Massachusetts State and Regional Employment Projections

Overview of Methodology

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UMASS DONAHUE INSTITUTE
Economic & Public Policy Research

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Introduction

UMDI was contracted to produce employment projections for each of Massachusetts' 13 regional planning agencies (RPAs) for 2020, 2030, and 2040 as part of a broader regional transportation exercise for by the Massachusetts Department of Transportation (MassDOT). This phase of the work came on the heels of population projections produced by our colleagues at UMDI's Population Estimates Program (PEP), and labor force projections produced by the Metropolitan Area Planning Council (MAPC).

Since the term is central to this analysis, it is helpful to define the word "projection" and compare it to the meaning of "forecast" in this context. Within the field of economics, a projection examines past trends and examines what the future will look like if those trends continue, while a forecast applies one's expert knowledge to estimate the ways in which the world will be different at some future point. While projections are necessary and useful for the planning process, it is important to remember a projection is not a forecast, and, for that matter, that any forecast stretching out across multiple decades will almost certainly miss numerous "game-changing" influential events, from emerging technologies to geopolitical shifts, that tend to occur over long timeframes.

As an example, many commentators have observed the progress made on automation and self-driving vehicles and come to the conclusion that a substantial share of current jobs in the transportation and warehousing sector will be automated within our lifetimes. This may very well be the case, but UMDI does not claim to have the specific industry expertise to estimate when that technology may become viable in a large-scale commercial setting, what the public policy response to such developments might be, or what share of jobs in that sector would be vulnerable to automation. Therefore, our projections assume that the share of jobs in the transportation and warehousing sector will shift based on that industry's relative prominence in the workforce in recent history.

While projections are useful and serve as a foundation to help inform policymakers on how their communities are likely to change if past conditions continue into the future, it is important to remember that projections are not set in stone. Rather, they are a tool to help local and regional policymakers understand the factors that will contribute to future regional employment levels and patterns. While UMDI firmly believes that these projections are based on sound assumptions, they should be seen as a starting point and may in some cases be augmented by the expert knowledge of data users in the RPAs.

Methodology

Fundamentally, this projections exercise is about taking the already-developed labor force projections from MAPC and then making adjustments by answering several questions about that labor force. Specifically, UMDI is looking to answer the following:

1. How many of the people in the labor force will actually be employed?
2. Where will those employed people work?
3. How many people will come into Massachusetts to work from other states?
4. What industries will these people work in?

In addition to the labor force projections generated by MAPC, UMDI's employment projections apply the following data sources to answer these questions:

1. Monthly "Local Area Unemployment Statistics" (LAUS) unemployment data by city/town from 1990 to 2017 sourced from the Massachusetts Executive Office of Labor and Workforce Development.
2. Census tract-level commuting pattern data from the Census Bureau's LEHD (Longitudinal Employer-Household Dynamics) Origin-Destination Employment Statistics (LODES), 2011-2015.
3. Projections of in-commuting from neighboring states from Emsi based on US Census Bureau Data.
4. Projections of shifting industry shares from Emsi. Emsi's jobs numbers are based on the U.S. Department of Labor's Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW) employment data series.

Incorporating Labor Force Estimates from MAPC

MAPC generated labor force projections (rooted, in turn, by UMDI's population projections) by RPA for historical years 2010 as well as future years 2020, 2030, and 2040. These labor force projections form the basis of UMDI's employment analysis. While their own methodology has been discussed separately, they took into account changes in Massachusetts' overall population, the aging of the present population into older age cohorts with lower levels of labor force participation (relative to the core 25-64 core workforce), and educational attainment levels (Massachusetts is trending towards higher educational attainment which increases labor force participation rates).

Table 1: Labor Force Projections by RPA

RPA	2010	2020	2030	2040
BRPC	68,423	64,069	60,722	59,935
CCC	110,213	103,736	91,408	79,885
CMRPC	301,198	310,222	314,039	319,138
FRCOG	39,894	38,266	35,723	33,961
MAPC	1,722,914	1,857,979	1,924,531	1,979,593
MRPC	127,553	127,366	123,112	120,296
MVC	9,325	9,615	9,867	9,960
MVPC	177,707	191,972	190,839	192,250
NMCOG	159,055	164,867	156,314	150,934
NPEDC	5,992	6,254	6,306	6,257
OCPC	199,783	204,814	201,878	201,578
PVPC	313,683	311,941	309,226	309,045
SRPEDD	337,509	342,515	340,764	338,074

Source: MAPC

Estimating Future Unemployment Rates and Employment Base

The labor force is comprised of both people who have jobs and people who are actively looking for jobs. Therefore, the first step to building employment projections from labor force projections is to estimate future employment. One challenge here is that unemployment rates are highly cyclical and will go up or down with business cycles (periods of economic recession or expansion). Unemployment, depending on the severity of an economic shock can rise quickly and dramatically as in the case of the Great Recession in 2008-2009 while recoveries and expansion periods tend to be more gradual and longer in duration. UMDI determined that attempting to estimate an exact unemployment rate even for 2020, let alone in future decades, would be problematic as economic cycles cannot be predicted. That said, certain structural factors have contributed to consistently higher unemployment rates in some RPAs than in others. For these reasons, UMDI applied the monthly unemployment rate for each RPA based on the average of the January 1990 to December 2017 period, a time-span that included three recessions and three periods of expansion. RPA-level unemployment rates were calculated by aggregating the number of unemployed persons in each RPA's constituent municipalities and then dividing that value by the aggregate number of persons in the labor force.

Table 2: Unemployment Rates by RPA

RPA	2010	Average
BRPC	8.7%	5.9%
CCC	9.9%	6.5%
CMRPC	8.6%	5.6%
FRCOG	7.6%	4.9%
MAPC	7.2%	4.7%
MRPC	9.6%	6.2%
MVC	9.8%	5.6%
MVPC	9.6%	6.4%
NMCOG	8.7%	5.8%
NPEDC	9.6%	3.9%
OCPC	9.1%	5.9%
PVPC	9.4%	6.0%
SRPEDD	10.5%	7.2%

Source: Local Area Unemployment Statistics (LAUS), Massachusetts Executive Office of Labor and Workforce Development

With these unemployment rates in place, UMDI could estimate the number of employed persons by RPA by multiplying the projected labor force by the employment rate (or one minus the unemployment rate). For the purposes of this exercise, UMDI has referred to this number of employed people as the "employment base".

Table 3: Employment Base by RPA

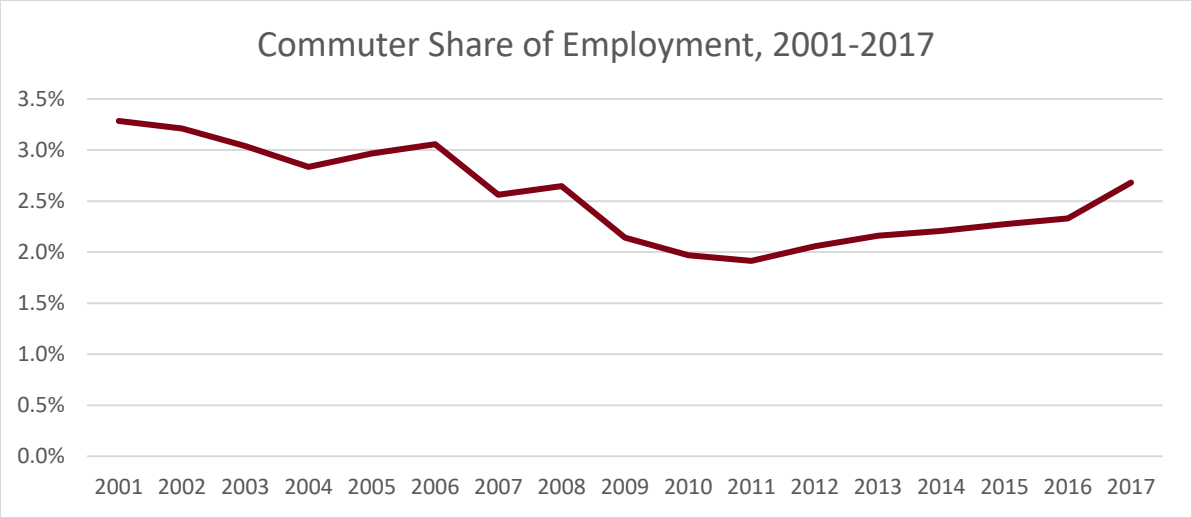
RPA	2010	2020	2030	2040
BRPC	62,485	60,283	57,134	56,393
CCC	99,269	97,043	85,510	74,730
CMRPC	275,294	292,864	296,468	301,281
FRCOG	36,853	36,399	33,980	32,304
MAPC	1,599,170	1,770,229	1,833,638	1,886,100
MRPC	115,260	119,448	115,459	112,817
MVC	8,414	9,081	9,320	9,408
MVPC	160,679	179,669	178,608	179,929
NMCOG	145,171	155,276	147,220	142,153
NPEDC	5,414	6,007	6,057	6,010
OCPC	181,619	192,723	189,961	189,678
PVPC	284,275	293,112	290,560	290,390
SRPEDD	302,125	317,768	316,144	313,648

Source: UMDI Calculations based on MAPC labor force projections and unemployment rates from the Massachusetts Executive Office of Labor and Workforce Development

Projecting Net Commuters

While the vast majority of workers in Massachusetts also live in Massachusetts, many residents of nearby states commute into the Commonwealth for work. Since the populations and labor forces of these states were not projected by UMDI's Population Estimates Program and MAPC, respectively, UMDI had to find a different source of this data. UMDI pulled data on net commuters into Massachusetts from Emsi and took those ratios as a share of Emsi's own employment projections. In doing so, UMDI observed a highly cyclical pattern in net commuting, which tends to rise and fall with economic cycles. Following the logic established when dealing with unemployment rates, UMDI opted to use the 17-year average when calculating the number of net commuters coming into the state. Since net commuters are equal to in-commuters minus out-commuters, and since out-commuters come from the labor force, UMDI now had the information necessary to derive the number of in-commuters to be shown at a later step.

Table 4: Net Commuters into Massachusetts as a Share of Employment



Source: Emsi, UMDI Calculations

Sharing Out Workers to RPAs using LODES Data

The US Census Bureau has recently begun producing the LEHD Origin-Destination Employment Statistics (where LEHD stands for Longitudinal Employer-Household Dynamics), a Census-tract level dataset of where individuals live and where they work, derived from administrative records (e.g., Social Security Administration, Internal Revenue Service, and State Employment Security Agencies), not surveys. Once UMDI had estimates of how many people would be in the labor force in each RPA and how many of them would be employed, the next step was to calculate where they worked. UMDI loaded up 2011-2015 average LODES data for the entire country and aggregated the census tracts to Massachusetts' RPAs and an out-of-state region. Then UMDI converted the LODES estimates into shares of an RPA's employment base as shown in Table 5. In terms of interpreting the table, it should be read horizontally.

For example, in OCPC, 32.3 percent of employed workers work within the region, 48.1 percent commute to MAPC, and the remainder works in other locations.

Table 5: Shares of Labor Force by RPA

RPA	BRPC	CCC	CMRPC	FRCOG	MAPC	MRPC	MVC	MVPC	NMCOG	NPEDC	OCPC	PVPC	SRPEDD	Out-of-State
BRPC	68.0%	0.4%	2.9%	1.1%	8.5%	1.0%	0.0%	0.8%	0.7%	0.0%	0.9%	6.7%	1.5%	7.4%
CCC	0.2%	63.2%	1.9%	0.1%	16.1%	0.5%	0.6%	0.7%	0.7%	0.3%	4.5%	1.2%	6.1%	3.7%
CMRPC	0.4%	0.5%	51.5%	0.3%	29.3%	2.9%	0.0%	1.0%	1.4%	0.0%	1.2%	3.8%	2.1%	5.5%
FRCOG	2.1%	0.5%	5.2%	37.2%	10.7%	4.9%	0.1%	1.0%	1.0%	0.0%	1.0%	24.7%	1.8%	9.9%
MAPC	0.2%	0.4%	2.1%	0.1%	85.1%	0.5%	0.0%	1.8%	1.8%	0.0%	2.1%	0.9%	1.7%	3.3%
MRPC	0.6%	0.4%	12.1%	1.3%	27.9%	38.9%	0.1%	1.6%	5.0%	0.0%	0.9%	3.3%	1.6%	6.2%
MVC	0.2%	11.8%	1.4%	0.1%	14.3%	0.6%	52.7%	0.7%	0.7%	2.2%	3.5%	0.9%	7.5%	3.4%
MVPC	0.2%	0.3%	1.6%	0.1%	39.0%	0.8%	0.0%	38.4%	6.9%	0.0%	0.8%	1.1%	1.1%	9.8%
NMCOG	0.1%	0.3%	2.1%	0.1%	44.4%	2.4%	0.0%	8.1%	31.2%	0.0%	0.9%	1.1%	1.1%	8.1%
NPEDC	0.1%	7.3%	1.1%	0.1%	11.9%	0.4%	2.1%	0.4%	0.4%	64.6%	2.6%	0.8%	5.5%	2.9%
OCPC	0.2%	2.4%	1.8%	0.1%	48.1%	0.5%	0.1%	0.8%	0.9%	0.0%	32.3%	1.3%	8.5%	3.0%
PVPC	1.2%	0.3%	3.7%	1.7%	9.1%	0.8%	0.0%	0.8%	0.7%	0.0%	0.8%	68.3%	1.4%	11.3%
SRPEDD	0.2%	2.0%	2.1%	0.1%	24.9%	0.5%	0.1%	0.7%	0.8%	0.0%	8.0%	1.3%	48.2%	11.3%
Out-of-State	2.7%	1.2%	7.0%	0.9%	46.0%	2.2%	0.2%	10.3%	7.1%	0.1%	2.3%	8.3%	11.8%	0.0%

Source: LODES, UMDI Calculations

With these shares in place, the projected employment base by RPA can be spread across regions to develop initial employment projections by RPA.

Table 6: Initial Employment Projections by RPA

RPA	2010	2020	2030	2040
BRPC	59,704	59,330	57,435	57,212
CCC	88,121	88,476	81,442	74,895
CMRPC	240,993	256,510	259,197	262,726
FRCOG	26,055	26,432	25,527	24,978
MAPC	1,944,052	2,124,259	2,174,751	2,220,191
MRPC	80,155	84,097	82,779	82,127
MVC	7,280	7,774	7,861	7,873
MVPC	142,784	155,965	156,917	158,861
NMCOG	121,665	130,930	129,888	129,849
NPEDC	4,954	5,412	5,438	5,399
OCPC	137,604	146,820	146,706	147,230
PVPC	270,311	280,357	278,990	279,618
SRPEDD	244,433	258,350	258,762	258,927
Total	**3,368,111**	**3,624,712**	**3,665,694**	**3,709,885**

Source: UMDI Calculations

Reconciling Projections with Previous MassDOT Data

Estimates of employment vary even between different federal government data sources for the same year, depending on the method used to develop them. After developing the initial projections, UMDI received feedback from MassDOT that discrepancies in the estimates in historical years would cause some issues in integrating these results into their travel demand model. In order to reconcile these two datasets, UMDI first calculated these projections as a rate of growth from 2010, and then applied those rates to the 2010 DET employment numbers already being used by DOT.

Table 7: Initial Employment Projections as a Rate of Growth from 2010

RPA	2010	2020	2030	2040
BRPC	100.0%	99.4%	96.2%	95.8%
CCC	100.0%	100.4%	92.4%	85.0%
CMRPC	100.0%	106.4%	107.6%	109.0%
FRCOG	100.0%	101.4%	98.0%	95.9%
MAPC	100.0%	109.3%	111.9%	114.2%
MRPC	100.0%	104.9%	103.3%	102.5%
MVC	100.0%	106.8%	108.0%	108.2%
MVPC	100.0%	109.2%	109.9%	111.3%
NMCOG	100.0%	107.6%	106.8%	106.7%
NPEDC	100.0%	109.3%	109.8%	109.0%
OCPC	100.0%	106.7%	106.6%	107.0%
PVPC	100.0%	103.7%	103.2%	103.4%
SRPEDD	100.0%	105.7%	105.9%	105.9%
Total	**100.0%**	**107.6%**	**108.8%**	**110.1%**

Source: UMDI Calculations

Table 8: Reconciled Employment Projections

RPA	2010	2020	2030	2040
BRPC	60,150	59,772	57,864	57,639
CCC	88,596	88,953	81,880	75,299
CMRPC	224,059	238,486	240,984	244,265
FRCOG	25,684	26,055	25,163	24,622
MAPC	1,823,515	1,993,310	2,041,465	2,084,667
MRPC	77,199	80,996	79,726	79,098
MVC	7,731	8,256	8,349	8,362
MVPC	145,374	158,793	159,763	161,742
NMCOG	119,332	128,420	127,398	127,359
NPEDC	5,699	6,227	6,256	6,212
OCPC	140,572	149,986	149,870	150,405
PVPC	252,156	261,527	260,253	260,838
SRPEDD	229,400	242,461	242,848	243,002
Total	**3,199,467**	**3,443,242**	**3,481,819**	**3,523,509**

Source: DET, UMDI Calculations

Developing Employment Projections by Industry

The final step of the jobs projections process was to share out the RPA-level employment projections by industry. To do this, UMDI returned to Emsi which generates zip-code-level employment projections by NAICS code out to 2027. UMDI determined that the use of Emsi data was necessary for this project in order to accurately capture the industry composition of the RPAs. While historical data on industry employment in Massachusetts is available from the Executive Office of Labor and Workforce Development, that data is not available at the RPA level. While the RPAs can be created by aggregating the employment data of their constituent municipalities, that municipal level data is heavily suppressed. Emsi uses other publicly available secondary data sources, as well as private sources such as resumes and job postings, in order to make estimates of the unsuppressed employment values for these communities, which can then be aggregated to the RPA level. To produce industry-level estimates past 2027, UMDI used a simple projection based on the trend from 2001 to 2027. These estimates are aggregated up, from zip codes to RPAs and from 2-digit NAICS codes to three broad super-sectors – basic, retail, and services—that are used in transportation demand modeling.

Table 9: Super-Sector Composition

NAICS Code	Super-Sector
Agriculture, Forestry, Fishing and Hunting	Basic
Mining, Quarrying, and Oil and Gas Extraction	Basic
Utilities	Basic
Construction	Basic
Manufacturing	Basic
Wholesale Trade	Basic
Retail Trade	Retail
Transportation and Warehousing	Basic
Information	Service
Finance and Insurance	Service
Real Estate and Rental and Leasing	Service
Professional, Scientific, and Technical Services	Service
Management of Companies and Enterprises	Service
Administrative and Support and Waste Management and Remediation Services	Service
Educational Services	Service
Health Care and Social Assistance	Service
Arts, Entertainment, and Recreation	Service
Accommodation and Food Services	Service
Other Services (except Public Administration)	Service
Government	Service

These shares are then applied to the RPA level employment projections, producing super-sector level employment estimates by RPA for 2020, 2030, and 2040.

Table 10: Employment Projections by RPA and Super-Sector

RPA	Super-Sector	2010	2020	2030	2040
BRPC	BASIC	9,283	9,267	9,045	9,079
BRPC	RETAIL	8,495	8,209	7,745	7,271
BRPC	SERVICE	42,372	42,295	41,073	41,289
CCC	BASIC	10,562	10,695	9,728	8,829
CCC	RETAIL	14,698	14,203	13,401	12,580
CCC	SERVICE	63,336	64,055	58,752	53,890
CMRPC	BASIC	46,676	50,203	51,051	52,025
CMRPC	RETAIL	25,834	24,965	23,555	22,112
CMRPC	SERVICE	151,549	163,319	166,378	170,128
FRCOG	BASIC	6,392	6,525	6,333	6,240
FRCOG	RETAIL	2,916	2,818	2,659	2,496
FRCOG	SERVICE	16,376	16,712	16,170	15,886
MAPC	BASIC	364,782	366,965	359,705	344,566
MAPC	RETAIL	308,706	308,698	303,845	297,775
MAPC	SERVICE	1,150,027	1,317,646	1,377,915	1,442,327
MRPC	BASIC	21,726	22,922	22,729	22,710
MRPC	RETAIL	9,830	9,499	8,962	8,413
MRPC	SERVICE	45,643	48,575	48,035	47,975
MVC	BASIC	1,193	1,301	1,333	1,350
MVC	RETAIL	1,205	1,164	1,098	1,031
MVC	SERVICE	5,333	5,790	5,917	5,980
MVPC	BASIC	32,932	35,958	36,278	36,735
MVPC	RETAIL	12,046	11,640	10,983	10,310
MVPC	SERVICE	100,396	111,196	112,502	114,698
NMCOG	BASIC	34,045	36,722	36,589	36,711
NMCOG	RETAIL	9,633	9,309	8,783	8,245
NMCOG	SERVICE	75,653	82,388	82,026	82,403
NPEDC	BASIC	991	1,110	1,125	1,126
NPEDC	RETAIL	826	798	753	707
NPEDC	SERVICE	3,883	4,319	4,378	4,379
OCPC	BASIC	30,424	32,949	33,192	33,571
OCPC	RETAIL	21,361	20,642	19,476	18,283
OCPC	SERVICE	88,787	96,395	97,202	98,550
PVPC	BASIC	44,907	46,836	46,887	47,221
PVPC	RETAIL	28,858	27,886	26,311	24,699
PVPC	SERVICE	178,392	186,805	187,055	188,918
SRPEDD	BASIC	55,241	59,296	59,911	60,442
SRPEDD	RETAIL	35,035	33,855	31,943	29,986
SRPEDD	SERVICE	139,125	149,310	150,994	152,574
Massachusetts	**BASIC**	659,153	680,748	673,906	660,605
Massachusetts	**RETAIL**	479,442	473,687	459,515	443,908
Massachusetts	**SERVICE**	2,060,872	2,288,807	2,348,398	2,418,996