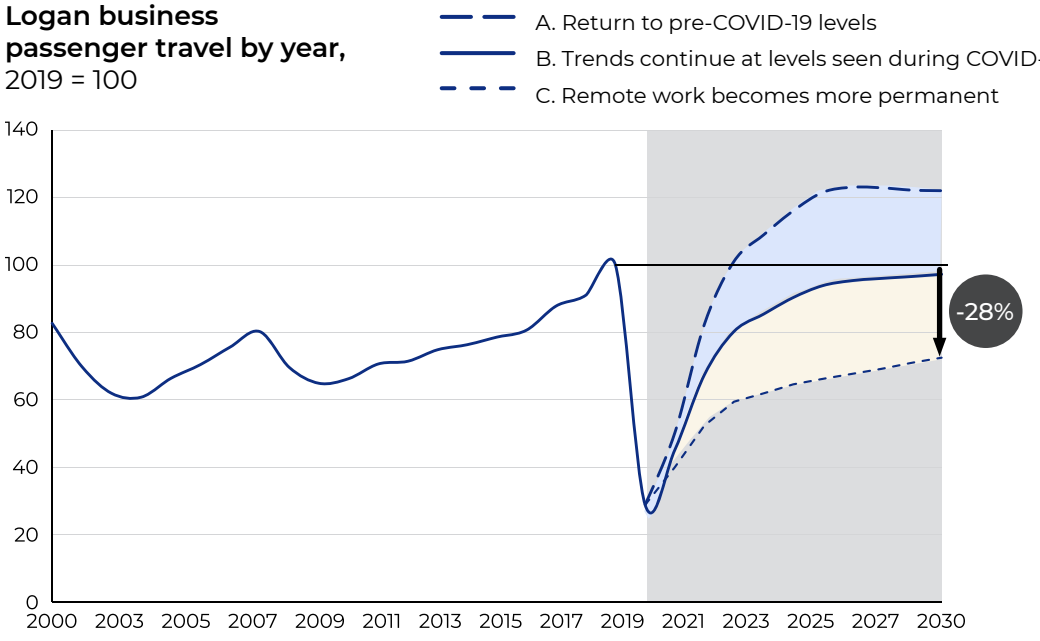
BUSINESS TRAVEL MAY BE STRUCTURALLY REDUCED FROM PRE-PANDEMIC LEVELS, WHICH COULD IMPACT THE HOSPITALITY AND AIRLINE INDUSTRIES AND HAMPER MASSACHUSETTS' COMPETITIVENESS

A structural disruption in the way companies approach business travel could cause the number of business passengers to Boston Logan International Airport to decline by up to 30 percent (Exhibit 10). For example, behavior changes sparked by the pandemic – particularly the reduction of intra-company meetings/trainings – may reduce airport traffic in the long term, as would an ongoing drop in professional services travel. During the pandemic, many companies realized that they could remain productive without the level of travel they had pre-pandemic and may continue to curtail travel to meet 2030 carbon emissions commitments.[47] According to the Massachusetts business survey, about 50 percent of respondents observed a reduction in business travel for a wide variety of purposes. That said whether the decline in business travel is long-term and/or a structural trend remains to be seen. The shift should be monitored further over the next couple of years to fully understand its long-term implications for the Commonwealth.

If a substantial (up to 30 percent) reduction in business travel holds true for the Commonwealth, many business hubs will be affected. Boston is particularly dependent on business travelers, which made up about 40 percent of Logan International Airport's passenger flows in 2019[48] (compared to the US average of 20 percent[49]). This change could result in a net decline of 7 to 15 percent of total airport travelers by 2030 – or as much as 5 million fewer business travelers per year into the state. Business travel tends to be disproportionately profitable for airlines, with 18 percent of the travelers accounting for 60 to 70 percent of revenues.[50] It is likewise disproportionately significant for airport economics, as 60 percent of parking customers at Logan Airport are business travelers.[51]

A long-term decline in business travelers will likely have the greatest economic impact on long-haul international flights or on domestic, business-heavy routes like BOS-LAX, BOS-SFO, BOS-IAH.[52] These routes may become less frequent or require changes in aircraft; some may even become unprofitable.[53] If connectivity declines, Boston's attractiveness to businesses and residents may suffer over the long term.[54]

Exhibit 10: Potential for reduction in business travel of up to 28% by 2030

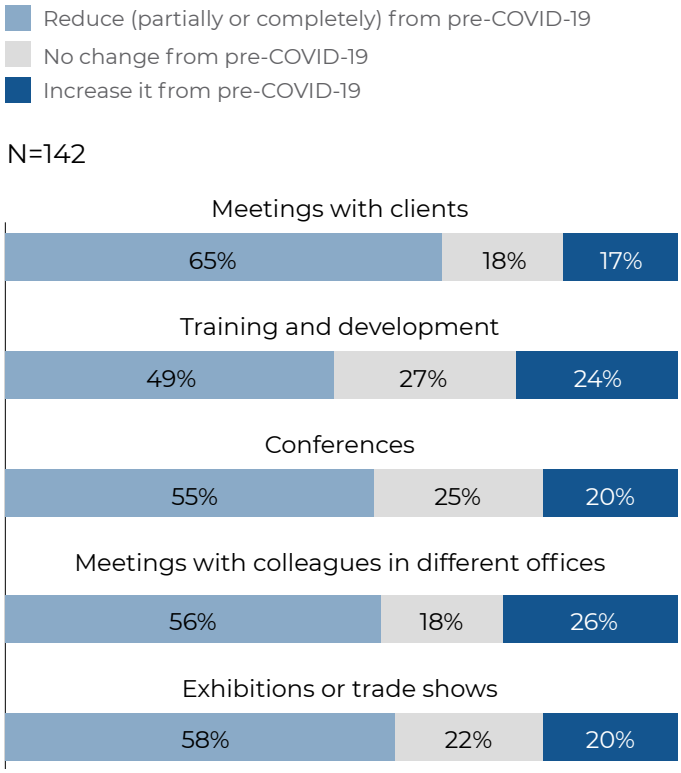


In 2023, when leisure travel is forecasted to fully recover, total air travel could remain 7-15% below pre-pandemic levels if business travel remains low

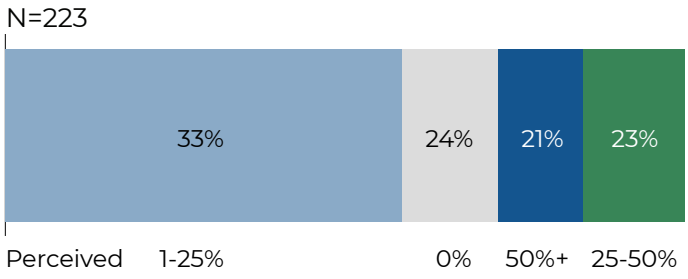
Source: Massport, Globaldata, Oxford Economics

Exhibit 11: Reduced business travel may cause businesses to lose some of their high-value customers

Intention to increase/decrease business travel by business trip purpose post-COVID-19[1]



Perceived % of pre-COVID profits at risk due to reduced business travel[2]



Employers suggesting their business is at risk are **primarily urban** (Boston and Metro areas or outside of MA[3]), **small-mid size (<100 employees)** businesses, with disproportionate impact on sectors like **Finance and Construction**

1. How are you planning to change business travel habits 12 months from now? (N = 142 respondents who stated that their employees travel for business)
2. What percent of your pre-COVID profit may be at risk due reduced business travel?
3. Or didn't report main primary location

Source: MA Business Survey, April 2021

In addition to the effects of connectivity changes, the surrounding business-travel ecosystem could be significantly impacted. Convention centers, hotels and the hospitality sector in general, as well as adjacent food and retail centers, may see profits drop as travelers dwindle. The pandemic had a sizable impact on the hospitality and food-services sector, which had lost about 100,000 jobs in Massachusetts as of March 2021. While this sector is showing a recovery of about 50 percent, it is still lagging behind other sectors' job recovery rates (total Massachusetts employment recovery already reached 78 percent in April).[55] Up to 21 percent of businesses surveyed in the Massachusetts Business Survey lost as much as 50 percent of their profits due to reduced business travel[56] (Exhibit 11). This may also mean that discretionary funding from airport parking will be negatively impacted due to reduced business travelers (who comprised 60% of Logan Airport parkers[57]).



03 – 05
RESKILLING MAY BE REQUIRED AT AN UNPRECEDENTED SCALE AND PACE

Employment demand in 2025 and 2030 is expected to be marginally higher than in 2018 (absent other macro-economic shocks); however, sectoral and occupational shifts are likely to occur in the composition of jobs, requiring job transitions and reskilling. Per our modeling, across all scenarios, approximately 300,000 to 400,000 individuals in the Commonwealth will need to transition to different occupations or occupational categories over the next decade. In Scenario B, about 75,000 individuals will have to jump multiple wage levels over the next decade to become employable, primarily due to faster adoption of automation. COVID-19 propelled a more rapid adoption of automation and of artificial intelligence (AI)[58], as the deployment of new technologies helped to accommodate surges in demand and reduce workplace density. Many of these technologies also allowed for reductions in physical proximity, frequency of interactions, and exposure to strangers, thereby boosting the safety of workers and customers during the pandemic.

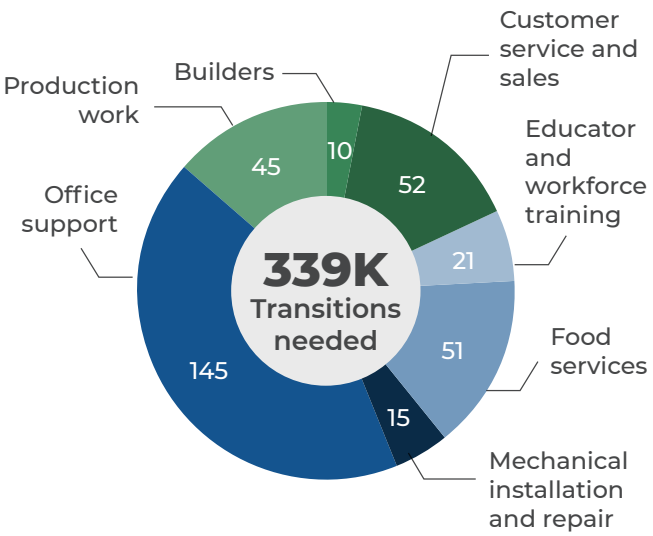
The effects of this change on the Commonwealth will not be even across industry, occupation, or region. Per this analysis, healthcare, professional, scientific and technical services are expected to see the greatest gains, while retail, finance, insurance, hospitality, and food services are likely to experience the greatest job losses. Across all sectors modeled in Scenario B, occupations such as office support (approximately 145,000), customer service (about 52,000) and food-service workers (approximately 51,000) will likely see the most significant gross displacement (at about 17 percent, 6 percent, and 5 percent in net reductions respectively) and require the most reskilling (Exhibit 12).

Exhibit 12: A majority of people who need to transition to new jobs/sectors may also need to reskill to new occupation categories across scenarios; illustrated for scenario B

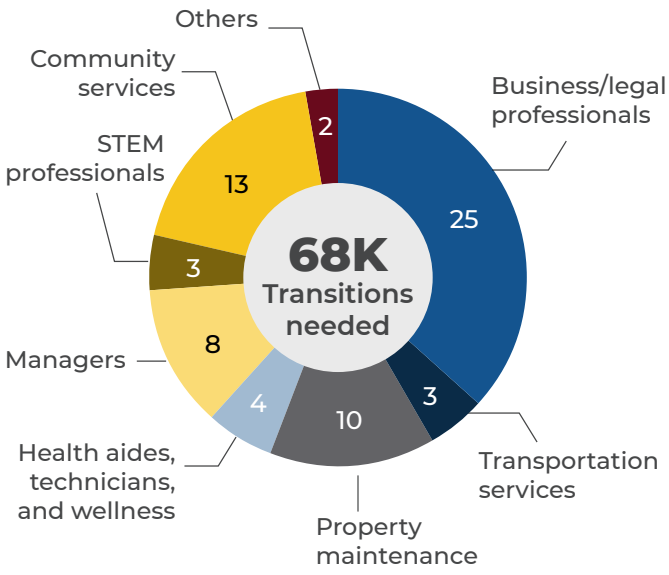
Breakdown of occupational changes estimated in Massachusetts by 2030

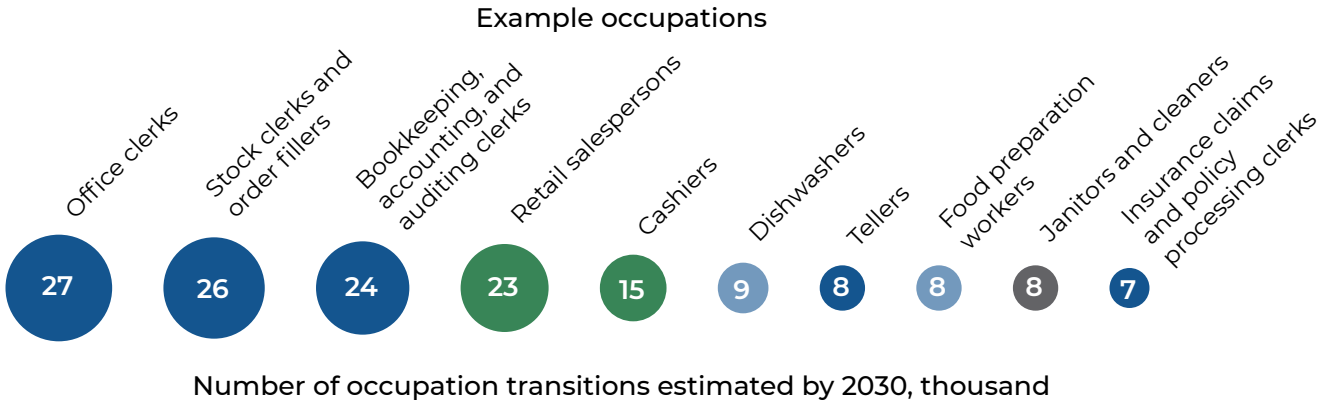
B Trends continue at levels seen during COVID-19

Number of workers who could need to find new work within a different occupational category, '000



Number of occupation transitions estimated by 2030, '000



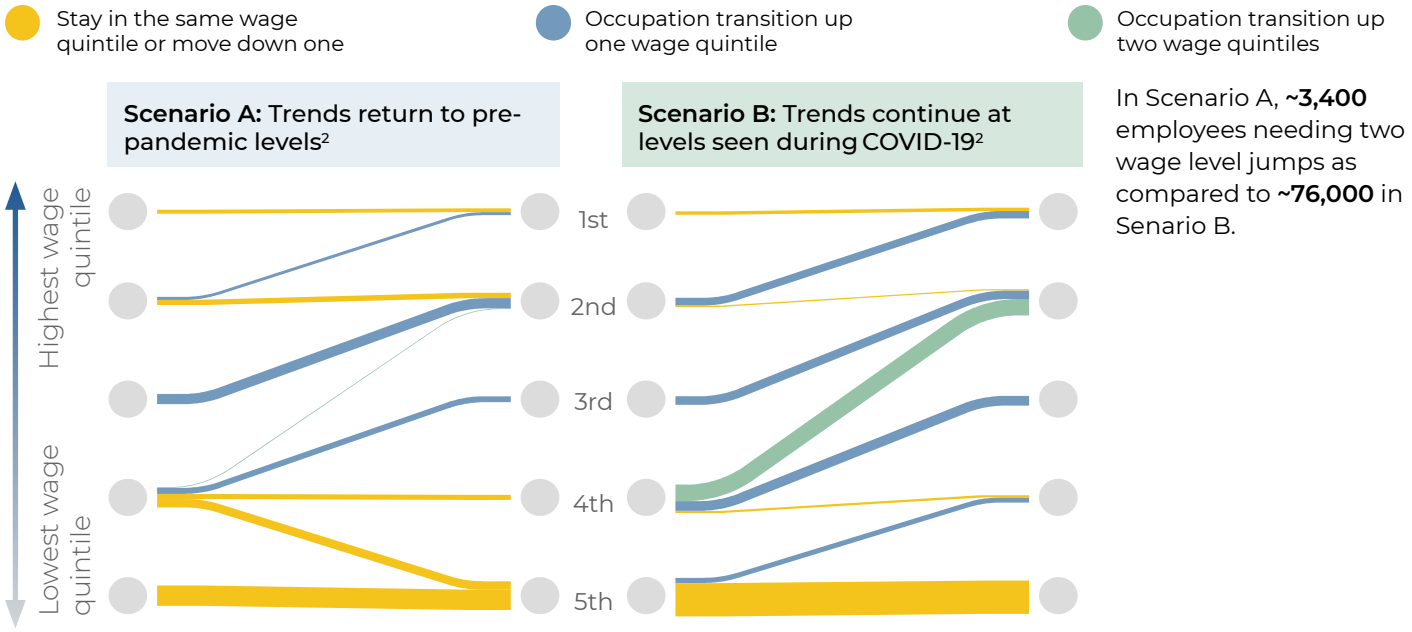


Source: McKinsey Global Institute analysis, "The Future of Work after COVID-19", April 2021

While gross job losses could reach around 0.9-1.2 million jobs (depending on the scenario), about two thirds of affected individuals will change jobs without requiring any significant re-skilling. However, approximately 300,000 to 400,000 individuals over the next ten years will likely be displaced and will need to transition to different occupational categories or occupations. In Scenario B, not only will the transitions outnumber those in Scenario A by about 100,000, but also a greater proportion of those transitions – 75,000 versus 3,500 – will likely need to jump multiple wage levels to be employable over the next decade (Exhibit 13). It is likely that these jumps

Exhibit 13: Workers in the lowest wage levels will likely need to transition to new occupations at much higher rates than before COVID-19

Estimated number of occupation transitions between wage levels, 2018–30
Jobs, Massachusetts[1]



In Scenario A, **~3,400** employees needing two wage level jumps as compared to **~76,000** in Senario B.

1. A transition is defined as a displaced job that does not come back due to lack of growth in labor demand in the same or similar occupation.
2. Additional jobs prioritized for lower income quintile workers.

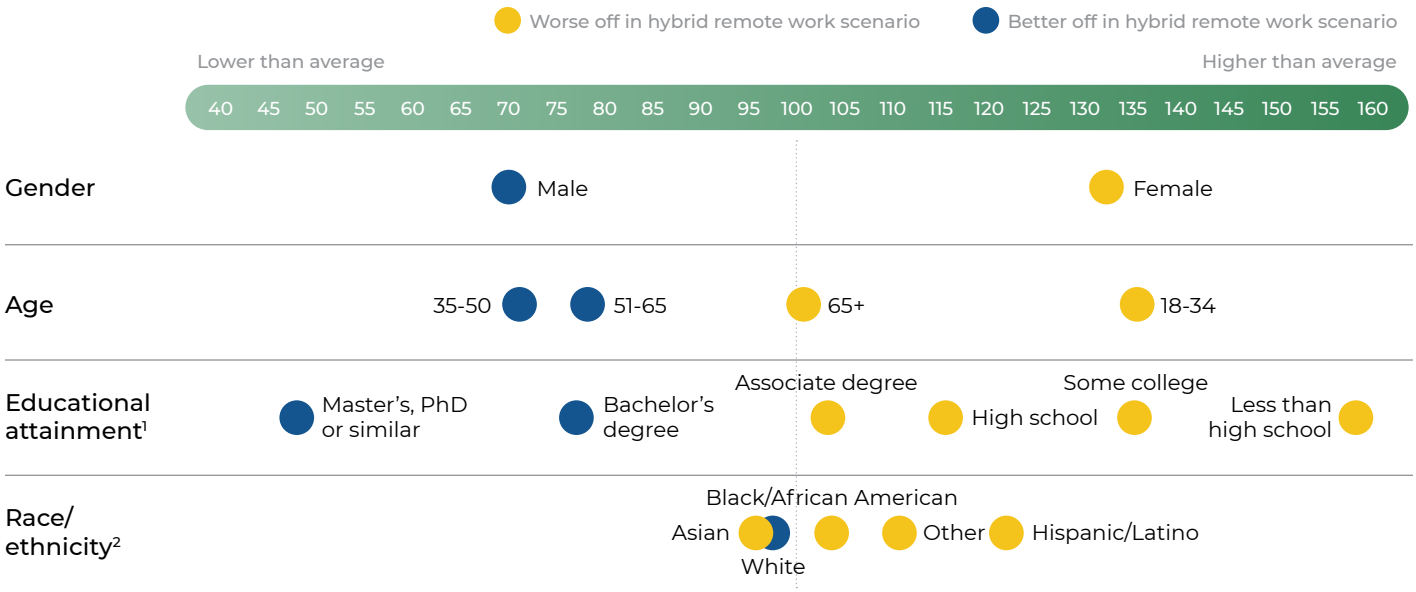
Source: McKinsey Global Institute analysis, "The Future of Work after COVID-19", April 2021

may need to happen in multiple moves, with interim moves serving as springboards to target occupations and occupational categories[59]. Some of the expected targeted roles that are expected to provide opportunities for growth are expected to be Human Resource (HR) specialists (such as

Exhibit 14: Women, young, less-educated workers, and minority workers are likely most at risk and may need to make more occupation transitions

Estimated percentage increase in number of occupational transitions between two scenarios; **Scenario A: Return to pre-COVID-19 levels** and **Scenario B: Trends continue at levels seen during COVID-19**

Indexed to overall percentage increase=100, weighted average of MA



1. Denotes max educational attainment achieved
2. Hispanic/Latino group broken out independently, all other groups are exclusively non-Hispanic

Source: MA LMI, McKinsey Global Institute analysis, "The Future of Work after COVID-19", April 2021

Corporate recruiter, HR analyst, HR coordinator, HR generalist), computer user support specialists, business operations specialists and general and operations managers (such as Business Manager, Finance Manager, Operations Director, Store Manager) and sales representatives (such as account representative, customer account technician, sales consultant) amongst others.

Women, Black, Latino/Hispanic workers who have been disproportionately impacted by COVID-19-related job displacement will likely continue to experience the highest rates of displacement (Exhibit 14).

The need for reskilling will vary by location in the Commonwealth. Approximately 50 percent of reskilling needs (9,000 and 11,000 per year respectively) will be concentrated in Suffolk and Middlesex counties due to their size. Areas with larger proportions of vulnerable jobs (such as retail and hospitality and food services) – including the Cape and Islands, Bristol County and the North Shore – will likely be most affected, per our analysis, as these sectors account for a sizable percentage of their employed population.

No matter the scenario, reskilling will ultimately be necessary to support industry growth and to maintain Massachusetts' competitiveness. The

Massachusetts Business Roundtable released an editorial urging the prioritization of development, recruitment, inclusion and retention of talent, or "business will go…where talent is." Maintaining Massachusetts' competitive edge for both highly skilled and hard-to-fill, mid-skilled roles can help the Commonwealth to support that growth.[60] Such support may be particularly needed in two areas poised for continued growth post-pandemic: healthcare and "new economy" sectors.



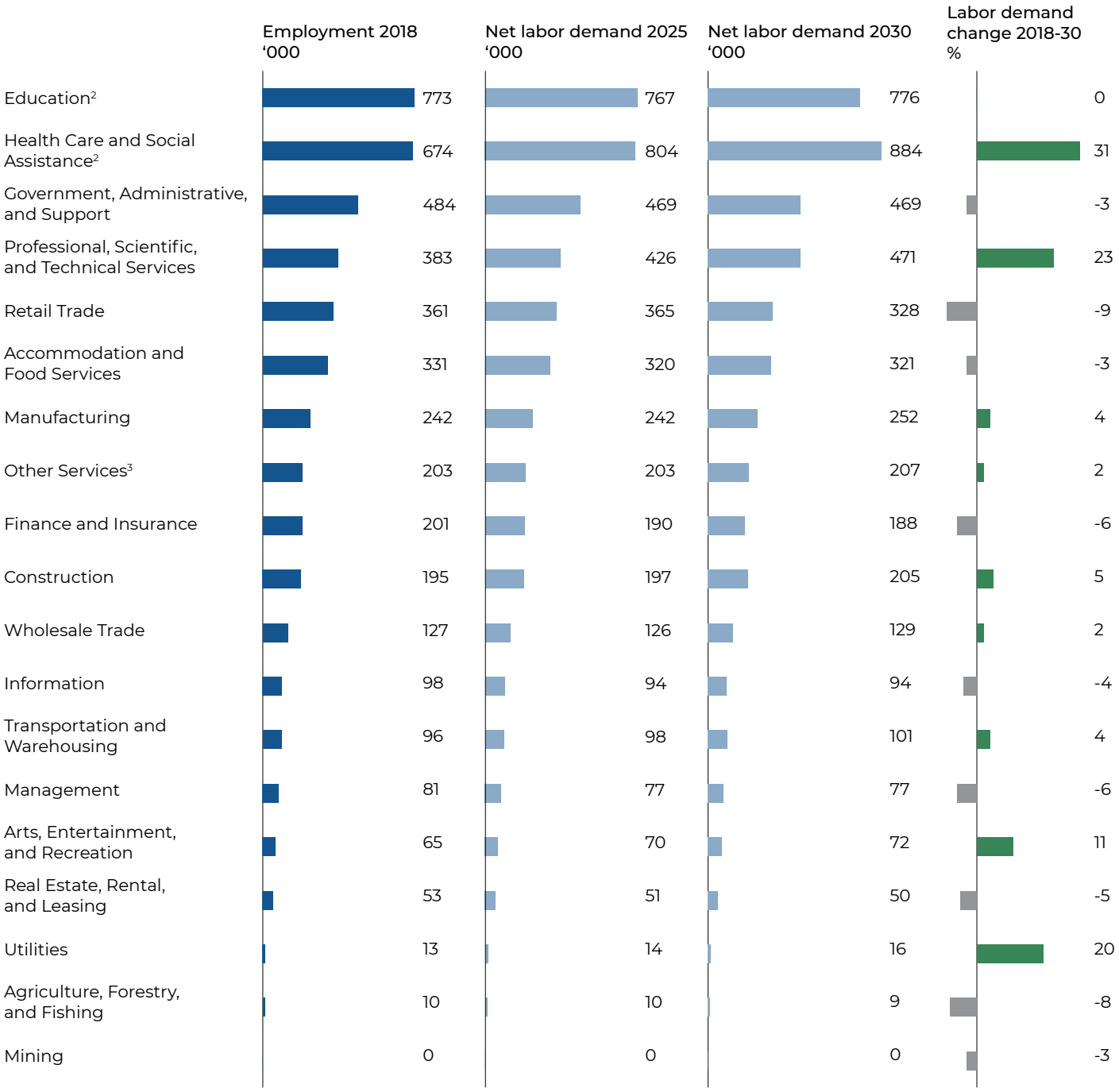
Healthcare is likely to be the largest source of employment growth in Massachusetts across all scenarios. The sector is expected to add an estimated 210,000-230,000 jobs by 2030.

Economists at the US Department of Labor project that employment in healthcare will grow at a rate 15 percent faster than the average for all occupations, adding about 2.4 million new jobs nationwide by 2030.[61] Per our analysis, we expect continued growth in jobs over the next decade across all sub-sectors in healthcare (including ambulatory care services, hospitals, nursing and residential care facilities and social assistance) driven by high demand for healthcare occupations (including healthcare diagnosing and practitioners, health technologists and technicians, other healthcare practitioners and technical occupations, home health and personal care aides, nursing assistants, orderlies, psychiatric aides, occupational therapy, physical therapist assistants and other healthcare support occupations). The five job categories expected to grow most are nurse practitioners, home health and personal care aides, mental health specialists, massage therapists and respiratory therapists.[62] If managed well, some of these growing healthcare jobs may be supplied through reskilling workers from lower pay levels through apprenticeship and certificate programs. For example, orderlies could be transitioned to licensed practical vocational nurses, radiologic technologists, licensed practical/vocational nurses, or medical coders.

According to our analysis, healthcare employment in the Commonwealth is expected to see similar growth, with demand in 2030 leading to 210,000-230,000 in additional healthcare jobs (Exhibit 15). In Scenario B, the demand for personal care aides in the Commonwealth is expected to increase by 35,000 by 2030 – an approximately 50 percent increase from 2018. Similarly, demand for home health aides is likely to increase by 22,000 (an increase of about 85 percent), for registered nurses by 25,000 (approximately 30 percent), and for health professionals (including nursing assistants and licensed practical/vocational nurses) by about 20,000 (an increase of ~40%).
Based on expected demographic shifts and other factors, our modeling shows that by 2030, about 25 percent of the likely growth in demand

Exhibit 15: Health care could become the largest employment sector and generate the most new jobs by 2030.

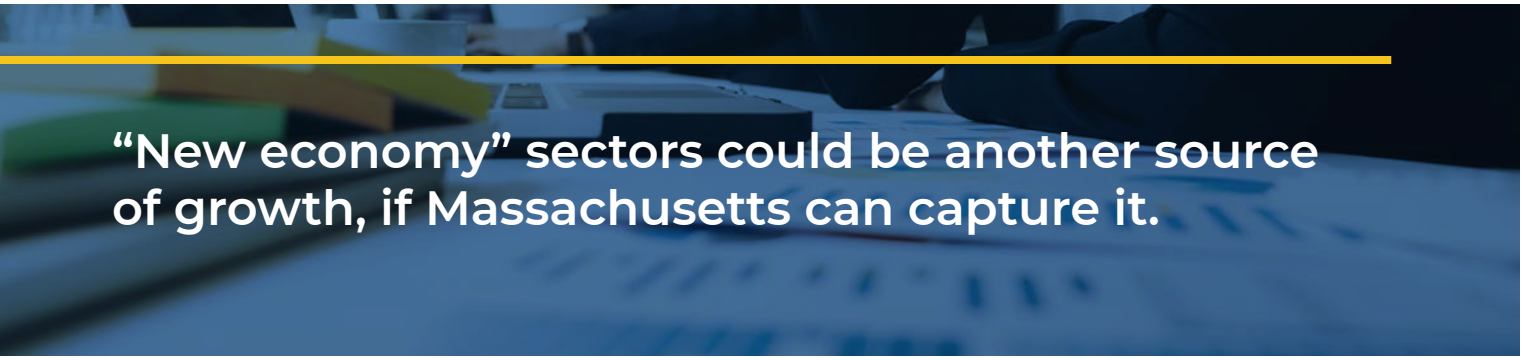
B Trends continue at levels seen during COVID-19



1. Based on specific assumptions assumed in this scenario, as documented the appendix
2. Including private, state, and local public institutions
3. Excluding public administration

Source: MA LMI, LaborCUBE, BEA, BLS OES, QCEW, Moody's analytics

(about 50,000 jobs) is expected to occur within the Boston Workforce Development Area (WDA). Another 23 percent will take place in Metro North (about 21,000 jobs) and Metro South/West (approximately 27,000 jobs). About 10 percent will occur in the Hampden WDA (around 21,000 jobs). The need for a trained workforce to sustain this expected growth in healthcare – and the associated demand on educational institutions for trained professionals – will likely be felt over both the short and long terms. A talent shortage could slow healthcare's anticipated growth (thereby negatively impacting GDP projections) and impact the availability of needed healthcare services. This talent shortage could be driven by a lack of available workers to fill new positions, but also from current healthcare workers leaving the industry for other, better-paying jobs. Recruiting and retaining workers for these healthcare jobs will be important to ensuring the delivery of critical services. The sector could also see continued, high levels of medical innovation and entrepreneurism driven by investments in the sector and demographic necessity, as an aging population is likely to strain both public and private healthcare networks, thereby driving growth in other sectors like healthtech.[63]



"New economy" sectors could be another source of growth, if Massachusetts can capture it.

Accelerating sectors and new technologies are expected to spur innovation and job growth at a faster pace than before the pandemic. This new economy will require people who can create, deploy and maintain new technologies. Massachusetts was first in the nation in patent creation and venture capital per GDP in 2019 and has served as a center of innovation in the Northeast.[64] Additional funding for investment opportunities could significantly expand research and development in healthcare and life sciences. Members of the Advisory Council have shared that there is already opportunity for scientific research in the state. With additional federal funding coming out of the pandemic there will likely be opportunities to build a foundation of knowledge and skill, ahead of our competitors.

The sectors poised for accelerated growth (including technology, healthcare and biology) are already strongly anchored in Massachusetts, and new economy sectors (such as artificial intelligence, electric vehicles/clean energy and biotechnology) play well to the Commonwealth's existing strengths. Already, Massachusetts seems to be benefiting from these opportunities; the life-science industry, for example, is driving vacancies in lab space to all-time lows, even as office space is being rapidly converted into lab space.[65] However, to help ensure that this growth happens in Massachusetts rather than in lower-cost locales, ongoing access to increasingly mobile talent will be critical.

Reskilling at the necessary pace and scale will likely require newer interventions and a more purposeful approach – such as working



To support and retain talent in the state, providing job retraining and enabling individuals to learn marketable new skills throughout their lifetimes will be essential.

with employers, community-based partners, technical institutes and training providers to bring lifetime training and education to workers. Businesses will need to take the lead in some areas, including on-the-job training and providing opportunities for workers to upgrade their skills. Many companies are finding that training and preparing workers for the future workplace not only serves their best interests but also is part of their societal responsibility.[66] Successful new hiring and upskilling practices rely on a business culture that is designed at all levels to bring on alternative hiring candidates or talent in new ways. Businesses may need to re-imagine their culture around hiring and on-boarding (for example, changing job descriptions to not require four-year degrees, training hiring managers to recruit based on skills versus degrees, and ensuring the company culture has support networks for non-traditional pathways) to build strong pipeline and retention strategies for those in apprenticeship or certificate programs. By 2025-2030, the ability to successfully reskill approximately 30,000 to 40,000 people per year could lead to a vibrant Commonwealth economy in which new job opportunities outpace workforce growth. By contrast, the failure to reskill will likely cause rising unemployment, unmet labor demand and a scarcity of qualified talent (especially in high-growth sectors like healthcare) and ultimately impede economic growth in the Commonwealth.



03 – 06

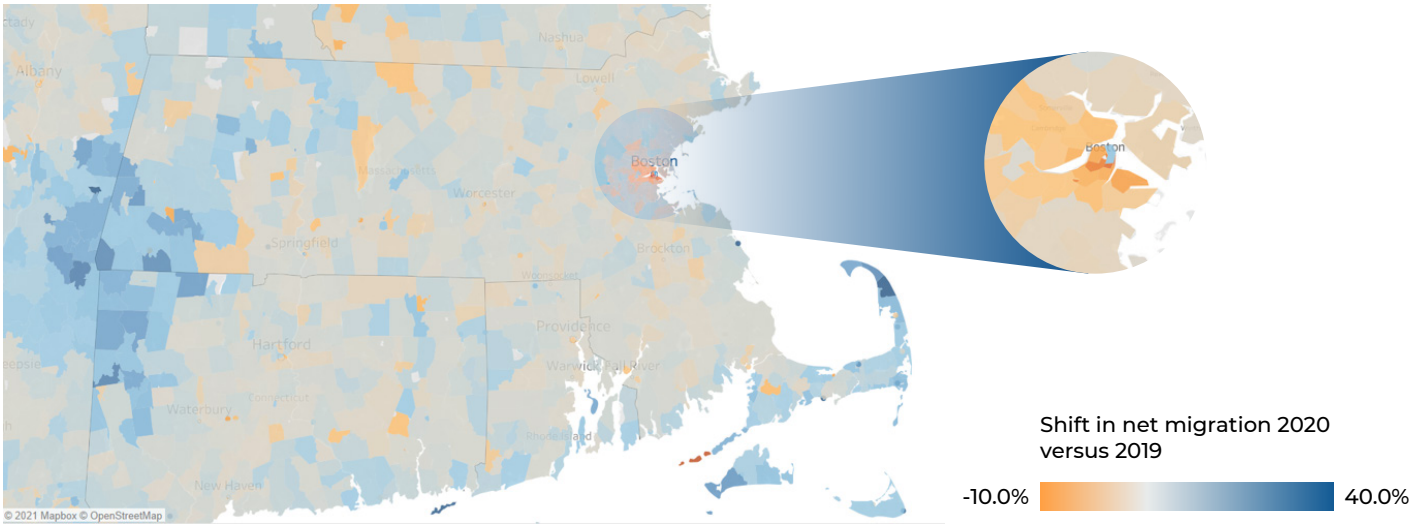
THE COMMONWEALTH POPULATION IS LIKELY TO GROW, ALBEIT MORE SLOWLY THAN PRE-PANDEMIC

The Commonwealth's population is likely to grow, but more slowly than it did before the pandemic – by about 4.5 percent from 2018-2030, as compared to 6.4 percent in 2006-2018. The slowing rate can be attributed to declines in birth rates and international immigration, as well as a rise in domestic emigration. Consistently across all modeled scenarios, the total impact is estimated at approximately 50,000 fewer residents than previous estimates for 2030.[67]

Before COVID-19, Massachusetts had a steady but declining growth in immigration driven by international inflows that offset consistent domestic emigration. During COVID-19, Massachusetts saw both a higher domestic outflow (an estimated 5,000- to 10,000-person increase in emigration compared to the previous year)[68] and a potential decrease in international inflows, which may have dropped by as much as 30,000.[69]

Within Massachusetts, the populace has been moving away from Boston and other urban areas into suburban or even rural areas, with vacation hubs such as Cape Cod and the Berkshires seeing net inflows at times when they previously had experienced population declines (Exhibit 16). Higher-income (greater than $100,000) and older individuals have driven movement to the Cape and the Berkshires, while those below age 24 are still net-migrating into Boston.[70]

Exhibit 16: In 2020, Massachusetts residents moved from urban parts of Boston to other areas throughout Massachusetts, notably the Berkshires and Cape Cod



Source: NYT Analysis from USPS data adjusted for MA, denominator uses 2019 US Census population data by zip code

Massachusetts saw an increase in domestic emigration – particularly to New Hampshire, Rhode Island, Connecticut and Florida – while net inflows from New York almost doubled.[71] This trend likely involved both temporary and permanent moves; some people moved due to college closures or to be near family, while others moved due to financial reasons.[72] High-income individuals accounted for a large portion of pandemic-related movement both into and out of Massachusetts.[73]

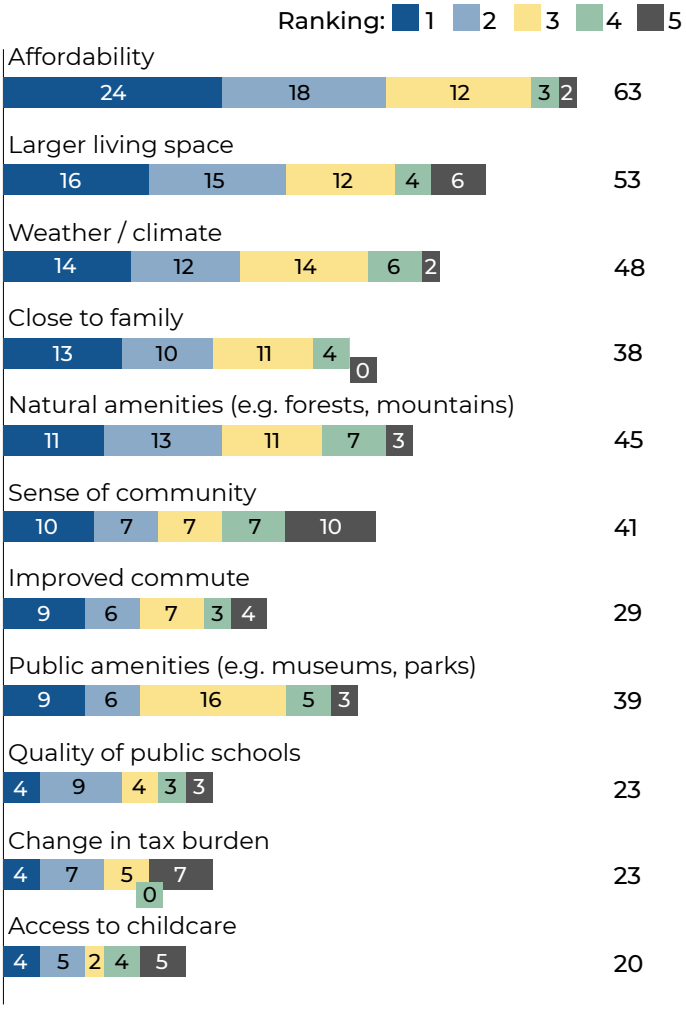
Whether patterns begun in COVID-19 will continue is still uncertain. Some evidence suggests that remote/hybrid workers may behave similarly to those who do not work remotely. For example, compared to respondents who did not expect to do more work remotely in the future, respondents

to the Massachusetts Future of Work survey who said they expected to continue to do more work remotely in the future were not more likely to say that they intended to move within the next 12-24 months (Exhibit 17). Reasons cited for moving are similar to the reasons cited before the pandemic; affordability, a larger living space, and weather and climate are still determining factors in choosing where to move.[74]

Yet, given the historic importance of international immigration to Massachusetts' population growth, slowing international movement due to pandemic restrictions and visa backlogs could hamper population growth for years to come. Additionally, more residents could move from Boston to Western and Central Massachusetts as they seek out affordable, larger living space and are required to come to work in person less often. This trend could result in small shifts of population away from central Boston, with implications on housing and infrastructure demand.

Exhibit 17: Massachusetts survey respondents found affordability and larger living space to be determining factors in where they would choose to move

Reasons influencing where people choose to move[1], N=118, responses by ranking and reason



1. If you are considering relocation in the next 12 months, please rank the factors influencing where you might choose to move

Source: MA Future of Work Resident Survey, April 12-20, 2021



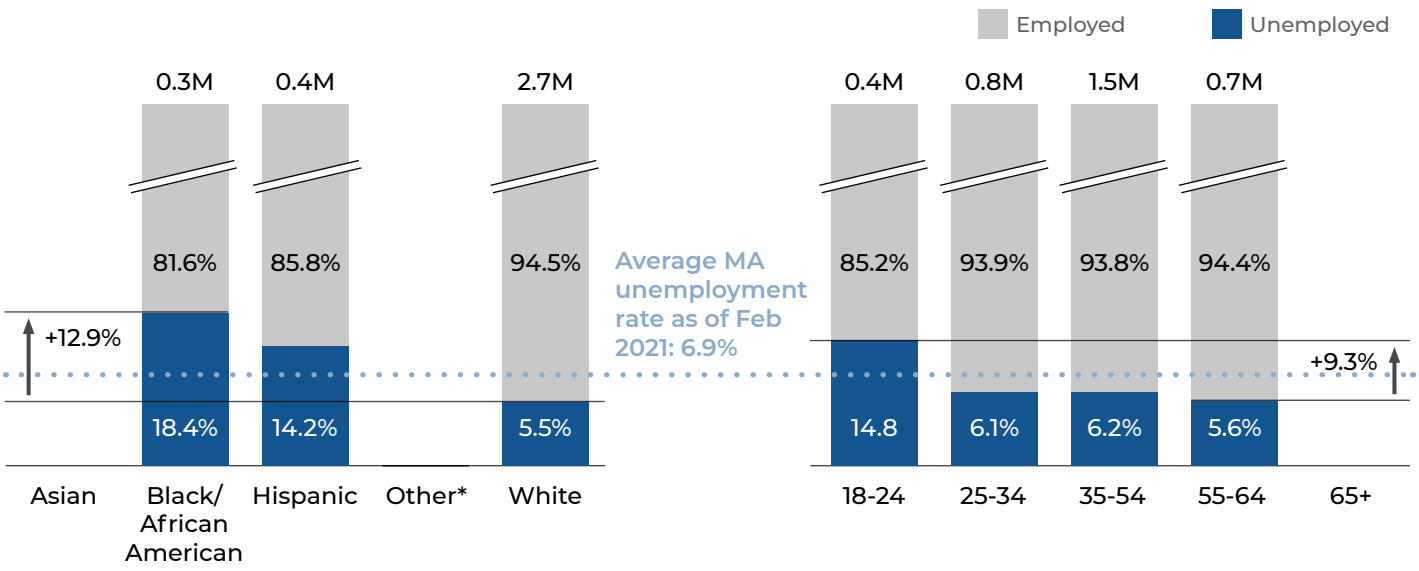
03 – 07
EXISTING EQUITY CHALLENGES WILL INTENSIFY

The COVID-19 pandemic led to a historic national unemployment rate of 14.6 percent in April 2020 – more than three and a half times pre-pandemic levels. People of color, women, relatively low-income workers, and workers without college degrees were disproportionately affected, exacerbating equity challenges.[75] Nationally, job recovery from unemployment during COVID-19 is expected to occur more than 18 months later for women than for men; for those without college degrees, recovery could happen one to two years later than for those with such degrees.[76]

The picture for Massachusetts was similar to that of the US. Unemployment in the Commonwealth peaked in April 2020 at 16.4 percent – more than 5.4 times pre-pandemic levels[77] – and remains at 6.4 percent (2.1 times pre-pandemic levels) as of April 2021 with more than 240,000 workers unemployed in the Commonwealth.[78] Black workers in Massachusetts are particularly affected, as they faced unemployment rates that were 9 to 13 percent higher than the rates affecting other racial groups in February 2021. Moreover, a significant portion of some populations has not been able to work remotely during the pandemic; before COVID-19, only about 20 percent of African-American and 16 percent of Hispanic/Latino workers worked in occupations and sectors that allowed them to work remotely, compared to about 30 percent of white workers and 37 percent of Asian-American workers (Exhibits 18 and 19).

Exhibit 18: Workers aged 18-24 and Black/African-American workers in Massachusetts face 9.3-12.9% higher unemployment rates than their counterparts

Unemployment by race/ethnicity[1] and age, Feb 2021
Demographic categories are excluded if they do not meet sample size thresholds[2]



Unemployment by race/ethnicity **Unemployment by age**

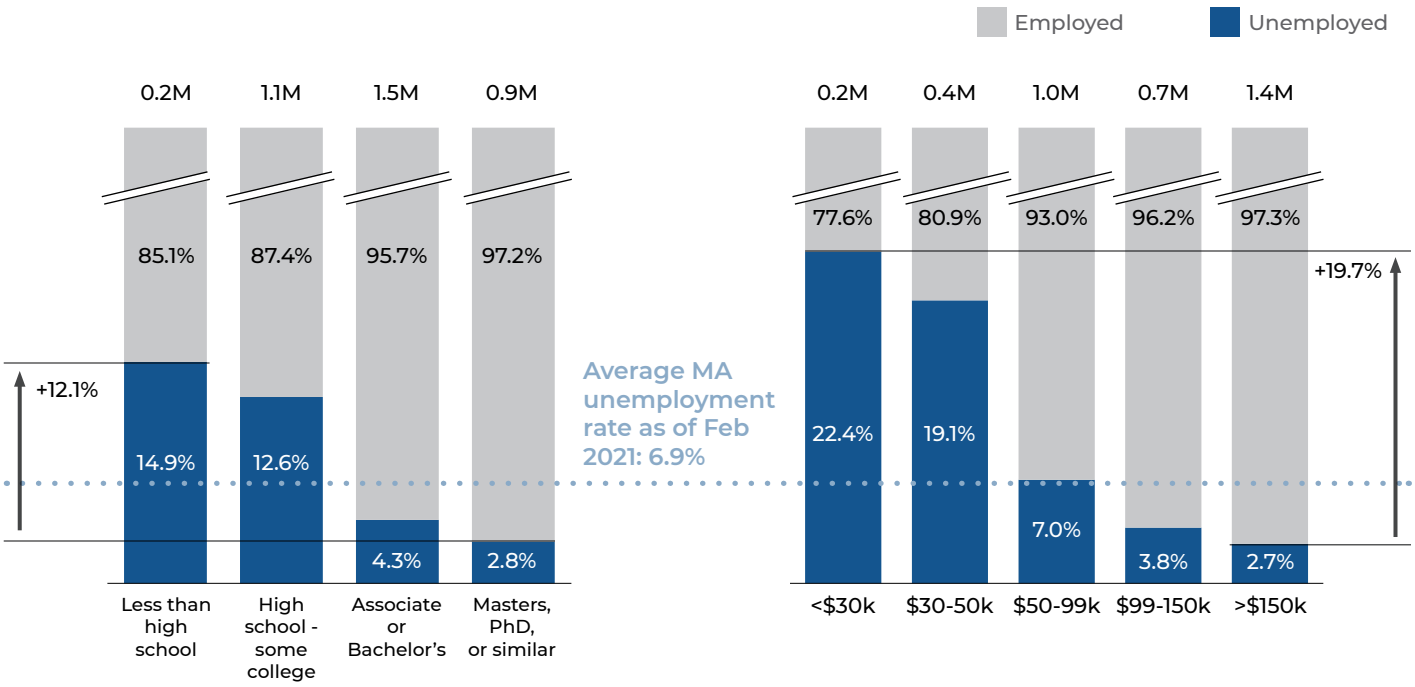
1. "Hispanic" as referenced here represents all Americans who self-identify as ethnically Hispanic. All other groups are solely non-Hispanic
2. For the segmentations ethnicity/race, age, gender, income, and education level, data corresponding to a particular subsegment is not displayed if US Current Population Survey (CPS) data is unreported, has insufficient sample size (n<30 for subsegment), or unemployment in any month is 0% (indicative of insufficient sample size)

* Other includes: American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander

Source: CPS

Exhibit 19: Massachusetts workers with less than a high-school education or with a family income under $30,000 face 12.1-19.7% higher unemployment rates than their counterparts

Unemployment by educational attainment and household income[1], Feb 2021
Demographic categories are excluded if they do not meet sample size thresholds[2]



Unemployment by educational attainment **Unemployment by household income**

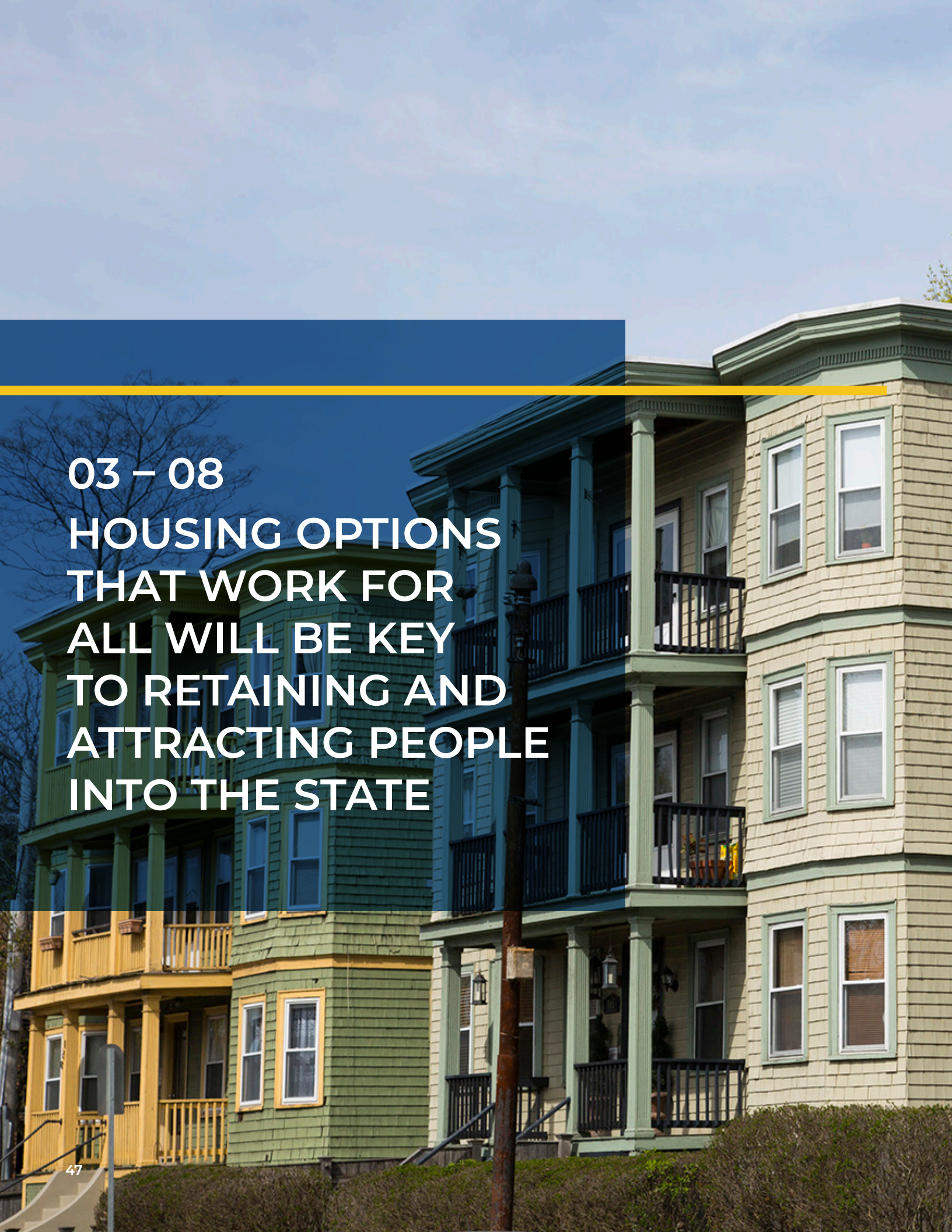
1. Household income refers to the total combined income of the household's family over the past 12 months
2. For the segmentations ethnicity/race, age, gender, income, and education level, data corresponding to a particular subsegment is not displayed if US Current Population Survey (CPS) data is unreported, has insufficient sample size (n<30 for subsegment), or unemployment in any month is 0% (indicative of insufficient sample size)

Source: CPS

As these exhibits show, population groups negatively affected by future-of-work trends in the Commonwealth are demographically skewed toward women, young people, workers without college degrees, and ethnic minorities – in short, groups in which equity issues are already pronounced. (Exhibit 14.)

Given these trends, it is quite likely that a disproportionate amount of job displacement will impact women, who represent over 85 percent of administrative occupations such as assistants, secretaries, payroll clerks and receptionists.[79] Without thoughtful and concentrated reskilling and childcare efforts, these workers may drop out of the workforce. Similarly, Black and Hispanic/Latino workers – based on their current occupational and sector mix – are less likely to work remotely[80].

Widening gaps in wealth and access to opportunities among various ethnic and racial communities could further concentrate and compound existing challenges – from health outcomes and poverty to educational attainment and safety – if positive action is not taken.



03 – 08
HOUSING OPTIONS THAT WORK FOR ALL WILL BE KEY TO RETAINING AND ATTRACTING PEOPLE INTO THE STATE

In 2019, Massachusetts had the most saturated residential market in the US, with the fourth-highest property values and the lowest vacancy rates[81] for both rental (3.4 percent) and home-owner properties (1.0 percent) (Exhibit 20). A well-functioning housing market needs additional units to keep up with growing population, replace depreciated units, and also maintain capacity for sale and rent. These vacant properties enable a more efficient marketplace; lower vacancy markets are often associated with higher prices.[82] The number of units needed to keep up with projected population growth and reach a national average target vacancy rate were calculated to estimate the low-range of units needed to overcome potential housing shortage in Massachusetts in 2030. In addition, given the already high housing costs in the state, a higher range was calculated based on an average of vacancies from the top 10 highest vacancy rate

Exhibit 20: Massachusetts' housing market stock varies by WDA, but residential occupancy is near-capacity statewide

Workforce development area	**Total housing stock** 2018, 000's	**Total reported occupancy rate** 2018, % of total	**Housing stock out of market** 2018, % of total stock	**Real occupancy rate**[1] 2018, % of stock in market
Boston	**293**	91.6%	6.3%	97.7%
Metro North	**334**	94.3%	4.0%	98.2%
South shore	**228**	92.6%	6.2%	98.8%
Central MA	**240**	92.8%	5.0%	97.7%
Greater New Bedford	**94**	88.8%	8.9%	97.5%
Metro South/West	**374**	95.3%	3.1%	98.4%
Lower Merrimack Valley	**137**	94.1%	3.8%	97.8%
Brockton	**89**	94.7%	3.6%	98.3%
North Shore	**176**	93.9%	4.9%	98.7%
North Central	**104**	92.7%	5.5%	98.0%
Hampden County	**195**	92.6%	5.2%	97.7%
Bristol County	**156**	92.9%	4.8%	97.6%
Berkshire County	**69**	79.3%	18.5%	97.3%
Franklin/Hampshire	**104**	91.0%	7.1%	98.0%
Greater Lowell	**110**	96.0%	2.5%	98.5%
Cape & Islands	**195**	54.3%	44.0%	96.9%
MA total	**2897**	**90.3%**	**7.8%**	**98.0%**

1. Removed residential RE not available in market (not for rent/sell nor occupied)

Source: ADP, American Community Survey, UMASS-Donahue Population Projections, McKinsey Global Institute analysis, "The future of Work after COVID-19", April 2021

states as well as taking into account the highest vacancy rates in the US for each category – rental and homeowner. Our analysis and models reflect a shortage of 125,000-200,000 housing units by 2030. This gross, statewide number does not, however, account for more specific or regional goals such as transit-oriented and multi-family development which may be necessary for the state to meet to achieve much greater affordability. Massachusetts faced competitive pressures related to housing affordability prior to the pandemic, and as remote/hybrid work continues to enable mobility and boosts the importance of larger living space, housing affordability is likely to become even more important for Massachusetts' competitiveness.

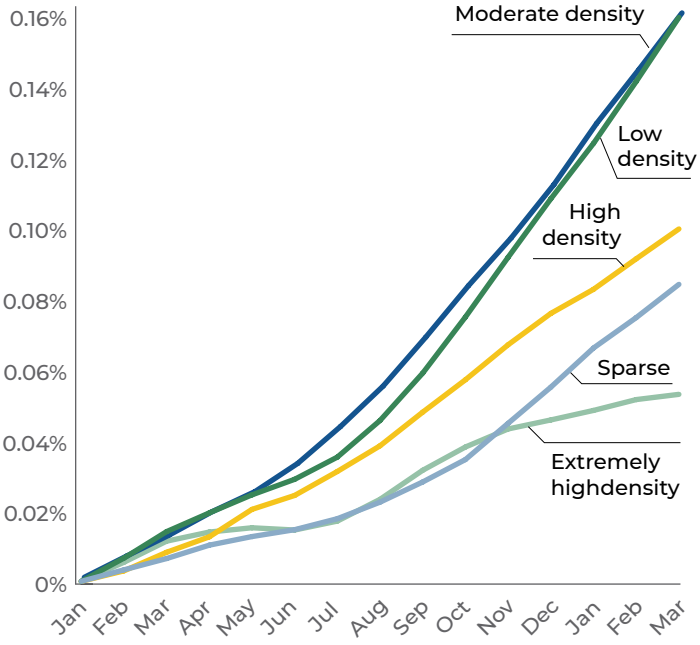
During the pandemic, there was some indication that more people were buying houses in moderate and low-density areas. Housing prices in these areas rose 0.16 percent between January 2020 and March 2021 – almost quadruple the rise in prices in extremely high-density areas (Exhibit 21). This price increase may signal a desire for additional space during the pandemic (cited as the second-most common factor in determining where to move in the survey of Massachusetts residents). This shift could present an opportunity to improve Gateway Cities' (defined as midsize urban centers that anchor regional economies around the state) attractiveness, as these cities' rents rose by as much as 12 percent in lower-cost markets, such as Fall River.[83]

Lower-density suburbs outside the Boston area may also see higher demand post-pandemic. Redfin and Zillow are predicting post-COVID housing booms in suburbs and smaller cities and have found national survey data indicating that remote workers in cities are more likely to move to more spacious housing.[84] Some of these potential changes may be temporary, however; while rents in Boston have not yet recovered to pre-COVID-19 levels, they have been rebounding since December 2020.[85]

The net population of Massachusetts is expected to grow at a rate of 4.5 percent by 2030,[86] creating a need for up to 90,000 more housing units[87] in addition to the 35,000-110,000 required just to catch up with unmet demand.[88] This market stress exists state-wide, with all regions of Massachusetts showing a real occupancy rate of more than 97 percent. Maintaining growth in residential housing units, then, may be essential to keep up with demand. Without continued growth, expanding the workforce enough to attract new businesses may be difficult, which will hamper the state's competitiveness and growth.

Exhibit 21: During COVID-19 housing prices continued to increase, with moderate-density areas increasing the most

Growth in average 2BR house prices by population density[1,2]
Jan. 2020 = 0



1. MA counties categorized by density: Extremely high density: Suffolk County; High density: Middlesex, Norfolk, Essex counties; Moderate density: Bristol County; Low density: Plymouth, Hampden, Worcester, Barnstable counties; Sparse: Nantucket, Hampshire, Dukes, Berkshire, Franklin counties
2. Extremely high density: Above 2,000 people/mi^2; High density: 1,500-2,000 people/mi^2 ; Moderate density: 1,001-1,500 people/mi^2; Low density: 501 – 1,000 people/mi^2; Sparse: 0 – 500 people/mi^2

Source: Zillow Housing Index, ACS 2019

04 REGIONAL IMPLICATIONS

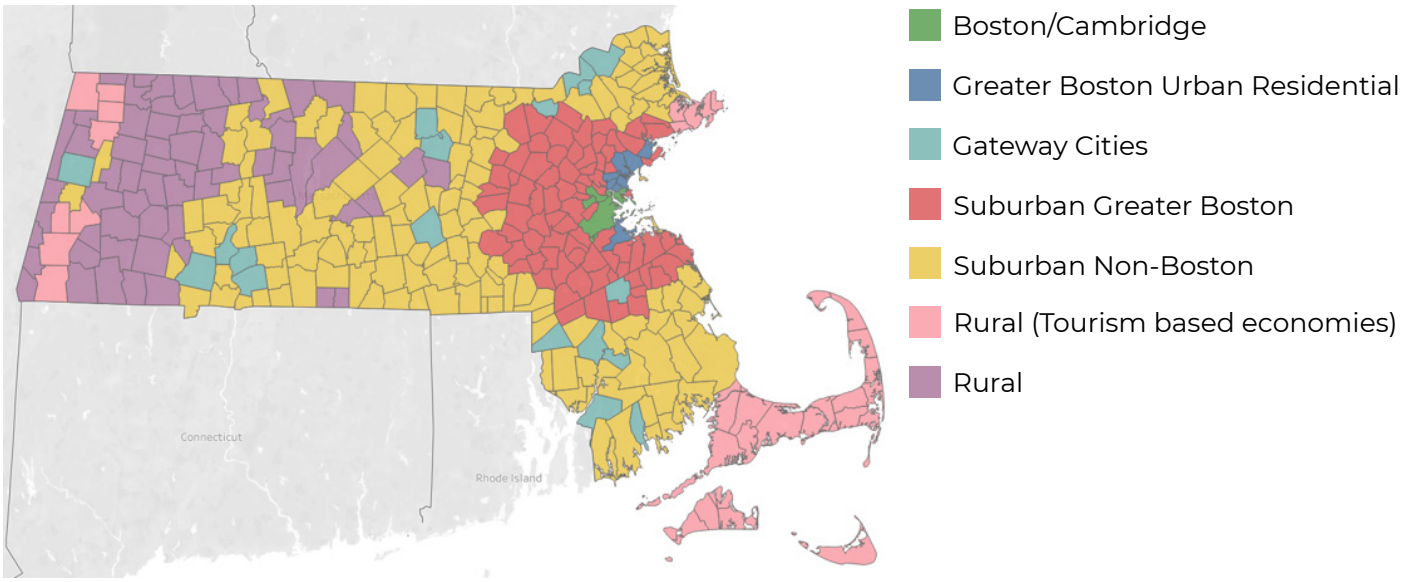
For the purpose of these analyses, regional archetypes were identified that broadly capture the breadth of Massachusetts. These regional archetypes include: Boston/ Cambridge, Urban Residential, Gateway Cities, Suburban Greater Boston, Suburban Non-Boston, Rural (Tourism based economies), and Rural. We mapped Massachusetts municipalities to these archetypes and assessed the potential impact of future-of-work implications on each. (Exhibit 22)



Exhibit 22: Massachusetts municipalities were mapped to regional archetypes to understand how each would be impacted by future-of-work implications

Future-of-work regional archetypes by municipality

Mapping 351 municipalities to the 7 regional archetypes



Source: LMI, US Census

Some of the insights – such as slowing population growth, the need for accelerated reskilling, automation's impact on equity, and a lack of workable housing options for all – apply almost universally to all of the archetypes. Other insights – such as the reduction in commuter-rail ridership – affect a few of the archetypes (Suburban Greater Boston, Greater Boston Urban Residential, Gateway Cities, and Boston/Cambridge) much more strongly than the rest. Four of the archetypes (Boston/Cambridge, Urban Residential, Suburban Greater Boston, and Gateway Cities) will likely endure the most disruption from future-of-work trends. For the remaining three archetypes, the changes will likely be modest but will add to existing challenges already facing those regions. For each archetype, the likely disruptions were highlighted and potential impact of the identified future-of-work implications explored (Exhibit 23).

Exhibit 23: Future-of-work insights for the Commonwealth will likely impact four of the archetypes (A-D) more than the rest

Potential impact of major trends across regional archetypes



Trends	A. Boston/ Cambridge	B. Greater Boston Urban Residential	C. Gateway Cities	D. Suburban Greater Boston	E. Suburban Non-Boston	F. Rural (Tourism based economies)	G. Rural
1. Reduced demand for office real estate							
2. Need for affordable, flexible, childcare options							
3. Ridership decline in public transit							
4. Reduced business travel							
5. Accelerated pace and scale of reskilling							
6. Slowing population growth							
7. Greater equity challenges							
8. Capacity costrained housing options							

Source: LMI data, US Census, McKinsey Global Institute analysis, "The Future of Work after COVID-19", April 2021



04 – 01 BOSTON/ CAMBRIDGE

Boston/Cambridge areas will be strongly impacted by almost all future of work trends, but overall will likely remain a leader in innovation and talent due to strong fundamentals

Boston and Cambridge's strong fundamentals – such as its access to world-class, diverse talent and its proximity to research institutions – will remain largely unaffected (absent other shocks) and continue to attract growing sectors of the new economy, such as e-commerce, biotechnology, AI and robotics/automation. Boston/Cambridge represents 11.6 percent of the state's total population and 22.6 percent of the state's total employment.population and 22.6 percent of the state's total employment.

While fundamentals will remain robust, future-of-work trends are expected to impact Boston/Cambridge more than other regions in all scenarios modeled. The shifting center of gravity away from the urban core will be especially significant to Boston/Cambridge; of the 245,000 net-inflow of commuters into Boston in 2019,[89] 34 percent work in roles that could be performed remotely[90] – higher than most other cities. Additionally, this region will likely be most impacted by decreases in business travel – resulting in an estimated reduction of up to 30,000 visitors to Boston per day[91] – and declines in resident population due to migration to other parts of the state. During 2020, Boston/Cambridge saw increased domestic outflows of ~10,000 residents, and estimated decreased international inflows by ~6,000 residents, when compared to 2019 figures.[92] Some of this outflow may be temporary, due to COVID-19 risks and closed campuses, while a portion is likely permanent due to the freedom of hybrid working models, desire for more space, and financial pressures[93].

Across all three scenarios in the future-of-work models (explained in the Methodology section of this report), reductions in the number of commuters and travelers could impact the vibrancy of parts of Boston/Cambridge. Real estate vacancies could increase as affected retail businesses relocate or close due to declining business. Retail, food service, office supplies and commuter-oriented businesses may suffer disruption. A survey conducted by the Commonwealth to gauge citizen and business sentiment found that 12 percent of businesses may close due to the impact of remote and hybrid work models and reductions in business travel, and 26 percent may consider moving their business to a different area.[94]

Especially in increased remote-work scenarios, areas with Class B and C office real estate (which consists of older buildings, often in less desirable locations than Class A) will likely see the most vacancies or redevelopment. Localities in the Boston Central Business District with the most square feet in Class B and Class C real estate (such as the financial district, which has 11.7 million square feet; Seaport, which has 6 million square feet; and Beacon Hill, which has 4.5 million square feet[95]) may see increased vacancies. More expensive Class A real estate may see some reduction in rent per square foot but with higher occupancy rates, as businesses currently in Class B real estate use this opportunity to move to smaller Class A spaces.

That said, there is early, emerging evidence[96] of office spaces being converted to lab spaces in an effort to meet R&D and medical companies' growing demand for in-person work environments. This trend is drawing new types of tenants to Boston/Cambridge and changing the sector and occupation mix of workers downtown. Other new types of tenants could include educational institutions, which were previously constrained by space.

Meanwhile, lower prices due to reduced demand[97] will likely encourage mid-sized businesses to lease previously unaffordable office real estate in Boston/Cambridge, causing a different mix of firms to enter the area and replace the retail spending of outgoing hybrid/remote office workers. How real estate footprints will be impacted will depend on the degree to which remote/hybrid work is eventually adopted, as

well as how "sticky" the remote-working trend is over a five-to-ten-year period. Whether and how new businesses and sectors will expand into existing retail space is also in question. In short, the evolution of trends impacting real estate in Boston/Cambridge remains uncertain and thus requires monitoring over time.

The cost of living in Boston/Cambridge may improve somewhat if the shift away from urban areas actually occurs and relieves some of today's pressure and density. The potential decrease in population growth and/or reduction in commuters may help to alleviate childcare shortages as well. However, over the next five to ten years, our modeling indicates that the Boston Workforce Development Area (WDA) will continue to endure shortages in available childcare for children ages zero to five years, as the Boston WDA alone needs approximately 3,000 to 4,000 additional childcare workers.

Future-of-work effects will not be felt by all population across Boston/Cambridge equally, potentially exacerbating the inequities that have existed since before the pandemic. Lower-income workers and small independent businesses will likely be most at risk, as they can less readily adapt by re-locating or finding alternate employment. Small businesses in Boston/Cambridge are seeing declines in revenue; for example, within Beacon Hill, Back Bay, and Cambridge, small businesses experienced revenue losses of about 40 percent in May 2021 in comparison to January 2020 figures.[98] Employment rates are likewise suffering; while rates for high-wage workers have mostly recovered to pre-COVID-19 levels, rates for low-wage workers remain significantly lower than before the pandemic.[99]

While these numbers contrast data from two periods in time during the pandemic at a time of significant fluctuation, our analysis shows that up to 16,000 jobs could disappear from the Boston WDA by 2025 in all three of the modeled scenarios, affecting occupations like retail salespersons, stock clerks, cashiers, tellers and dishwashers. At the same time, the types of occupations in demand are likely to change, and workers may be able to "jump" income levels if reskilling efforts are successful.

Sectors likely to benefit from the expansion of e-commerce and remote/hybrid work (such as online retail, food delivery and software) are likely to grow (e-commerce adoption, for example, is projected to expand from 25 to 38 percent of retail spend from 2024-2030)[100] and could thus continue to draw talent to Boston/Cambridge. As evidence, Amazon recently announced plans to create 3,000 new jobs at its Boston tech hub in Seaport,[101] while Apple promised to add "hundreds" of jobs in the Greater Boston area by 2026 as part of a nationwide, $430 billion expansion in AI, advanced manufacturing, silicon engineering and 5G.[102] To continue this momentum, talent will be key; according to a survey by the Massachusetts Business Roundtable (MBR), access to world-class talent is the number-one reason to expand in Massachusetts.[103]

Pre-pandemic congestion levels in Boston/Cambridge are likely to return: although increased work from home may marginally reduce congestion in the traditional morning and post mid-day peaks, this would be counterbalanced by increased freight traffic from a rise of e-commerce, and a small, but potentially significant, mode shift that may occur from transit to automobiles.



04 – 02 GREATER BOSTON URBAN RESIDENTIAL

Greater Boston Urban Residential areas may face the most challenges post-pandemic, particularly as residents work in sectors that are more vulnerable to disruption (hospitality, retail, food service).

The Greater Boston Urban Residential archetype comprises municipalities within about 15 miles of Boston that tend to have relatively lower average wages, a higher proportion of immigrant and minority communities,[104] and a higher proportion of residents employed in sectors vulnerable to future-of-work trends. These sectors include hospitality, retail and food service.[105]

Greater Boston Urban Residential areas represent 7.0 percent of the state's total population and 4.5 percent of the state's total employment. They were facing challenges prior to the pandemic – including food insecurity, relatively lower education levels, and a lack of access to affordable childcare.[106] The pandemic has affected these areas more severely than many others; they have experienced both higher COVID-19 case rates[107] and higher unemployment due to a lower proportion of jobs with remote and hybrid work capability.[108] Future-of-work implications like automation displacement, employment disruption by e-commerce, and reduced business travel will also disproportionately impact them. As people in this regional archetype are less likely to work remotely, city centers will probably not see revitalization from increased time spent in residential areas.

Reskilling will likely be critical, especially for workers who are vulnerable to automation and e-commerce and/or impacted by the decline in business travel. Many of these workers may need assistance in transitioning to new employment. Targeted reskilling may provide an opportunity to move residents to "gateway" jobs, which are stepping-stone positions that could lead to middle-wage or higher-wage jobs. Gateway jobs with the highest transition volume as of 2019 included retail salespersons, customer-service representatives, administrative assistants, construction carpenters, nursing assistants and automotive service technicians and mechanics.[109]

Additionally, based on evidence from the current unemployment insurance claimant pool, a focus on language training (such as English to Speakers of Other Languages (ESOL) programs) in cities with larger immigrant communities (such as Chelsea, Everett, Revere, and East Boston) will not only help this segment but also create additional employable talent for the Commonwealth. Childcare availability will also be a significant barrier for workers in these areas, which after Boston, could face some of the state's highest gaps in childcare availability, across all future of work scenarios.

Transit access will remain important, with 33 percent of Mattapan and Roxbury residents, 29 percent of Chelsea residents, 27 percent of Revere residents, and 24 percent of Everett residents taking public transit to work. Most of these riders are not working in sectors that will be able to work remotely.[110] For these geographies, high-quality transit service (despite potentially reduced ridership compared to pre-COVID-19 levels) is necessary to maintain access to employment, and reductions in service levels could be detrimental.



04 – 03 GATEWAY CITIES

Gateway Cities may experience the same future of work trends as Boston/ Cambridge, but on a much smaller scale. Reskilling with an eye towards technology access and literacy may be crucial.

Gateway Cities are midsize urban centers as defined by state law, that anchor regional economies around the state[111]. These cities represent approximately 19 percent of the state's total population and approximately 16 percent of the state's total employment.[112] Even prior to the pandemic, Gateway Cities were struggling to attract investment and economic opportunity. A relatively aging workforce and outflow of younger working-age people both contributed to these cities' labor gap and lack of urban vitality. For example, although Gateway Cities are home to just 25 percent of the Commonwealth's population, they have more than 44 percent of the state population that falls below the poverty threshold.[113]

The impact of future-of-work trends on Gateway Cities may resemble the impact on Greater Boston/Cambridge – but on a smaller scale, with fewer out-of-county commuters and a smaller proportion of the population that can work remotely. (Gateway Cities' largest industries are healthcare, education, government and manufacturing.) Gateway Cities also have a smaller proportion of sectors that will be affected by reduced business travel, as the food and hospitality sectors account for 7 to 8 percent of employment versus 10 percent in Boston.[114]

While a smaller proportion of Gateway City employees can work remotely, many businesses can still shift their employees to remote working; for example, large insurance companies had nearly all employees working remotely during the pandemic and expect to offer more such choices to employees in the future.[115] Gateway Cities could have an advantage as people seek out more affordable and spacious accommodations; during COVID-19, rents increased by 2 to 12 percent,[116] and home values by 14 to 24 percent.[117] Notably, this increase occurred at a time when rents and home values in areas like Boston, for example, were falling. Migration data shows some migration into these cities (-0.4 to 4.3 percent)[118] has occurred during the pandemic.

As workforce needs evolve, reskilling may prove critical. In particular, retail trade sectors will likely be affected by automation; modeling shows employment in the retail trade falling by as much as 9 percent by 2030. This sector constitutes 6 to 8 percent of employment in Gateway Cities.[119] Furthermore, the workforce needs to have expanded technological skills to prepare for future job demands. This effort will necessitate investing in basic computer skills and digital literacy, especially for low-income residents. As evidence, more than 30 percent of Springfield households do not have sufficient technology access, mostly due to lack of computer hardware or digital literacy.[120]

Our modeling finds that healthcare growth will likely be more pronounced in Gateway Cities. The sector is expected to grow from 25 to 31 percent of employment by 2030 – a higher rate than in other Commonwealth areas, where healthcare employment ranges from 17 to 20 percent. Across the three scenarios modeled, this growth will be strongest in areas with large aging populations or healthcare-based economies, such as New Bedford and Lowell. Engaging the healthcare sector to encourage demand for reskilling in these areas and provide jobs with room for growth could be a way to improve upward mobility.

Falling demand for office real estate could also impact the Gateway Cities (notably Springfield, Lowell, Worcester, and Lawrence, which have the greatest amount of vulnerable Class B and C office space[121]). This in turn could threaten these cities' attractiveness if spaces remain vacant but could also provide opportunities for revitalization if spaces can be converted to new uses, such as housing.

Increasing manufacturing demand (with an expected statewide increase of 4 percent) and affordable, available commercial real estate

suitably close to suburban remote/hybrid workers may attract businesses that still need physical spaces, such as medical technology, biotechnology, and on-shore manufacturing companies. For example, Shawmut opened an N95 factory in West Bridgewater,[122] and Merrow Manufacturing became the largest manufacturer of personal protective equipment (PPE) in Fall River.[123]

Addressing the affordable childcare gap in the future may enable more women in these areas to re-enter the workforce, especially as growing healthcare demand could create shortages in roles such as nurses and home health aides, which are typically filled by a higher proportion of women (with female employees making up 90 percent and 82 percent of each profession respectively in 2019[124]). At 5.6 to 12.4 percent in November 2020,[125] unemployment rates among these roles in Gateway Cities lagged behind rates in the rest of Massachusetts.

Gateway Cities' populations could increase if cities like Springfield and Worcester can lure remote workers away from the Boston Metro area, creating the potential for a more vibrant economy. However, increasing prices and fewer housing options could also put affordability pressure on local residents and risk their displacement.



04 – 04 SUBURBAN GREATER BOSTON

Suburban Greater Boston communities may be the natural beneficiaries of future of work trends, with potential for increased vibrancy as remote-eligible workers spend more time closer to home.

The Suburban Greater Boston archetype includes suburban neighborhoods within 20 miles of Boston, which are characterized by higher median income, and higher rates of educational attainment. These towns represent 30.6 percent of Massachusetts' total population and 33.1 percent of the state's total employment. According to our modeling, Suburban Greater Boston communities in Massachusetts' "knowledge core" may become natural beneficiaries of future-of-work trends. These areas have a higher proportion of residents who work in sectors that lend themselves to remote work (such as professional and scientific services, finance and insurance), so residents may spend more time close to home, thus creating more vibrant residential communities and local downtowns.

Throughout the pandemic, suburban Boston communities enjoyed lower unemployment rates, as their largest employers come from sectors facing fewer restrictions due to the pandemic. As evidence, the city of Concord had a June 2020 unemployment rate of 10 percent, while Lawrence had a rate of 33 percent, Revere a rate of 28 percent, and Boston 19 percent.[126] Suburban Greater Boston also experienced a small increase in net migration compared to 2019; the city of Lexington increased by 0.7 percent, Concord by 0.6 percent, and Wellesley by 0.6 percent.[127] The increase could be attributed to these cities' more spacious suburban housing, although their growth is hampered somewhat by limited affordability and housing inventory.

Suburban Boston towns may be on the receiving end of the shifting center of gravity away due to new ways of working. A large proportion of Suburban Boston residents commute into the city of Boston for work and thus spend much of their time and money outside their local community. If the trend toward remote and hybrid work takes hold, however, these communities may have an opportunity for mixed-use economic activity. More time spent in residential areas could move retail and food-service spending from business districts like Boston/Cambridge to local businesses in the suburbs, potentially encouraging businesses to pivot to residential areas or expand their e-commerce offerings. This in turn could also boost the vitality of Suburban Greater Boston, as new local businesses open, increasing area attractiveness.

Likewise, the demand for childcare could shift from Boston/Cambridge to Suburban Greater Boston areas as workers seek childcare closer to home. This development could pose a challenge since these areas were already facing shortages in childcare availability. The models indicate that the Metro North WDA and Metro South Shore WDA, for example, face some of the state's highest shortages in childcare availability, with a childcare workforce shortage of 6,000 to 8,000 workers across both WDAs.

An increase in remote and hybrid work from pre-pandemic levels may lead workers to scale back their commuting days to one to three days a week. Moreover, up to 4.5 percent of the Suburban Boston population could shift from transit to auto commutes by 2025, depending on the scenario. Relatively wealthy, multiple car-owning households may shift to auto travel after changing their transit habits during the pandemic. The resulting impact to commuter-rail ridership could be significant.

All these transportation trends could cause surface roads to become more congested as traffic shifts from arterial commuting to more local traffic. Congestion could be further compounded by the growth in last-mile deliveries due to expanding e-commerce, inefficient trip-chaining (i.e., making multiple, single-purpose trips rather than combining work-related and non-work-related trips), and increased vehicle usage throughout the day. Given the prevalence of shorter (less than five-mile) trips, the demand for micro-mobility options and infrastructure – such as bicycle lanes and

electric scooters – could rise as a way to reduce congestion and increase mobility, outside of the provisioning of traditional transit options.

Real estate prices may likewise climb as demand for suburban areas grows. During COVID-19, housing values grew approximately 12 percent in suburban areas, compared to an average of about 20 percent in Gateway Cities and 6 percent in Boston. (Specifically, Wellesley saw an increase of 11 percent in housing values, while values in Newton, Concord and Lexington grew by 9 percent, and Winchester's values increased by 10 percent.) Given the higher base home values in these areas, the average increase in home values over that time period was $70,000, about 40% higher than the average increase in Gateway Cities.[128] This continuing rise in prices could deter urban residents from moving into the suburbs, potentially pushing them to more rural suburbs or Gateway Cities. High housing prices and low availability reduces Massachusetts' competitiveness, and may even prompt residents seeking more space to move to lower cost states or discourage potential talent from moving into the state.

If the adoption of remote or hybrid work becomes permanent, the resulting changes could significantly impact Greater Suburban Boston. Given the uncertainties surrounding this trend, it will need to be closely monitored and managed to fully understand its implications for the future.

04 – 05
SUBURBAN – NON-BOSTON

Suburban Non-Boston will likely see subdued growth due to a smaller concentration of workers in sectors that will be high-growth.



Our "Suburban – Non-Boston" archetype consists of municipalities more than 20 miles away from Boston, with populations comprising more than 5,000 residents and median incomes close to Massachusetts' state-wide average. Suburban – Non-Boston has a lower share of professional service and knowledge workers than other areas, a smaller share of commuters to Boston, and high commuter flows to other areas. Workers in these areas are spread out across sectors, with the highest numbers employed in healthcare (16 percent), manufacturing (14 percent), and retail (12 percent) sectors.[129] These areas have enjoyed relative resilience in employment during COVID-19.

Our models indicate that these areas will likely see subdued employment growth over the next ten years across all scenarios, despite increasing manufacturing demand (with an expected statewide increase of 4 percent). This subdued growth can be attributed to Suburban – Non-Boston's smaller concentration of workers in high-growth sectors; healthcare, for example, employs 16 percent of workers versus 25 percent in Gateway Cities[130]. Future-of-work models project employment growth of 3.9 percent in these areas from 2018-2030, while the state overall is expected to see growth of 5.9 percent across all scenarios. Suburban – Non-Boston represents 25.6 percent of the state's total population and 19.0 percent of the state's total employment.

As of April 2021, suburban non-Boston communities had average or lower unemployment rates. Shrewsbury had a 4.1 percent rate, Andover a 4.6 percent rate, and Plymouth a 6.1 percent rate – below the state of Massachusetts' overall rate of 6.5 percent.[131] These areas will likely be less impacted for example by reduced business travel due to their higher dependance on local demand for economic growth. Workers in these communities tend to commute to nearby Gateway Cities and other populous outlying suburbs. A significant portion of residents commute, and a lower share of workers in these areas is employed by sectors typically associated with jobs suited for remote or hybrid work. Therefore, time spent in these areas is unlikely to significantly increase due to hybrid work, and these areas are thus less likely to see resulting growth in local economic activity.

Housing occupancy rates in Suburban – Non-Boston areas remain high, with real occupancy rates exceeding 98 percent for most. During COVID-19, housing values increased by more than 16 percent on average (specifically, by 14 percent in Dartmouth, Shrewsbury, Plymouth, and Ipswich, and by 15 percent in Amesbury).[132] The increase in housing costs and low availability of housing stock could encourage lower-income workers to move to neighboring Gateway Cities or surrounding lower-cost areas.

Moreover, Suburban – Non-Boston areas face challenges in both availability and affordability of childcare. The Central Massachusetts WDA, for example, has the third-highest childcare supply gap among WDAs in Massachusetts, and models show it could have a shortage of up to 3,000 childcare workers over the next five years. Housing for all and access to affordable childcare will pose ongoing challenges for these suburban areas to address.



04 – 06 RURAL (TOURISM BASED ECONOMIES)

This regional archetype has seen the most in-migration – likely temporary, driven by the pandemic. Increased adoption of remote and hybrid work could spur population growth attracting remote/hybrid workers from the Boston metro area, boosting spending and economic activity but also putting additional affordability pressures on housing and childcare.

The Rural (Tourism based economies) regional archetype includes municipalities that are outside the commuting distance to Boston, are less dense, and have higher median incomes. Tourism accounts for a large share of these communities' economies. These areas have population sizes that generally fall below 15,000 and median incomes that are lower than the state average for year-round residents, and higher than the state average for part-time residents. The Rural (Tourism based economies) region represents 4.8 percent of the state's total population and 4.3 percent of the state's total employment.

Rural (Tourism based economies) areas have saturated housing markets characterized by high prices and a high share of housing stock that is not for sale, as many are second homes. Workers in these areas tend to be primarily employed in the service and support sectors, with many workers commuting in from adjacent areas. Compared to other regional archetypes, Rural (Tourism based economies)areas have a higher share of workers in the hospitality and food-services sectors (at 17.3 percent versus the Massachusetts average of 9.3 percent), arts and entertainment (4.4 percent compared to the state average of 1.9 percent), and retail trade (at 16.3 percent versus the Massachusetts average of 10.5 percent).[133]

As of April 2021, Rural (Tourism based economies) areas had some of the highest unemployment rates in the Commonwealth (at 6.9 percent in Barnstable, 6.4 percent in Stockbridge, 8.5 percent in Dennis, and 7.6 percent in Gloucester – compared to the state average of 6.5 percent)[134]. These higher rates can be partially attributed to the mix of sectors in these areas and the sharp decline in tourism.[135] Our models project modest growth of 4.3 percent in employment from 2018-2030 for these areas (compared to 5.9 percent growth for the state overall). Demand for healthcare workers may increase in these areas due to their aging population and high concentration of retirees.

During the COVID-19 pandemic, these areas have experienced very high migration flows, with net intake in the Berkshires and Cape areas doubling or tripling over the past year.[136] While most of this migration is likely temporary and driven by the pandemic, the increased adoption of remote and hybrid work could spur population growth if these areas can attract remote workers from the Boston metro area. This change could boost spending and economic activity in Rural (Tourism based economies) areas, but it could also put additional affordability pressure on housing and childcare.



04 – 07 RURAL

This regional archetype will likely experience the lowest employment growth – lower than the state average – and reskilling could play a critical role in developing these economies.

The rural area archetype consists of municipalities with populations lower than 2,500 and low-density, low-transit areas. These areas account for 1.3 percent of the state's total population and less than 1 percent of total state employment. Population growth over the last ten years in WDAs like Franklin/Hampshire has ranked among the lowest in the state, with Berkshire County being the only WDA in Massachusetts to experience a decline in net population.[137] As of April 2021, unemployment in rural areas of Massachusetts ranged widely, from 2.1 percent in Leyden to 9.2 percent in Becket.

These rural areas have a median income lower than Massachusetts' state average. The top employment sectors include construction, representing 18.3 percent of total employment (compared to the state average of 4.9 percent), and hospitality and food services, which accounts for 17.3 percent of employment (versus the state average of 9.3 percent). Healthcare is the third-highest employment sector but employs just 14.0 percent of workers in the region – far less than the overall state average of 19.2 percent.[138] Based on our modeling, the current mix of sectors in these areas may cause them to experience the lowest employment growth of all regions through 2030, at just 3.7 percent. The state average is 5.9 percent.

Reskilling could play a critical role in developing these economies as workforce needs evolve, particularly given the disproportionate concentration of low-growth sectors that carry greater risk of worker displacement. In addition, increasing housing prices could put affordability pressure on local residents and drive further displacement. The residential real estate market is saturated in rural Massachusetts thanks to its low supply of housing stock. Home prices over the past year have increased in places like Wales (16 percent), Princeton (13 percent), and Erving (15 percent).[139] Improving access to housing options that work for all residents could also attract new residents looking for more space and more affordable conditions.



06 GOING FORWARD

Research for this report was completed just as vaccinations were ramping up in Massachusetts, with expanded supply and approximately 6.4 million doses administered as of May 6.[140] It was and remains a time of extreme uncertainty, with the sustainability and degree of the trends taking root still a question.

Businesses and others are still determining how to implement long-term hybrid work models, for example, and making momentous choices related to office leasing, post-pandemic business travel policies, and the speed of international reopening, among others. The remainder of 2021 will likely be a time of experimentation in which residents, businesses, educational institutions and students try new ways of working and living as they emerge from the pandemic and begin to settle into a "new normal."

That said, these analyses have endeavored to assess the potential impact of the future of work under various scenarios to understand which sectors, geographies and aspects of life will be more sensitive to future-of-work changes. We hope to help equip the Commonwealth of Massachusetts to think through the many potential implications inherent to the future of work. As part of that effort, metrics were identified across each of the eight top insights that can be monitored to track the Commonwealth's progress in a variety of scenarios. Quarterly and in some cases annual tracking of the following metrics may help to understand how Massachusetts will evolve as it moves toward a post-pandemic equilibrium.

Exhibit 24: Metrics to monitor on a quarterly or yearly basis

Insights	Metrics	Sources
1. Reduced demand for office real estate	Employment growth by municipality (particularly retail)	LMI
	VMT/local traffic indicators	MassDOT
	Toll revenues	MassDOT
2. Need for affordable, flexible, childcare options	Childcare supply (labor and "slots" by age group)	EEC surveys, EEC licensing data
	Childcare demand by location	Estimates based on ACS population data
	Labor force participantion by gender	CPS micro-data (IPUMS)
3. Ridership decline in public transit	Ridership by mode	MassDOT/MBTA/NTD
	VMT	MassDOT
	Car registrations	RMV
	Parking occupancy	City of Boston
4. Reduced business travel	Congestion data over time of day and geography Monthly air passengers (split by leisure/business, domestic/international)	Waze/Tom Tom MassPort (supplemented with surveys)
	Average routes originating at Logan Airport	MassPort
	Hotel occupancy rates	Occupancy taxes, GBCVB
	Accomodation and food services employment	LMI

Insights	Metrics	Sources
5. Reduced business travel	Congestion data over time of day and geography Monthly air passengers (split by leisure/business, domestic/international)	Waze/Tom Tom MassPort (supplemented with surveys)
	Average routes originating at Logan Airport	MassPort
	Hotel occupancy rates	Occupancy taxes, GBCVB
6. Reduced demand for office real estate	Employment growth by sector	LMI
	Unemployment by sector	UI Claimant data
	Job openings	MassHire, survey employers
	Program enrollment and outcome metrics	Workforce Development Team
7. Greater equity challenges	Unemployment and labor force participation by gender, ethnicity, education level, and age	CPS micro-data (IPMUS)
8. Capacity constrained housing options	Monthly building permits	US census
	Monthly housing reports from trusted partners	Greater Boston Association of Realtor
	Yearly ACS insicatiors, which includes total stock, occupied stock by type and vacansy rates	ACS (table DP04)



07
APPENDIX AND METHODOLOGY

This appendix provides methodological details on the following analyses:

1. Scenarios
2. Employment modeling
3. Remote work potential
4. Migration modeling
5. Real estate modeling
6. Childcare modeling
7. Transportation modeling

It also provides details on the Advisory Council, including its membership.

1. Scenarios

We constructed three scenarios that remain consistent across all modeling efforts: Scenario A, Trends return to pre-pandemic levels, Scenario B, Trends continue at levels seen during COVID-19, and Scenario C, Remote/distributed work becomes more permanent. The goal of these scenarios is **not** to portray every possible outcome, but rather to consider a range of two to three scenarios and explore potential implications under each for the Commonwealth.

"Scenario A: Trends return to pre-pandemic levels" assumes that trends return to the pre-COVID-19 trajectory and serves as a baseline for discerning COVID-19's effect on different modeled outcomes. This scenario assumes that automation continues at a more modest pace, business travel returns to almost pre-pandemic levels, and people return largely to in-person work. COVID-19 impacts, particularly from observed migration impacts for 2020, are still accounted for.

"Scenario B: Trends continue at levels seen during COVID-19" assumes that trends continue on a trajectory seen during COVID-19 and serves as a comparison for exploring COVID-19's potential effect on different aspects of work in Massachusetts. This scenario assumes that automation adoption continues at a rapid pace accelerated by COVID-19, people eligible to work remotely do so two days per week, and e-commerce continues at an increased pace.

"Scenario C: Remote/distributed work becomes more permanent" assumes that trends continue a trajectory seen during COVID-19 but explores the impact of an even more exaggerated move to hybrid and remote work. This scenario differs from Scenario B by assuming that all those eligible to work remotely work at their maximum efficient capacity, assumed to be three or more days per week. Scenario C also explores a stronger impact of remote work on residents' center of gravity, with retail businesses relocating to serve remote workers in residential areas.

Scenarios were grounded in expert interviews, surveys, and existing Oxford Economics and Euromonitor projections of different trajectories and assessed the range of likely inputs at the time of this report.

2. Employment modeling

Scenario A and B followed the net labor demand modeling as outlined by The Future of Work after COVID-19 report, localized for a Massachusetts context and created at the Workforce Development Area level for 2025 and 2030, based on LMI data at the municipality level. For more

detailed information on the Future of Work methodology, please see the technical appendix of the MGI Report, The Future of Work after COVID-19.

Scenario A estimates the labor demand effects of McKinsey Global Institute's midpoint automation adoption scenario and identified long-term trends. These trends include: rising incomes, which represent increased consumer spending as well as overall spending on healthcare and education that results from increased prosperity; aging populations, which in many countries will raise healthcare demand; investment in technology that companies deploy in the wake of increasing technological progression; ongoing spending on infrastructure and commercial and residential buildings; the shift away from fossil fuels and move toward green energy production; investment to improve education standards; and marketization of unpaid care work as more women enter the labor force. These models were updated with the latest available economic and labor force data and assumed a return to full employment by 2030.

Scenario B projects the labor demand effects of the trends above, as well additional COVID-19-specific trends: increased remote work and virtual meetings, a shift to e-commerce and other virtual transactions, and faster adoption of automation and AI. For both Scenario A and Scenario B, the steps in estimating final labor demand at the occupation level are (a) create a 2018 employment baseline with standard occupation taxonomy; (b) construct a baseline of employment in 2030; (c) size the jobs lost and jobs gained effects of each trend (in the case of the post-COVID 19 scenario, including COVID 19 trends); and (d) subtract or add job losses and gains from the 2030 employment baseline, and scale employment proportionally to return to full employment.

Scenario C uses Scenario B as a baseline and assumes that in a high-remote-work scenario, the economic activity and employment in Massachusetts remains the same but is redistributed across the Commonwealth, with more economic activity in residential areas. A proportion of customer-facing sectors in line with the proportion of remote workers moves employment closer to commuters' residential areas rather than their place of work, redistributing employment away from Boston toward the knowledge core.

Job transitions are defined as jobs in net declining occupations compared to the 2030 baseline (which assumed 3.4 percent growth by 2030 across all occupations).

3. Remote work potential

Remote work potential followed the methodology outlined by The Future of Work after COVID-19 report, localized for the Massachusetts context. For more detailed information on the Future of Work methodology, please see the technical appendix of the MGI Report The Future of Work after COVID-19.

Remote work potential was estimated based on work activities, and the percentage of time that could be spent doing effective remote activities for each occupation. This was based on an analysis of more than 2,000 work activities and 800 occupations, using the 2018 O*Net database of the Employment and Training Administration of the US Department of Labor.

Remote work potential (both theoretical and effective) was determined for each activity and occupational context based on expert interviews with organization experts and surveys. Activities that were possible remotely but determined not to be effective remotely included coaching, counseling, and providing advice and feedback; building customer and colleague relationships; bringing new employees into a company; negotiating and making critical decisions; teaching and training; and work that benefits from collaboration, such as innovation, problem-

solving, and creativity. For this report, remote work potential includes effective remote work potential only.

4. Migration modeling

The Massachusetts migration model considers three future-of-work factors to evaluate their impact on migration, using Donahue estimates of population by Workforce Development Area for 2025 and 2030 as a baseline.

Donahue Estimates were done in 2018 using a component of change method based on trends observed in state- and town-level fertility and mortality, regional gross migration-by-age trends from ACS data, and 2015 launch populations. For more detailed information on the Donahue methodology, please see Projections Methodology for Massachusetts Population Projections by Regional Planning Area.

On top of the Donahue estimates, adjustments were made for international migration disruptions, with an assumed ~15 percent decline from 2021-2025 (70 percent decline in 2020) with a return to pre-COVID-19 trends from 2025-2030 across all scenarios. This was based on national monthly visa statistics for decrease in monthly visa processing throughout 2020, as no state-level data was available at that time.

In addition, remote work shifts were added to estimate the movement of those who choose to work remotely. Assumed 0-7 percent[141] of remote eligible workers choose to move, and that they followed movement patterns seen in ADP data from January 2021, 12-month average data.

Finally, employment shifts were added to estimate movement to reflect evolving industry composition across the state in 2025 and 2030. The Massachusetts employment model and ACS commuter data were used to assume a proportion of Massachusetts residents will move to fulfill employment demand in those areas.

5. Real estate modeling

The real estate model considers impacts from employment and migration future-of-work models to estimate demand going forward, by scenario. Modeling was done across four property types.

Residential:

Residential real estate modeled to be driven by population growth forecasted in migration model across scenarios. Occupancy rates were assumed to remain the same, and historical relationship between population and housing demand growth assumed to remain constant. ACS housing stock and occupancy rate data was used to establish baselines. For sizing of potential additional housing stock needed, first national vacancy benchmarks were calculated using ACS data: 6 percent rental vacancy rates, 1.5 percent home-owner vacancy rates. Then the amount of additional stock needed to reach national benchmarks in 2018, assuming no change in density, was calculated (~35,000 units). Then, the additional units needed until 2030 were calculated based on the population growth from the migration model, assuming constant occupancy rates and density (an additional ~80,000 at current occupancy rate, and an additional ~85,000 if maintaining national benchmark occupancy rates).

All commercial real estate modeling used CoStar stock data to establish benchmarks and historical relationships between employment and square footage growth by asset class.

Industrial:

Industrial CRE real estate modeled to be correlated with growth in manufacturing, warehousing, and transportation sectors employment across scenarios. Historical relationship between

manufacturing, warehousing, and transportation sector employment and square footage demand growth assumed to remain constant.

Retail:

Retail real estate sector modeled to be correlated with retail trade employment. Historical relationship between retail employment and retail square footage demand growth assumed to remain constant.

Office:

Office real estate modeled to be correlated with employment of those sectors able to work from home across scenarios. Model uses growth of workers able to work from home effectively (across all sectors), by scenario, as input. Historical relationship between office employment and office square footage demand growth expected to remain constant. A reduction in two days in office space modeled to reduce demand by 15 percent in the long-term, while three-day reduction modeled to reduce demand by 22 percent.

6. Childcare modeling

Childcare modeling was done to estimate the potential childcare workforce shortage in the Commonwealth in 2025 and 2030. First, the total number of children by age group (<15 months, 15-33 months, 33 months-5 years old, 6-13 years old), was sized based on Donahue Data estimates with adjustments made using the Future of Work migration model. Then, the percentage of those children who will need center or program-based care was estimated (to account for those who remain home with a parent or other caregiver). Assumption used was 70-76 percent for ages 0-5, 50 percent for ages 6-13 needing before/after-school care based on input from EEC. Staffing ratio standards[142] were then applied to each age group, to estimate the number of childcare workers needed, adjust based on a) 5 percent buffer as not all centers can be optimally staffed b) 30 percent buffer to center-based facilities as they are open ~52 hours per week[143] and staff work on average ~40 hours per week. Finally, the gap in childcare workers was calculated by comparing analysis above to current childcare workers based on BLS[59] and FCC estimates for 2020 by Workforce Development Area and for 0-5 age group.

7. Transportation ridership modeling

Transportation ridership was forecasted for 2025 and 2030 for bus, subway, and commuter rail ridership in five steps.

First, a base origin and destination model was created. Using ACS data, pre-COVID-19 work trips were established in 23 O&D pairs by mode. Then leveraging assumptions on percentage of work trips by mode, non-work trips were calculated by mode for each O&D pair. Second, the amount of trips lost due to the growth of hybrid remote work was calculated based on estimates for commuters that can work remotely based on ACS data, and assumptions on days working remotely established across the three scenarios. Third, the number of trips lost due to post-COVID-19 non-work trip trends were calculated based on a decline in ridership due to a shift to e-commerce and a slow recovery of international tourism. Fourth, the number of transit trips that shift to non-auto modes were calculated, based on the percentage of trips under 10 minutes by mode, which were assumed to shift to micro-mobility options like walking or cycling. Finally, transit trips shifting to auto modes were calculated by assuming that a percentage of commuters with a vehicle available may shift to auto, based on their annual wages and place of work. This shift was assumed to have 75 percent of the impact by 2025, and 100 percent impact by 2030, and was adjusted to account for parking capacity.

All modelling was done based on a static system. That is, analysis was done based on the

trips and network that existed pre-COVID, and demographic, employment, work from home and other trends were applied to those trips and network. This analysis did not assume changes to the transportation system (e.g., completion of the Green Line Extension); and for simplicity the possibility of autonomous shared vehicles beginning to impact transit and auto mode share in 2030 was not modeled. The model does not include the potential impact of any interventions (for example more frequent service or reduction or increase in fare revenues) that could further increase or decrease ridership.

Advisory Council:

The Future of Work Advisory Council was an informal network of leaders from different regions in the Commonwealth across business, academia, and public policy. The Advisory Council brought together a wide range of backgrounds and perspectives to help understand the challenges and opportunities presented by the changing nature of the economy especially in the wake of disruptions from the COVID-19 pandemic and validate the insights. The Council members included:

- Aaron Ain, CEO, Ultimate Kronos Group
- Joe Bahena, Senior Vice President, Joseph Abboud Mfg. Group
- Camilo Cabos, Vice President, Human Resources, Thermofisher Scientific
- Patricia Canavan, President, United Personnel Services (Recruitment)
- Kevin Churchwell, M.D., EVP Health Affairs/ COO, Boston Children's Hospital
- Roger Crandall, Chairman, President andChief Executive Officer, MassMutual
- Warren Fields, President & CEO, Pyramid Hotel Group
- Bill Grant, CFO, Cummings Properties
- Michael Lauf, President & CEO, Cape Cod Healthcare
- Laurie Leshin, President, Worcester Polytechnic Institute
- Mark Nunnelly, Managing Director, Bain Capital
- Niraj Shah, CEO & Co-Founder, Wayfair
- Carolyn Stimpson, Owner, Wachusett Ski Area
- Kumblr R. Subbaswamy, Chancellor of the University of Massachusetts Amherst

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GOING FORWARD

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APPENDIX AND METHODOLOGY

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