SEIGMA SOCIAL AND ECONOMIC IMPACTS OF GAMBLING IN MASSACHUSETTS

UNIVERSITY OF MASSACHUSETTS SCHOOL OF PUBLIC HEALTH AND HEALTH SCIENCES

The Construction of Plainridge Park Casino

Spending, Employment, and Economic Impacts

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Executive Summary

The UMass Donahue Institute (UMDI) is a member of the Social and Economic Impacts of Gambling in Massachusetts (SEIGMA) project team that has been charged with carrying out aspects of the research agenda of the Massachusetts Gaming Commission (MGC). In this report, UMDI describes the activities undertaken to construct the Plainridge Park Casino (PPC) in Plainville, Massachusetts and measures the economic impacts generated through this process.

The construction of Plainridge Park Casino occurred over two phases: the architecture, engineering, and design phase, which took place from 2010 until 2014, and the actual construction phase, which went from 2014 to 2015. Of the two phases, the vast majority of spending occurred during construction. In both cases, most of the spending was spent on goods and services supplied by firms within Massachusetts.

Table 1: Architecture, Engineering, and Design Spending by Region

Region	2010	2011	2012	2013	2014
Metro Boston	$1,587,109	$0	$829,751	$413,303	$3,898,523
Bristol and Norfolk Counties	$803,095	$0	$1,948,792	$1,517,836	$1,724,919
Rest of Western MA	$74,940	$0	$0	$0	$0
Rest of Southeastern MA	$7,000	$0	$0	$0	$277,846
Lower Pioneer Valley	$0	$0	$0	$0	$92,405
Central MA	$0	$0	$0	$0	$0
Out-of-state	$9,781	$0	$22,726	$25,410	$88,520
Total	**$2,481,925**	**$0**	**$2,801,268**	**$1,956,549**	**$6,082,213**
Massachusetts Total	**$2,472,144**	**$0**	**$2,778,543**	**$1,931,139**	**$5,993,692**

Source: Massachusetts Gaming Commission

Table 2: Construction Phase Spending by Industry

Industry	Total	Percent Spent in MA
Construction	$91,875,994	87%
Insurance and Bonds	$15,098,255	100%
Manufacturing Goods	$4,041,560	4%
Rental and Leasing	$1,428,153	100%
Other	$1,343,505	100%
Administration And Waste	$879,412	100%
Wholesale	$718,271	0%
Total	$115,385,150	85%

Source: Pinck & Co.

The economic gains from the construction of Plainridge Park mainly accrued to the areas around the casino, including Norfolk County, where Plainville is located, and neighboring Bristol County, while the Metro Boston area to the north and the South Shore and Cape and Islands communities to the southeast also saw boosts in employment, output, value added, and personal income. All told, 170 jobs were created in Massachusetts during the architecture, engineering, and design phase, while 1,116 jobs

were created in the construction phase.[1] The architecture, engineering, and design phase of the project produced $24.3 million[2] in output, or new economic activity, while the construction phase generated $165.6 million. Of that output, $16.7 million in the architecture, engineering, and design phase and $105.1 million in the construction phase was net new, also known as value added.[3]

Table 3: Economic Impacts of the Architecture, Engineering, and Design Phase, 2010-2014

Category	Employment	Output	Value Added	Personal Income
Bristol and Norfolk Counties	76	$9.7	$6.8	$4.7
Metro Boston	75	$12.5	$8.5	$5.8
Rest of Southeastern MA	12	$1.3	$0.9	$1.3
Central MA	3	$0.4	$0.2	$0.5
Lower Pioneer Valley	2	$0.2	$0.1	$0.1
Rest of Western MA	1	$0.1	$0.1	$0.1
Total	**170**	**$24.3**	**$16.7**	**$12.5**

Source: Pinck & Co.; Regional Economic Models, Inc. as calculated by the University of Massachusetts Donahue Institute

Table 4: Economic Impacts of the Construction Phase, 2014-2015

Category	Employment	Output	Value Added	Personal Income
Bristol and Norfolk Counties	755	$102.7	$65.6	$47.8
Metro Boston	203	$43.9	$27.6	$22.1
Rest of Southeastern MA	114	$13.5	$8.5	$15.4
Central MA	39	$4.8	$2.9	$5.9
Lower Pioneer Valley	4	$0.6	$0.4	$0.2
Rest of Western MA	1	$0.1	$0.1	$0.0
Total	**1,116**	**$165.6**	**$105.1**	**$91.5**

Source: Pinck & Co.; Regional Economic Models, Inc. as calculated by the University of Massachusetts Donahue Institute

[1] These are job-years, which are equivalent to one worker being hired for one year's worth of labor. So two workers working half of the time for a year would be 1 job-year, while a single worker working the full year for two years would equal 2 job-years.

[2] Numbers throughout this report are sometimes rounded for the sake of easy presentation. Therefore, numbers in figures and tables may not always sum perfectly to their associated totals.

[3] For a more detailed description of output and value added, see page 9.

Introduction

The UMass Donahue Institute (UMDI) is a member of the Social and Economic Impacts of Gambling in Massachusetts (SEIGMA) project team that has been charged with carrying out aspects of the research agenda of the Massachusetts Gaming Commission (MGC). A remarkable aspect of the MGC's research agenda is the opportunity to measure the actual economic outcomes of the casino facilities as they are built and carry out operations in the state. This report describes the activities undertaken to construct the Plainridge Park Casino (PPC) in Plainville, Massachusetts and measures the economic impacts generated through this process.

In November of 2011, Governor Deval Patrick signed the Expanded Gaming Act which allows for the creation of up to three commercial resort-style casinos and one slot parlor.[4] To reduce internal competition among casinos and maximize their potential benefits, the Commonwealth was divided into three regions, shown in Figure 1, with each region able to attract only one full casino license. The slot parlor license was not geographically limited. To date, two full licenses in Regions A and B and the slots license have been awarded with the host communities distributed across the state as shown in Figure 2. The subject of this report, Plainridge Park Casino, which is the singular slot parlor, is the only venue currently operating. The status of the Region C casino license is complicated by the decision of the MGC to not award a license to the only commercial bidder, which hoped to open in Brockton,[5] and the recent U.S. District Court ruling invalidating the land in trust granted to the Mashpee Wampanoag tribe for a casino in nearby Taunton.[6]

Recognizing that the introduction of casinos will create both positive and negative social and economic effects, section 71 of the Expanded Gaming Act includes a mandate for the Massachusetts Gaming Commission to establish "an annual research agenda."[7] To facilitate this research, the MGC sought bids through a competitive process, which was won by SEIGMA, a team led by researchers at the UMass Amherst School of Public Health and Health Sciences.[8] The role of UMDI in the larger research agenda is to collect data on and measure the economic impacts of the introduction of casinos in Massachusetts.

This report seeks to inform stakeholders about the construction of Plainridge Park Casino and its economic contribution to the Commonwealth. Over the course of 2014 and 2015, UMDI worked with the MGC and its construction management vendors to obtain data on the spending, employment, and wages related to the construction of PPC. These data are presented in this report along with an estimate of the total economic impacts to the Commonwealth of Massachusetts resulting from the casino construction.

[4] <http://massgaming.com/about/expanded-gaming-act>
[5] http://massgaming.com/wp-content/uploads/16-025RegionC.pdf
[6] https://www.gpo.gov/fdsys/pkg/USCOURTS-mad-1_16-cv-10184/pdf/USCOURTS-mad-1_16-cv-10184-0.pdf
[7] <http://massgaming.com/about/research-agenda>
[8] An overview of the research plan can be found on the MGC's website: < http://massgaming.com/wp-content/uploads/SEIGMA-Research-Plan.pdf>

Figure 1: Massachusetts Gaming Regions[9]

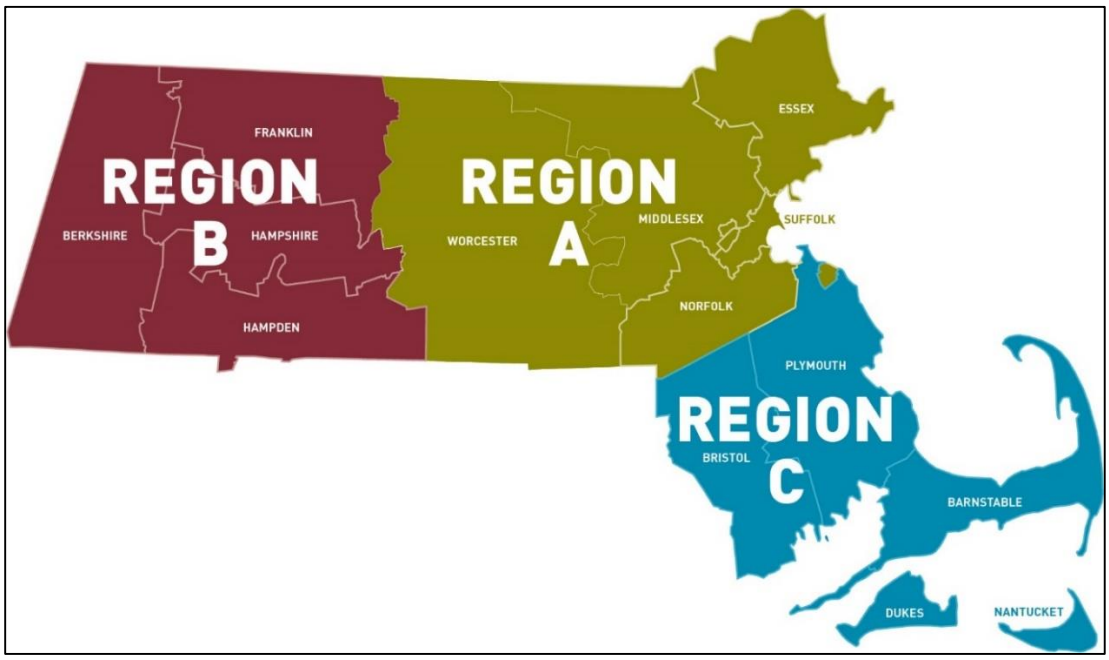
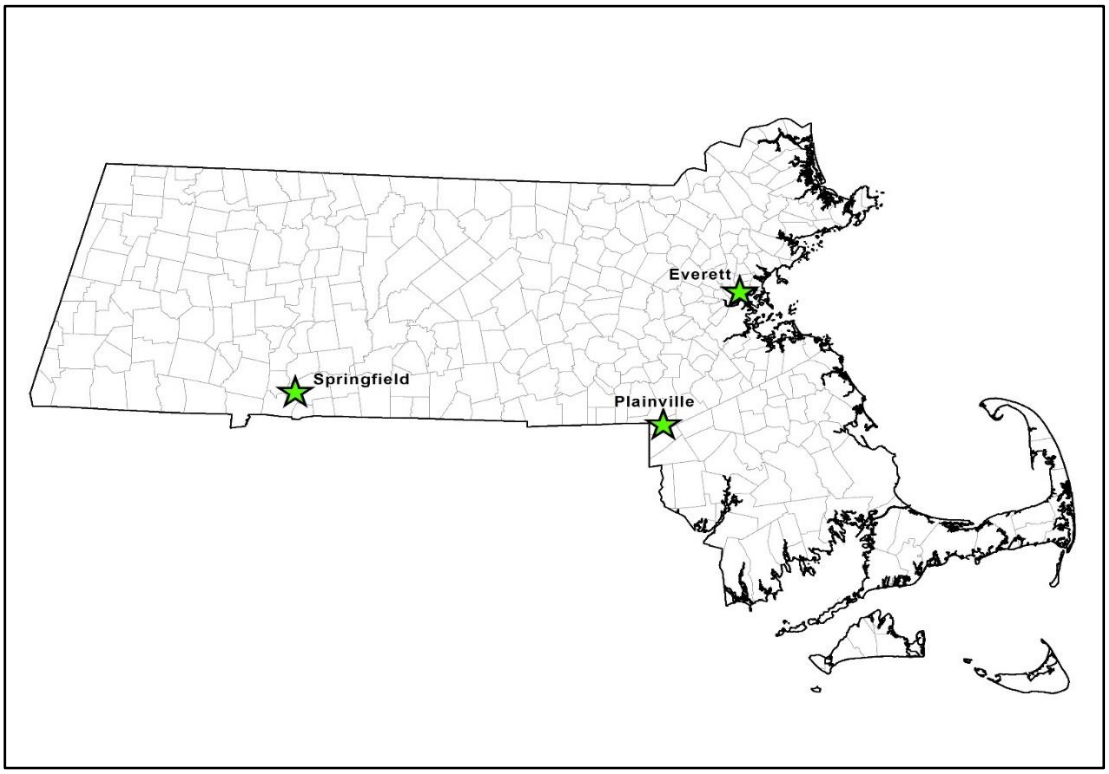


Figure 2: Locations of Approved Massachusetts Casinos



[9] <http://massgaming.com/about/expanded-gaming-act>

Plainridge Park Casino is located in the northeast corner of Plainville, Massachusetts near the intersection of Route 1 and Interstate 495. This site was formerly the home of Plainridge Racecourse, which has now been integrated into the casino facility. The final structures on the casino property include the racetrack used for harness racing, a grandstand and simulcast building, the casino, and a parking garage.

Pre-construction activities including engineering, architecture and design took place in the years between 2010 and 2014. More than $13.3 million was spent during this phase. The building of Plainridge Park Casino began in earnest in the second quarter of 2014 and finished prior to the casino's opening day on June 24, 2015. During this time, a total of $92 million was spent on construction in addition to $23 million on other related purchases. This total includes money spent on both in-state and out-of-state vendors. The lead contractor, the Boston office of Turner Construction Company,[10] oversaw the renovation of the 50,000 square foot simulcast building and construction of the single-story, 106,000 sq. ft. casino, which is a pre-engineered metal building. Turner also supervised the completion of the new parking garage. The racetrack remained open for harness racing throughout construction, beginning its season in April 2015 as scheduled.[11]

[10] Turner project background: <http://www.turnerconstruction.com/experience/project/694D/penn-gaming-at-plainridge-park-casino>

[11] 2015 PPC racing schedule:
< http://www.plainridgeparkcasino.com/~/media/Plainridge/pdfs/racing/schedule/plainridge-live-racing-2015.ashx>

Glossary for Economic Impacts

In this section, we define terms common to economic modeling and analysis that are used in this report. They are as follows:

Employment: Employment is a count of jobs, not people, by place of work. It counts all jobs with the same weight regardless of whether the position is full- or part-time or whether the labor of a self-employed proprietor. Additionally, jobs are counted as job-years, which are equivalent to one job lasting for one year. It is a similar concept to "person-hours." New jobs often carry over from year to year and therefore the jobs in one year include many of the same jobs as in the previous year. For example, if a new business opens with 10 employees then the host community of that business will have 10 more jobs than it would have had in every future year that the company maintains its workforce. For example, over 5 years, the business will have created 50 job-years (10 jobs at the company x 5 years = 50 job-years) though it is possible that it is not the same 10 people who are working there over time. When reviewing changes in employment across multiple years, knowledge of the concept of job-years is vital to proper interpretation.

Output: Output is the total value of production, sales, or business revenues, whether final (i.e., purchased by the end user) or intermediate (used by another business to produce its own output). It includes the value of inputs to production, wages paid to employees, capital expenses, taxes, and profit. It is useful as an indicator of business activity but it should not be construed as net new economic activity.

Personal Income: Personal income is income and benefits from all sources earned by all persons living in an area. It excludes the income earned by non-resident workers who commute into an area but includes the income of residents who commute out.

Value Added: Value added is the value of all final goods and services created in an economy. It is new economic activity and is also known as gross product or net economic impact. It differs from output by the value of inputs to production. Value added provides a useful summary of the economy and is why all nations and US states report their economic growth by using it, calling it either gross domestic product or gross state product as appropriate. Its usefulness derives from the elimination of the double-counting inherent in output, which stems from the inclusion of inputs. An example of the double-counting of inputs can be found and simplified in the process of making and selling a loaf of bread. A farmer sells wheat to a mill, which then sells flour to a baker, who then sells bread to the final customer. The sale price of the bread includes the cost of all necessary inputs including growing the wheat, milling the flour, and baking the bread. Value added only counts the sale price of the bread to the final consumer which is the net new value created in the economy. On the other hand, output counts the revenues earned by every business in the supply chain which means that the value of the wheat and flour are counted more than once.

Methodology

Overview

The process of assessing economic impacts began with collecting data from the general contractor in charge of building Plainridge Park Casino. These data were then prepared for and run through an economic impact model to produce an estimate of the impacts of construction on Massachusetts and its regions. UMDI worked in collaboration with Pinck & Co., which is the Massachusetts Gaming Commission's construction management vendor overseeing the Plainridge Park Casino project. In turn, Pinck & Co. worked with Turner Construction to obtain the necessary data and provide it to UMDI.

For this and future economic analyses, the SEIGMA team has chosen the PI$^+$ model from Massachusetts-based Regional Economic Models, Inc. (REMI). PI$^+$ generates realistic year-by-year estimates of the total regional effects of specific initiatives. Model simulations using PI$^+$ allow users to estimate comprehensive economic and demographic effects created by economic events such as the development and operation of a casino within a region. PI$^+$ allows economists to assess a variety of effects including economic impact analysis; changes in policies and infrastructure; and state and local taxes. REMI allows for dynamic, multi-year modeling as compared to other, more simplistic modeling systems. REMI thus has significant advantages for major complex initiatives that: a) have time-series based impacts that are likely to vary over time; b) require the use and interpretation of multiple economic variables; and c) emphasize economic interactions between regions within the state that add up to a true state-level impact.

The REMI model purchased by SEIGMA is a 6 region, 70 sector model. Each of the 6 regions in the model is built from Massachusetts counties, and the 70 REMI industry sectors roughly correspond to the 3-digit codes of the North American Industry Classification System (NAICS). For the purposes of this study, PI$^+$ used information on spending, the number of workers, and wages, all by region, to produce economic impact estimates. These inputs allow for the appropriate allocation of economic activity across the regions of the Commonwealth so that the model can calculate the total economic impacts for the state and show how activity in one region impacts others.

More information on the PI$^+$ model and the methods used to prepare the data from Pinck & Co. for use in the model can be found at the end of this report in Appendices 1 and 2.

Data Collection

Pinck & Co. served as a data intermediary between UMDI and Turner Construction. Pinck & Co. forwarded to Turner a data request template prepared by UMDI that took into account the data needs of the economic model and the qualitative and quantitative data of importance to the public. Data on spending and wages were provided quarterly to UMDI beginning at the end of the third quarter of 2014.

Due to the ramp-up of construction activity, the second and third quarters of 2014 were aggregated into one data delivery. Based on advice from Pinck & Co., UMDI split the combined second and third quarter spending into separate values for the second (Q2) and third (Q3) quarters of 2014 using 40 percent of the combined value for Q2 and 60 percent for Q3. This methodology cannot be applied to employment as it would result in fractions of jobs. Therefore employment and wages are still combined for Q2 and Q3 of 2014.

The specific data requested included construction spending by NAICS code, location of the supplier by state, and the building for which the spending was intended. For example, the data show how much

concrete was sourced from Massachusetts for use in the construction of the parking garage. Employment and wage data were organized by the zip code of residence of the workers.

Data on architecture, engineering, and design spending were obtained separately from Pinck & Co. This information was provided directly by Plainridge Park Casino with the assistance of the MGC and includes spending from both the prior owners of the site, Ourway Realty, and the current owners, Penn National Gaming. The data included the year and amount of spending and the name of the firm that received the money. The UMDI team then found the location and industry sector for each firm to round out the information necessary to input this data into the PI^+ model.

Preparation of Data for Economic Impact Analysis

The detail and specificity of the data provided by Pinck & Co. allowed the modelers at UMDI to replace some of the default assumptions of the model with project-specific information. For example, PI^+ includes average wages by industry and region and the typical flows of goods and services among regions. The construction data on PPC included specific information on each of these areas and therefore allowed the use of actual reported data rather than industry and/or regional averages. The averages built into the model are otherwise needed in the absence of precise inputs. As previously noted, detailed methodologies of the PI^+ model and the data preparation appear in Appendices 1 and 2.

Pre-Construction and Construction Data

This section provides an analysis of direct economic effects resulting from pre-construction and construction activities conducted to build Plainridge Park Casino. The analysis includes a discussion of spending on the project as well as employment and wages paid. These data serve as core inputs for modeling total economic impacts of the project.

Architecture, Engineering, and Design Spending

All construction projects are preceded by site surveys, environmental assessments, and the creation of building plans. In the case of Plainridge Park Casino, these activities amounted to $13.3 million of spending between Ourway Realty, the prior owners of the site, and Penn National Gaming, the current owners. Some of this money went to firms outside of Massachusetts, though nearly all of it ($13.2 million) remained in-state. Table 5 shows a gap in spending in 2011 which the team speculates represents a lull in activity during the year between the defeat of a 2010 attempt to legalize commercial casinos with a focus on adding slot machines at racecourses and the eventual signing of the Expanded Gaming Act in late 2011.

Table 5: Architecture, Engineering, and Design Spending by Region

Region	2010	2011	2012	2013	2014
Metro Boston	$1,587,109	$0	$829,751	$413,303	$3,898,523
Bristol and Norfolk Counties	$803,095	$0	$1,948,792	$1,517,836	$1,724,919
Rest of Western MA	$74,940	$0	$0	$0	$0
Rest of Southeastern MA	$7,000	$0	$0	$0	$277,846
Lower Pioneer Valley	$0	$0	$0	$0	$92,405
Central MA	$0	$0	$0	$0	$0
Out-of-state	$9,781	$0	$22,726	$25,410	$88,520
Total	**$2,481,925**	**$0**	**$2,801,268**	**$1,956,549**	**$6,082,213**
MA Total	**$2,472,144**	**$0**	**$2,778,543**	**$1,931,139**	**$5,993,692**

Source: Pinck & Co.

Construction Spending

Based on the data provided to UMDI, Plainridge Park Casino spent nearly $115.4 million on the new and renovated structures. This number is smaller than the amount frequently quoted for capital investment[12] because total investment includes the cost of furniture, fixtures, and equipment (FF&E) most of which are not included in the construction budget. Only the cost of items that are permanent or otherwise fixed parts of the structure are included in this analysis.

As is common, construction activities comprised the greatest cost in the total budget, which is categorized by industry in Table 6. These activities include pouring concrete, earthwork and site preparation, hanging drywall, and installing electrical, HVAC, and plumbing systems. When the aggregate industries in Table 6 are further divided into the specific activities of Table 7, insurance and

[12] For example, see MGC website <http://massgaming.com/about/casinoslots-parlor-development/>

general bonds[13] emerges more clearly as a significant component of the budget. These costs were roughly 13 percent of total costs and do not manifest in any on-the-ground activity.

Table 6: Total Spending by Industry

Industry	Total	Percent Spent in MA
Construction	$91,875,994	87%
Insurance and Bonds	$15,098,255	100%
Manufacturing Goods	$4,041,560	4%
Rental and Leasing	$1,428,153	100%
Other	$1,343,505	100%
Administration And Waste	$879,412	100%
Wholesale	$718,271	0%
Total	**$115,385,150**	**85%**

Source: Pinck & Co.

Table 7: Ten Largest Spending Categories by State

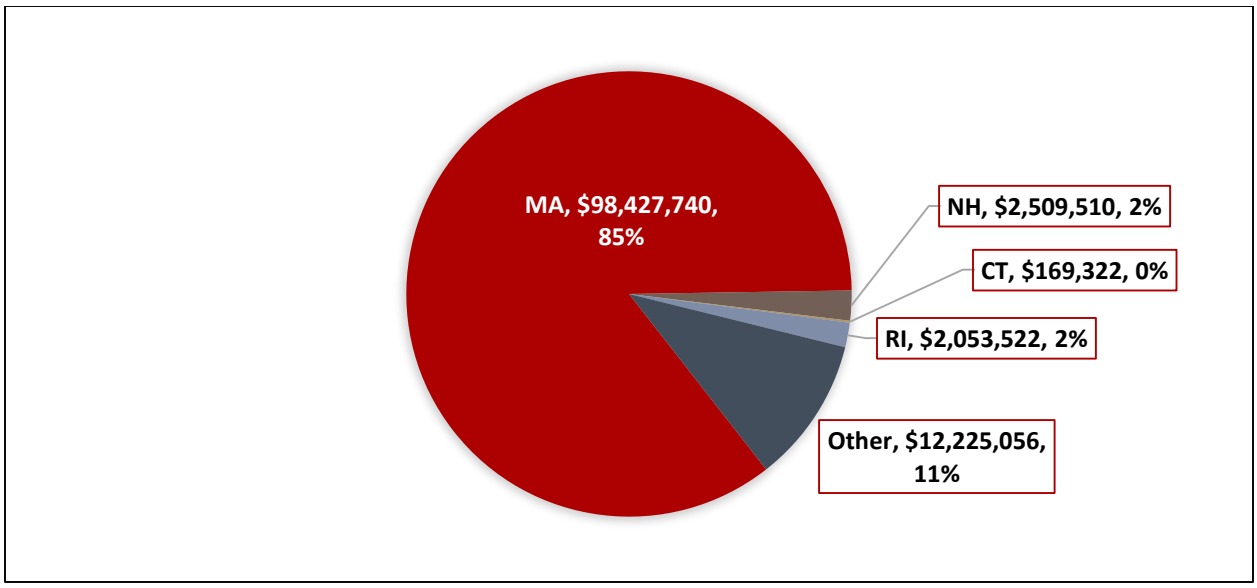
Largest Spending Categories	Total (Mil)	Share
Electrical - MA	$17.8	15%
General Conditions/ Insurance/ Bonds - MA	$15.1	13%
HVAC - MA	$10.2	5%
Earthwork - MA	$7.4	3%
Pre-Fab Metal Bldg. - MA	$6.0	3%
Glass & Glazing - MA	$4.5	2%
Drywall - MA	$4.3	2%
Plumbing - MA	$4.0	2%
Kitchen Equipment - FL	$3.9	2%
Concrete - MA	$3.5	2%

Source: Pinck & Co.

As Table 7 suggests and Figure 3 confirms, the majority of the spending, 85 percent in fact, went to in-state suppliers while Massachusetts' neighboring states together contributed less than 5 percent of the total. The bulk of the 11 percent of spending that went outside of New England is accounted for by kitchen equipment from Florida and structural steel from Quebec, Canada. It should be noted that the data received by UMDI cannot confirm the location of the "next level" of suppliers. For example, the data shows that $4.3 million of drywall was purchased from Massachusetts suppliers; however it is unknown where the drywall itself was manufactured. It is likely that there is notable leakage of spending out of the state after purchases from the first level of suppliers.

[13] In this case, general bonds refer to the performance bonds taken out for nearly all large construction projects. These bonds protect the owner of the property against the contractor's failure to complete the job.

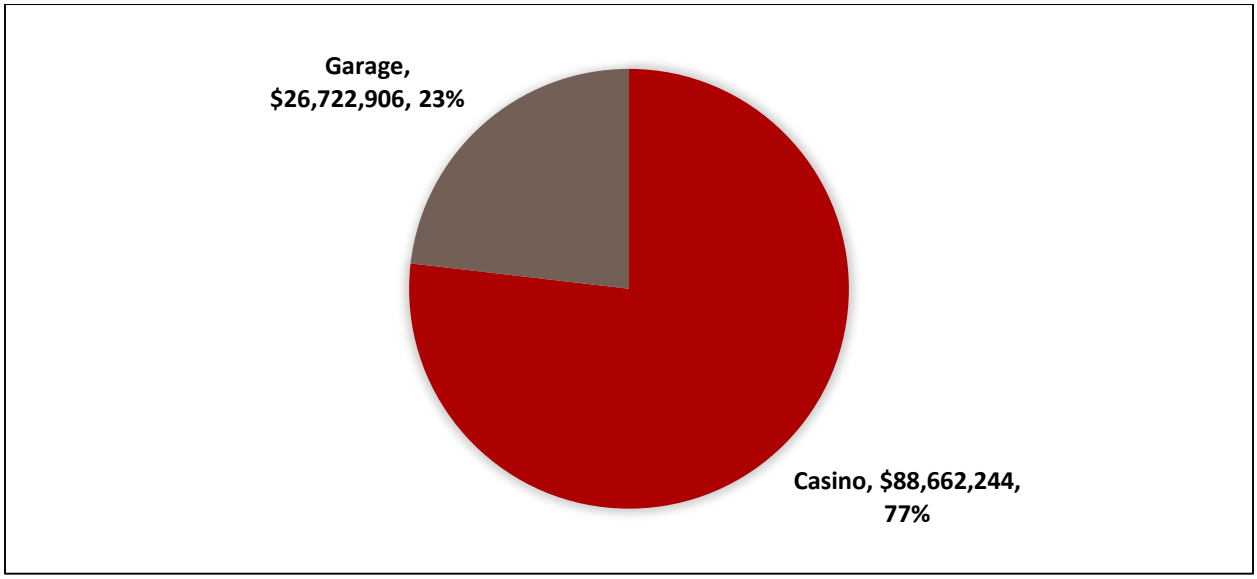
Figure 3: Share of Spending by State



Source: Pinck & Co.

Figure 4 shows that the cost of building the casino and renovating the simulcast building comprised most of the total budget. At over $88.6 million, these elements represent 77 percent of the total costs. The parking garage cost approximately $26.7 million and comprised the remaining 23 percent of total spending.

Figure 4: Share of Spending by Structure

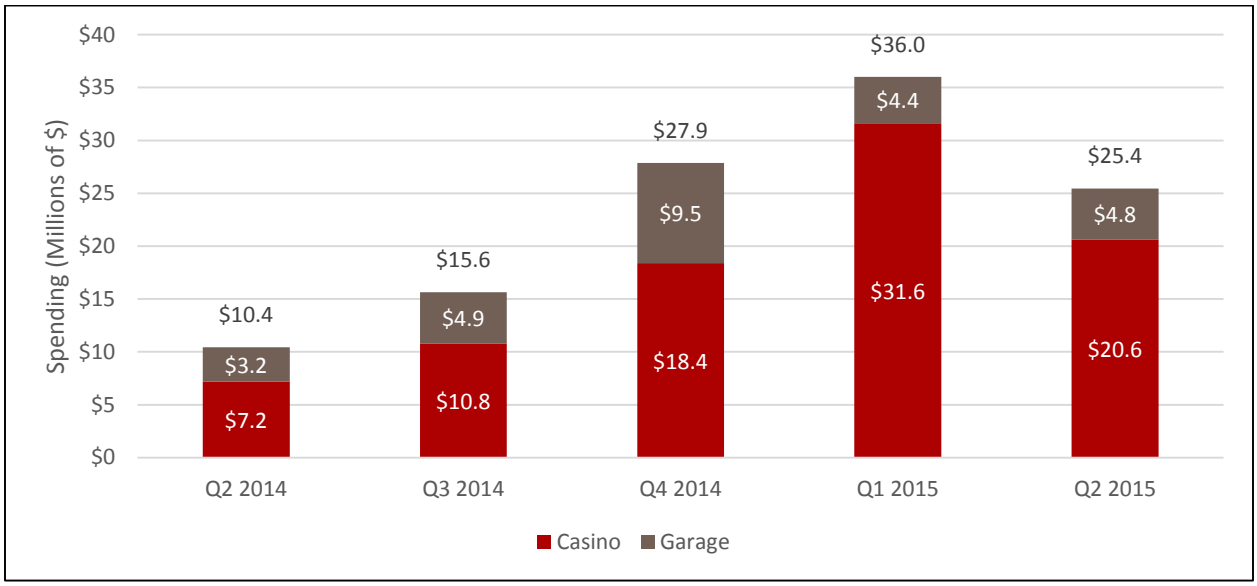


Source: Pinck & Co.

Total outlays, shown in Figure 5, hit their peak in the first quarter of 2015 at $36 million although spending began in the second quarter of 2014 at $10.4 million. Q1, 2015 is also the peak spending period for the casino while the previous quarter (Q4, 2014) marked the peak of expenditures for the

garage. At its quarterly peak, casino construction was $31.6 million while the garage reached its quarterly maximum at $9.5 million.

Figure 5: Spending by Quarter and Structure



Source: Pinck & Co.

Employment

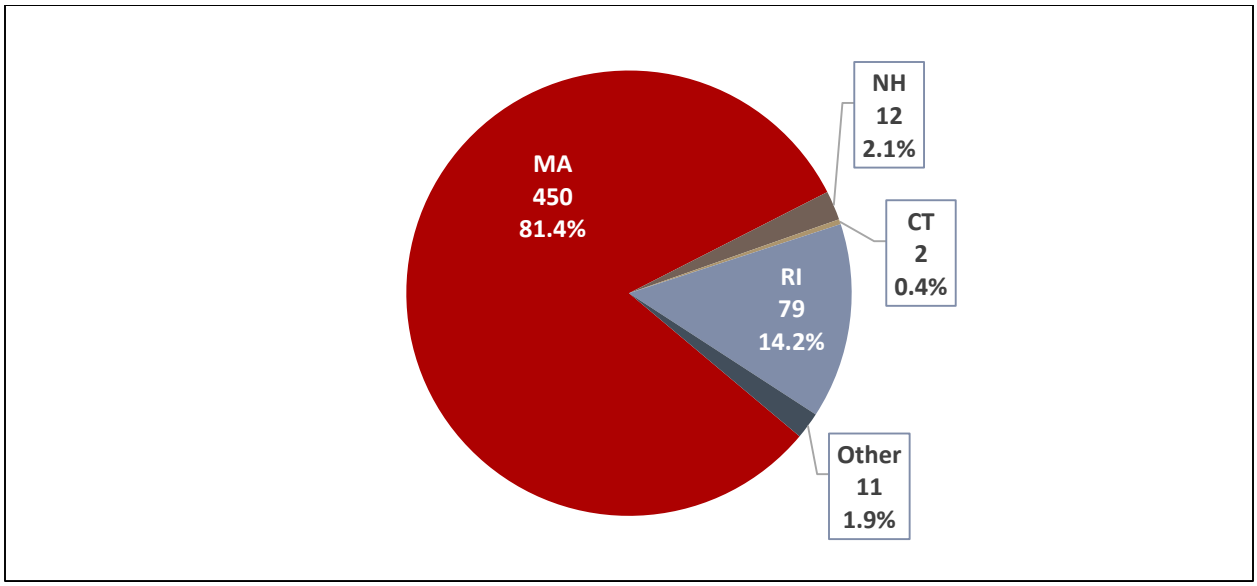
The construction effort at Plainridge Park Casino employed many tradesmen throughout its 14 month duration. However, many of those workers were only onsite for a short period of time. It is therefore important to appropriately interpret the employment numbers provided. Employment on the project is estimated using counts of workers paid each quarter. These data should not be thought of as full time equivalent annual jobs or even quarterly jobs but rather the number of workers who cycled through the site during a particular timeframe, many of whom could have only been there for a few weeks or even days. Indeed, some workers were paid less than $200 which implies a very short stay onsite. Also, as mentioned under Data Collection in the Methodology section above, employment and wages for the second and third quarters of 2014 could not be separated and are therefore presented together.

The number of workers employed in the construction of Plainridge Park Casino peaked during the final quarter of construction. Employment started at 390 in the second and third quarters of 2014 before jumping to 562, 627, and, finally, 634 in each of the following quarters. The average number of workers onsite was 554 per quarter while the cumulative total of employment across all quarters was 2,213. Again, this total does not represent the total number of employed people but rather the sum of the number of workers onsite at some point in each quarter and almost assuredly counts the same people multiple times. The average across all quarters (554) is better than the cumulative worker totals as a measure of the total employment of the project.

Figure 6 shows the number of workers by state of residence. From the chart, it is clear that the majority of the construction workers employed were from Massachusetts. In fact, on average over the course of construction, 82 percent of workers were Massachusetts-based despite the proximity of Rhode Island and its flagging construction sector, where employment is roughly 30 percent below its pre-recession

peak in 2006.[14] That being said, Rhode Islanders did make up the next largest group of workers with 14 percent of the average. New Hampshire, Connecticut, and all other states combined provided an average of roughly 5 percent of workers.

Figure 6: Number of Construction Workers by State of Residence and Share of Total from Quarterly Averages

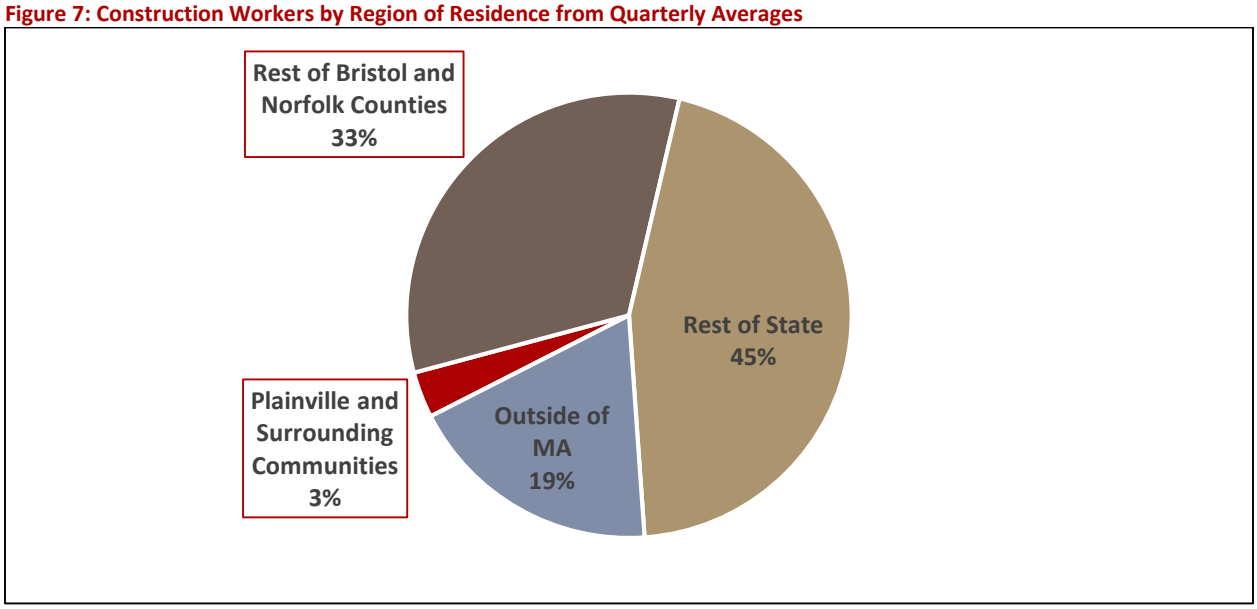


Source: Pinck & Co.

When it comes to geographic distribution within Massachusetts, workers were divided nearly equally between Bristol and Norfolk Counties (the immediate region) and the rest of the Commonwealth. Among all workers, 33% resided in Bristol and Norfolk counties, 45% in the rest of Massachusetts, and the remainder elsewhere. Within the immediate region, only a small share of workers was from the Town of Plainville or its MGC-designated surrounding communities. These workers represent 3% of all construction workers. Out of the average of 554 workers, 19 were from Plainville and its surrounding communities, 432 from elsewhere in Massachusetts, and 103 from outside the Commonwealth. Figure 7 shows the distribution of workers by region and Figure 8 and Figure 9 show total and average worker numbers, respectively. A map provided in Appendix 3 shows detailed worker distributions by town.

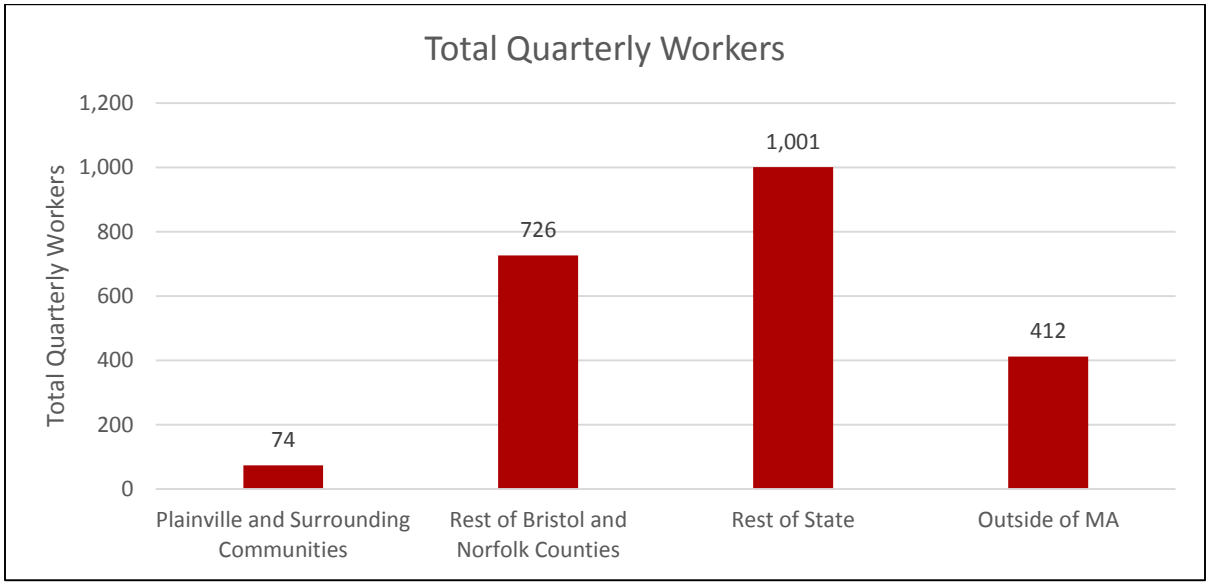
[14] QCEW private-sector construction employment, all establishments, annual average, 2001 – 2014.

Figure 7: Construction Workers by Region of Residence from Quarterly Averages



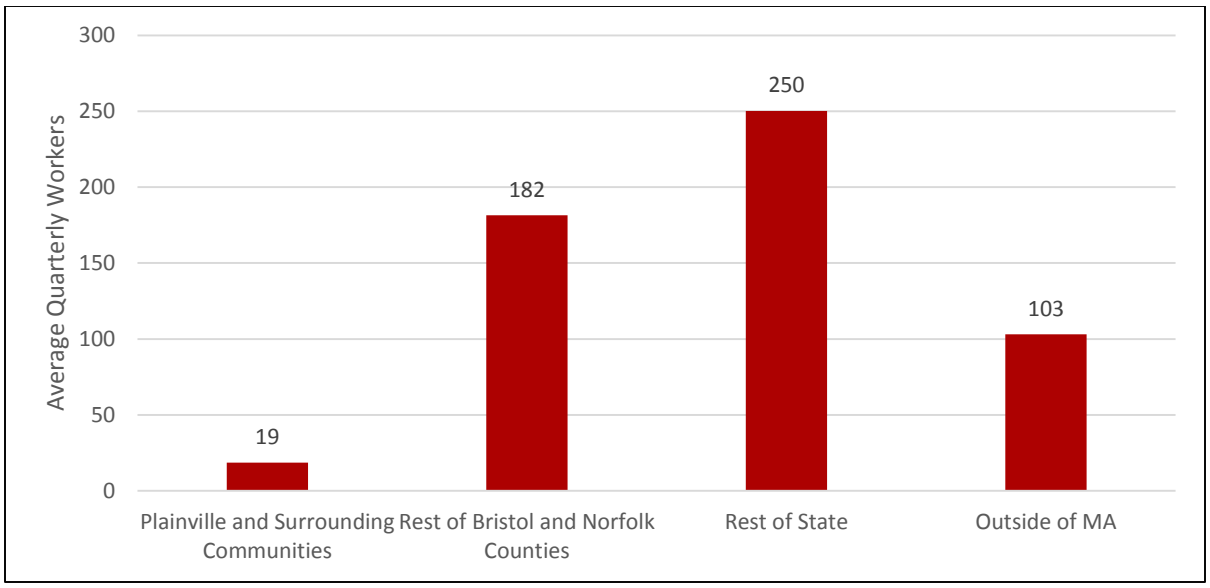
Source: Pinck & Co.

Figure 8: Construction Workers by Region of Residence, Total of Quarterly Counts



Source: Pinck & Co.
Note: These totals represent the cumulative sum of the number of workers onsite at some point during each quarter and likely count the same people multiple times.

Figure 9: Construction Workers by Region of Residence, Average of Quarterly Counts



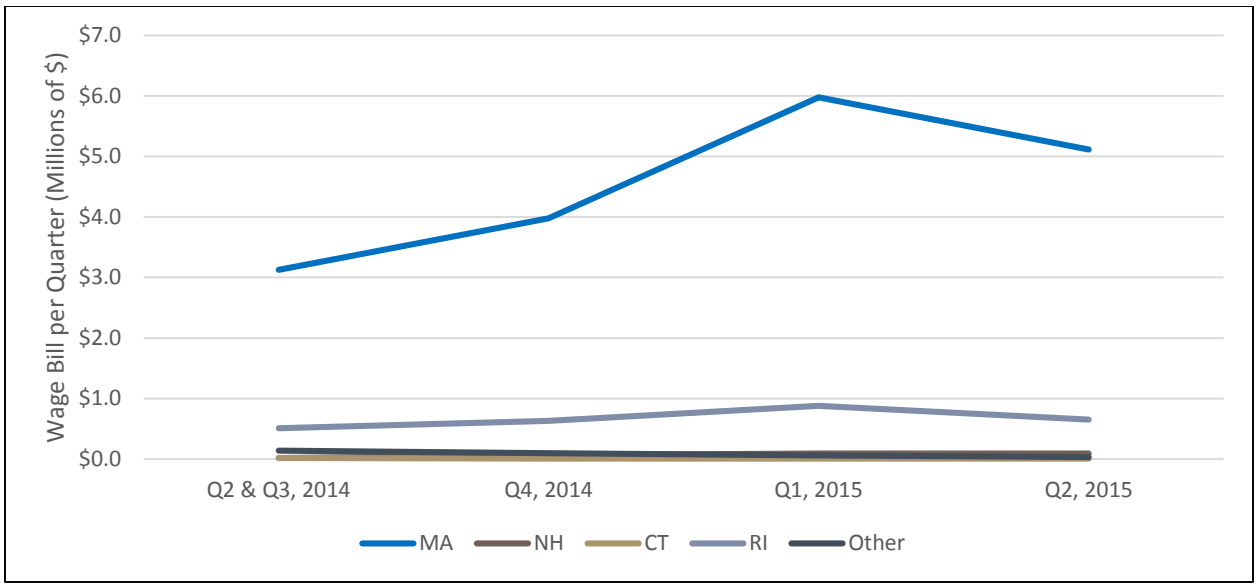
Source: Pinck & Co.
Note: These totals represent the average number of workers onsite at some point each quarter.

Wages

Unlike employment, wages can be summed over time to show cumulative dollars. Therefore, the totals that follow show the actual sums of money paid to workers over the course of the construction effort. However, when pairing these wages with employment, for example to show average wages, the same care should be taken in the interpretation of employment as described in the beginning of the Employment section above.

Not surprisingly, the geographic distribution of wages is largely similar to that of the workers who earned them though there are some notable differences. As shown in Figure 10 on page 19, while the peak quarter of employment was the second quarter of 2015, wages peaked one quarter earlier indicating that workers in Q2, 2015 worked fewer hours and/or were paid less on an hourly basis. In the second and third quarters of 2014, $3.8 million in wages was paid. Wages rose to $7 million in Q1, 2015 and fell to $5.9 million in Q2, 2015. Wages were distributed similarly to employment across regions. The bulk of the wages paid went to Massachusetts residents and a large proportion of those wages were paid to workers living within Bristol and Norfolk Counties.

Figure 10: Total Wage Bill by State of Residence and Quarter



Source: Pinck & Co.

Over the 14 months of construction a total of $21.5 million in wages was paid to workers. Of the total, $18.2 million, or 85 percent, was paid to residents of Massachusetts. Most of the remainder ($2.7 million or 13 percent) went to Rhode Islanders. Residents of Bristol and Norfolk Counties received 40 percent of all wages with 5 percent, or $1.1 million, staying in the Town of Plainville and its surrounding communities and 34 percent, or $7.4 million, going to the rest of Bristol and Norfolk Counties.

Table 8 shows that the distribution of wages among regions differed slightly from the distribution of employment and that Plainville and the surrounding communities received a higher share of wages than employment. These differences suggest that average wages per worker differ across regions.

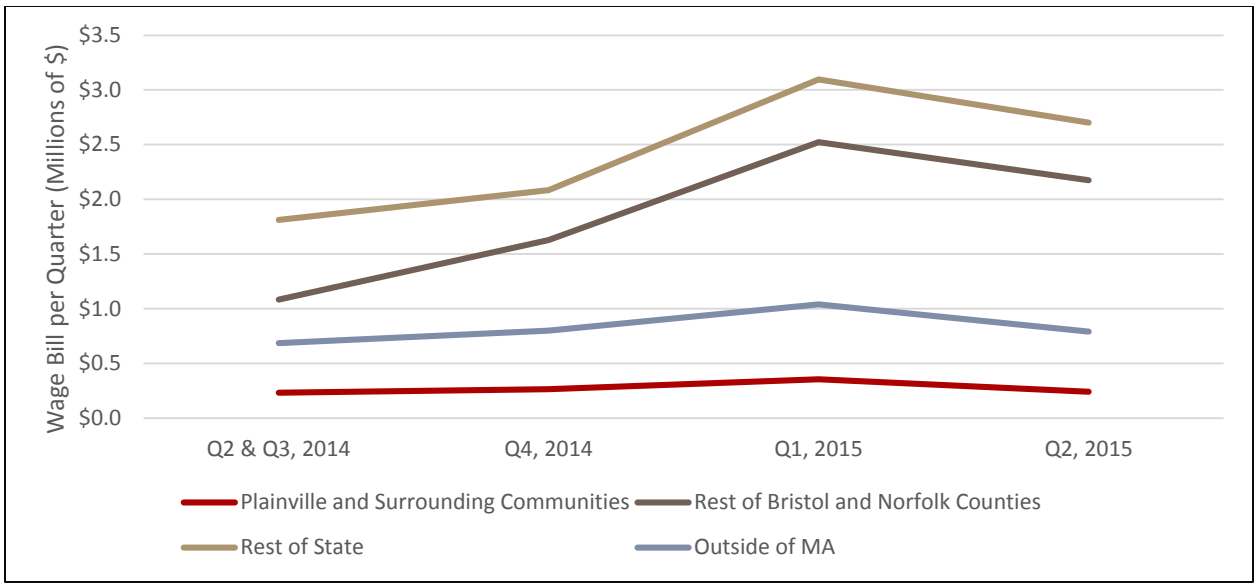
Table 8: Comparison of Average Share of Wages and Workers by Region of Residence

Region	Share of Wages	Share of Workers	Difference
Plainville and Surrounding Communities	5%	3%	2%
Rest of Bristol and Norfolk Counties	34%	33%	2%
Rest of State	45%	45%	0%
Outside of MA	15%	19%	-3%

Source: Pinck & Co.

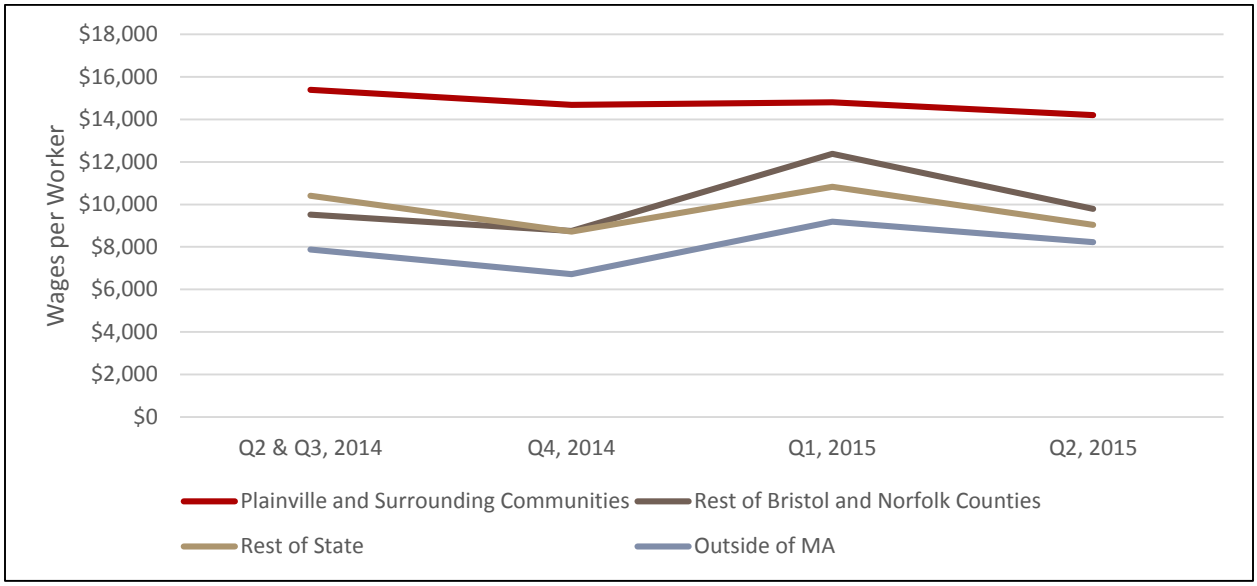
Table 8 does not tell the whole story. The reason that the Rest of State and Rest of Bristol and Norfolk Counties have the highest share of wages is because they are home to the majority of the construction workers (see Figure 9 on page 18). However, when looking at wages per worker (see Figure 12), Plainville and the surrounding communities have the highest average. At $14,750 per worker, the average wage paid to workers from the local area is over 50% higher than the project average of $9,717 and 45% higher than the next highest average wage of $10,206 paid to the residents of the other cities and towns of Bristol and Norfolk Counties. However, it is worth noting the data do not indicate whether the higher average earnings are due to local residents holding higher paying jobs and/or working more hours.

Figure 11: Total Wage Bill by Region of Residence and Quarter



Source: Pinck & Co.

Figure 12: Average Wages Earned per Worker by Region of Residence and Quarter



Source: Pinck & Co.

Economic Impacts of Pre-Construction and Construction Spending

While the previous section discussed spending, employment, and wages related to the project, this section shows how these direct effects generated additional economic effects within the Massachusetts economy**.** Using the data presented in the preceding sections and the PI^{+} model describe in detail in Appendix 1, the research team at UMDI produced the economic impact estimates presented on the following pages.

Impacts of Architecture, Engineering and Design Spending

Preconstruction expenditures occur over many years, beginning in 2010 and ending in 2014. As more fully explained in Appendix 2, due to a limitation in the economic model, the first simulation year available to the team is 2014. Therefore, the spending over time was adjusted for annual inflation and combined for a single year in 2014. Thus the impacts shown in Table 9 should be interpreted as the summation of changes induced by preconstruction spending that occurred over five years rather than impacts in 2014 alone.

Once adjusted for inflation, pre-construction spending on architecture, engineering, and design totaled $13.6 million over the five year period ending in 2014 (the unadjusted total was $13.3 million). Of that amount, direct spending to Massachusetts-based businesses totaled $13.2 million, or 99 percent. This direct spending resulted in a change of total output of $24.3 million and a multiplier of 1.84. The new business activity created demand for 170 jobs over the five years and increased personal income in Massachusetts by $12.5 million. Net new economic activity in Massachusetts (also known as value added or gross state product) totaled $16.7 million. The difference between output and value added is the cost of goods and services used in production, otherwise known as intermediate inputs. Because value added removes the double-counting inherent in the calculation of output, it is the preferred metric when summarizing the economic contribution of an event.

The data show that architecture, engineering, and design spending was heavily concentrated in two regions. Together, Bristol and Norfolk Counties and Metro Boston received 95 percent of direct spending. Once this spending cycled through the economy, the impacts were distributed slightly more widely. However, these two main regions still received 89 percent of new jobs, 84 percent of the income, and 92 percent of economic value added.

Table 9: Total Economic Impacts of Architecture, Engineering, and Design Spending, Jobs in Units, Dollars in Millions

Category	Employment	Output	Value Added	Personal Income
Bristol and Norfolk Counties	76	$9.7	$6.8	$4.7
Metro Boston	75	$12.5	$8.5	$5.8
Rest of Southeastern MA	12	$1.3	$0.9	$1.3
Central MA	3	$0.4	$0.2	$0.5
Lower Pioneer Valley	2	$0.2	$0.1	$0.1
Rest of Western MA	1	$0.1	$0.1	$0.1
Total	**170**	**$24.3**	**$16.7**	**$12.5**

Source: Regional Economic Models, Inc. as calculated by the University of Massachusetts Donahue Institute.

Impacts of Construction Spending

All told, construction of Plainridge Park Casino created 576 jobs in Massachusetts in 2014 and 540 jobs in 2015. These totals, shown in Table 10, include employees directly hired to work on the construction of Plainridge Park, as well as individuals hired at downstream suppliers (business-to-business or indirect jobs). An example of a new indirect job is one that is created at the firm installing the plumbing fixtures for the new buildings. The table also includes jobs created by these newly-employed workers spending their wages in their home communities (induced jobs). An example of an induced job would include those created at restaurants frequented by new direct and indirect employees.

Table 10: Direct, Indirect, and Induced Jobs from Plainridge Park Construction

Total Employment	2014	2015	Total
Direct	267	234	500
Business to Business (Indirect)	59	49	108
Induced	251	258	509
Consumption-Based	*128*	*127*	*255*
Other Induced	*123*	*132*	*255*
Total	**576**	**540**	**1,116**

Source: Regional Economic Models, Inc. as calculated by the University of Massachusetts Donahue Institute.

As outlined in Table 11 below, most of the new employment occurred within Bristol and Norfolk Counties, with a considerable number of jobs created in Metro Boston and the rest of Southeastern Massachusetts.[15] Fewer jobs were created in the more distant Western and Central parts of the state. It should also be noted that the construction of the casino almost certainly led to some new economic activity in other states, particularly in nearby Rhode Island although the Massachusetts-specific REMI model used for this analysis was not designed to capture any of this out-of-state activity.

Table 11: Employment Impact of Plainridge Park Construction by Massachusetts Region

Total Employment	2014	2015
Bristol and Norfolk Counties	400	355
Rest of Southeastern MA	53	61
Metro Boston	102	102
Central MA	18	20
Lower Pioneer Valley	2	2
Rest of Western MA	0	0
Total	**576**	**540**

Source: Regional Economic Models, Inc. as calculated by the University of Massachusetts Donahue Institute.

Over three-quarters of the new jobs resulting from building Plainridge Park were in the construction sector. Most of these were individuals either directly employed in the construction or contractors brought in for specific parts of the project, although the new spending created by these workers also led to new construction through marginal increases in the demand for other commercial and residential structures. The rest of the jobs are distributed among sectors supplying goods and services to the

[15] The definition of the regions appears in Appendix 2.

construction project (Finance and Insurance, Real Estate, Manufacturing) and jobs created by the expenditure of new personal income (Retail, Health Care, Accommodation and Food Services). While almost all of the construction jobs were located near Plainville, other parts of Massachusetts get a larger share of employment in a number of other industries.

Table 12: Employment Changes in the Top Ten Impacted Sectors

Employment Impact by Industry Sector	Bristol and Norfolk Counties		Rest of MA	
	2014	2015	2014	2015
Construction	282	256	34	40
Retail Trade	22	19	19	21
Health Care and Social Assistance	16	14	21	22
Other Services, except Public Administration	10	8	14	14
Finance and Insurance	11	8	18	14
Accommodation and Food Services	8	8	11	12
Administrative and Waste Management Services	5	8	8	12
Real Estate and Rental and Leasing	4	5	7	8
Wholesale Trade	4	2	4	4
Professional, Scientific, and Technical Services	6	2	11	9

Source: Regional Economic Models, Inc. as calculated by the University of Massachusetts Donahue Institute.

Massachusetts-based construction workers received $7.1 million in wages in 2014 and $11.1 million in 2015. These direct wages were part of the larger increase in total personal income in Massachusetts shown in Table 13, where the values include both the direct wages and indirect and induced personal income from other sources. In all, residents of Massachusetts earned additional income of $43.5 million in 2014 and $48 million in 2015. This new income flowed to the regions of Massachusetts in a manner similar to the proportion of jobs; however, in the case of personal income, Bristol and Norfolk Counties' share of the total was slightly lower and Metro Boston's share was slightly higher. This may be because businesses in Bristol and Norfolk Counties generally purchase many of their necessary goods and services from other businesses in the Metro Boston region, and the average wages in that region are considerably higher than those of other parts of Massachusetts. As in the employment analysis, these totals do not include the new income earned by out-of-state residents.

Table 13: Personal Income Impact by Region, Millions of Dollars

Personal Income	2014	2015
Bristol and Norfolk Counties	$23.7	$24.1
Rest of Southeastern MA	$6.7	$8.6
Metro Boston	$10.3	$11.8
Central MA	$2.6	$3.3
Lower Pioneer Valley	$0.1	$0.1
Rest of Western MA	$0.0	$0.0
Total	**$43.5**	**$48.0**

Source: Regional Economic Models, Inc. as calculated by the University of Massachusetts Donahue Institute.

The construction of the Plainridge Park casino generated $85.7 million and $80 million of business activity (often referred to as output) in 2014 and 2015, respectively. Direct output represents the construction spending remaining in Massachusetts. Comparing Table 14 to Table 6 shows that about one-third of the construction dollars left the state ($67.8 million compared to $91.9 million). However, once the indirect and induced activity is taken into account, the total budget of $115 million creates $165.6 million of output for a multiplier of 1.44. Of total output, $105.4 million in net new economic activity (also known as value added) was created, including $52.7 million in 2014 and $52.4 million in 2015. Almost two-thirds of the economic activity generated by the construction occurred in Bristol and Norfolk Counties, while a further one quarter occurred in Metro Boston.

Table 14: Direct, Indirect, and Induced Output, Millions of Dollars

Total Output	2014	2015	Total
Direct	$35.5	$32.3	$67.8
Business to Business (Indirect)	$13.5	$10.2	$23.7
Induced	$36.6	$37.4	$74.0
Consumption-Based	*$16.6*	*$16.7*	*$33.3*
Other Induced	*$20.1*	*$20.7*	*$40.7*
Total	**$85.7**	**$80.0**	**$165.6**

Source: Regional Economic Models, Inc. as calculated by the University of Massachusetts Donahue Institute.

Table 15: New Economic Impact by Region, Millions of Dollars

Economic Activity	Total (Output)		Net New (Value Added)	
	2014	2015	2014	2015
Bristol and Norfolk Counties	$54.4	$48.3	$33.2	$32.4
Rest of Southeastern MA	$6.2	$7.2	$3.9	$4.6
Metro Boston	$22.3	$21.6	$14.0	$13.7
Central MA	$2.3	$2.5	$1.4	$1.5
Lower Pioneer Valley	$0.3	$0.3	$0.2	$0.2
Rest of Western MA	$0.1	$0.1	$0.0	$0.0
Total	**$85.7**	**$80.0**	**$52.7**	**$52.4**

Source: Regional Economic Models, Inc. as calculated by the University of Massachusetts Donahue Institute.

Appendix 1: The PI+ Model

PI+ is a structural economic forecasting and policy analysis model. It integrates input-output, computable general equilibrium, econometric and economic geography methodologies. The model is dynamic, with forecasts and simulations generated on an annual basis and behavioral responses to compensation, price, and other economic factors.

The model consists of thousands of simultaneous equations with a structure that is relatively straightforward. The exact number of equations used varies depending on the extent of industry, demographic, demand, and other detail in the specific model being used. The overall structure of the model can be summarized in five major blocks: (1) Output and Demand, (2) Labor and Capital Demand, (3) Population and Labor Supply, (4) Compensation, Prices, and Costs, and (5) Market Shares. The blocks and their key interactions are shown in Figure 13 and Figure 14.

Figure 13: REMI Model Linkages

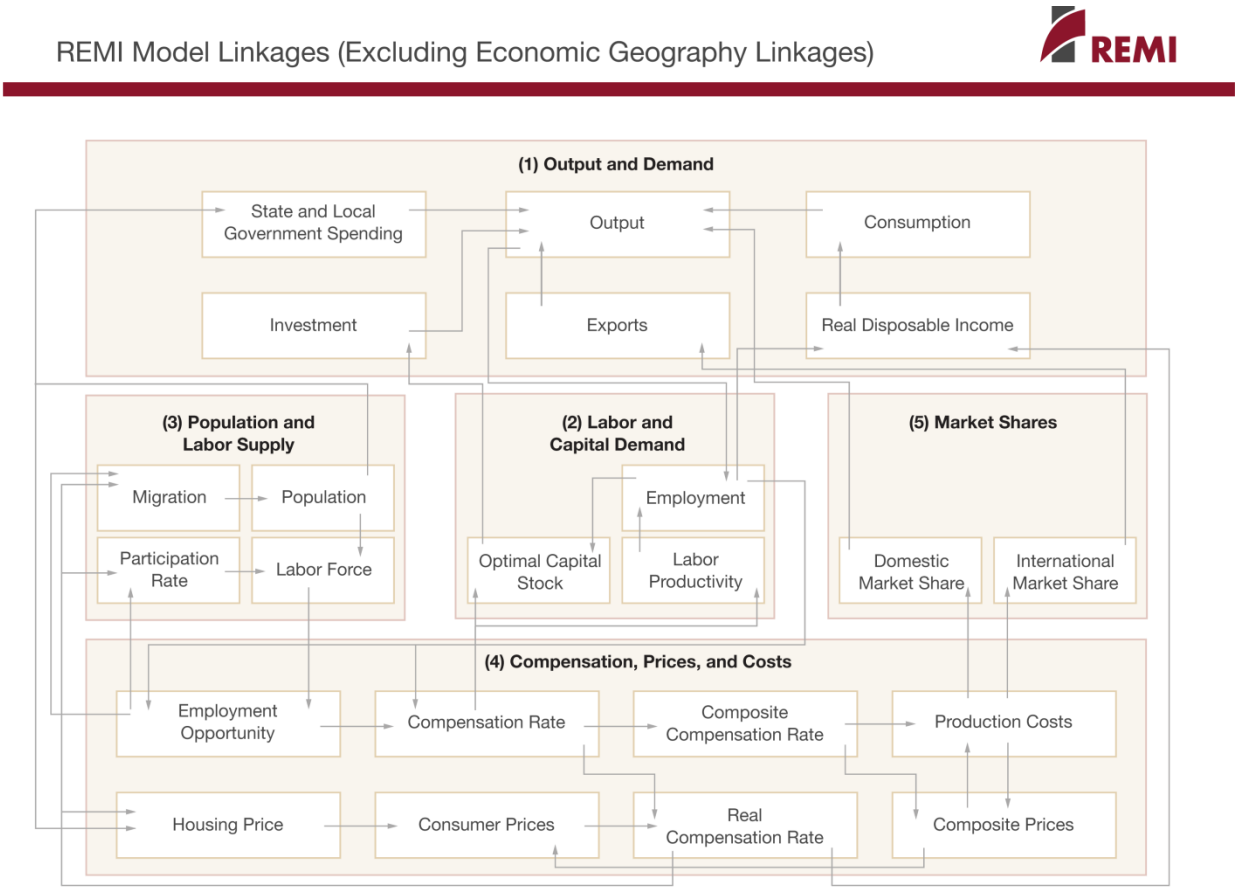
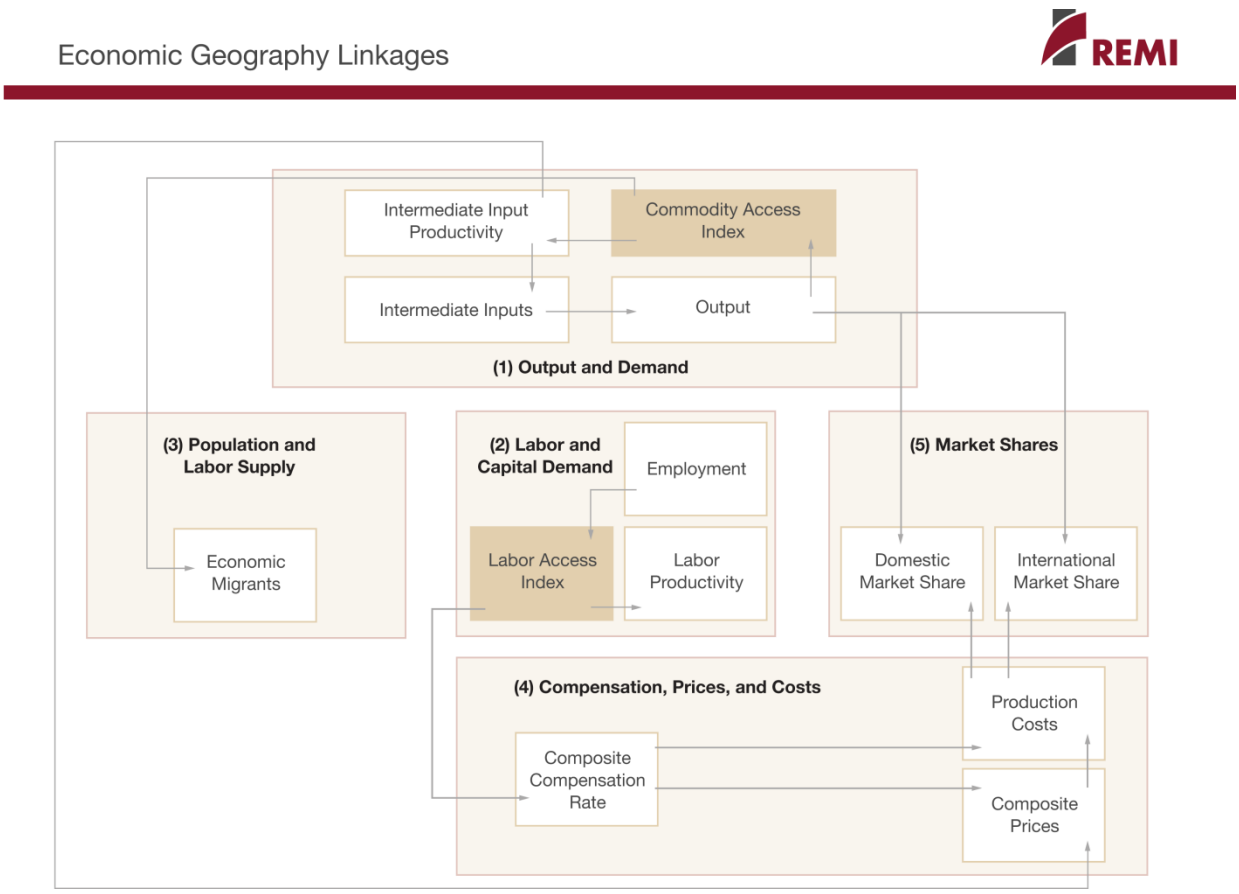


Figure 14: Economic Geography Linkages



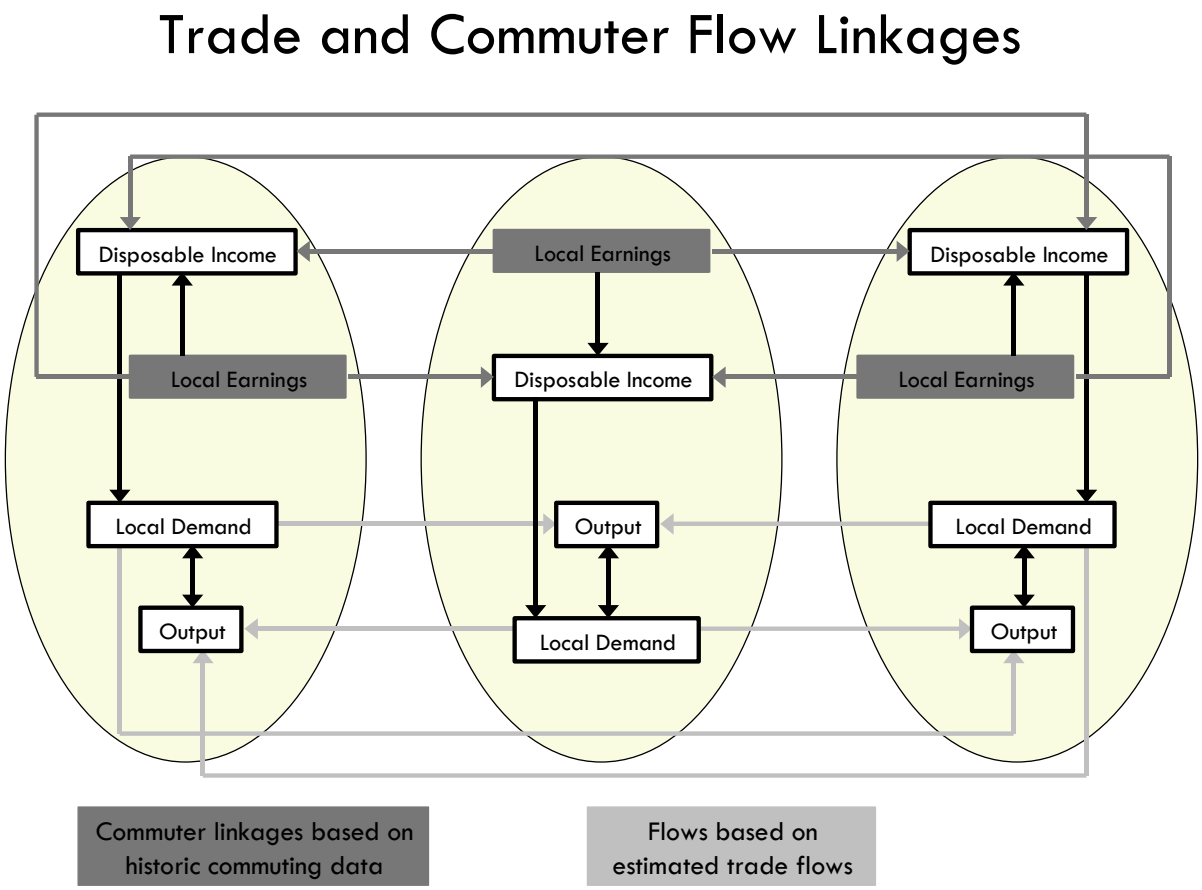
The Output and Demand block consists of output, demand, consumption, investment, government spending, exports, and imports, as well as feedback from output change due to the change in the productivity of intermediate inputs. The Labor and Capital Demand block includes labor intensity and productivity as well as demand for labor and capital. Labor force participation rate and migration equations are in the Population and Labor Supply block. The Compensation, Prices, and Costs block includes composite prices, determinants of production costs, the consumption price deflator, housing prices, and the compensation equations. The proportion of local, inter-regional, and export markets captured by each region is included in the Market Shares block.

Models can be built as single region, multi-region, or multi-region national models. A region is defined broadly as a sub-national area, and could consist of a state, province, county, or city, or any combination of sub-national areas.

Single-region models consist of an individual region, called the home region. The rest of the nation is also represented in the model. However, since the home region is only a small part of the total nation, changes in the home region do not have an endogenous effect on the variables in the rest of the nation.

Multi-regional models have interactions among regions, such as trade and commuting flows. These interactions include trade flows from each region to each of the other regions. These flows are illustrated for a three-region model in Figure 15.

Figure 15: Trade and Commuter Flow Linkages



Multiregional national models also include a central bank monetary response that constrains labor markets. Models that only encompass a relatively small portion of a nation are not endogenously constrained by changes in exchange rates or monetary responses.

Block 1. Output and Demand

This block includes output, demand, consumption, investment, government spending, import, commodity access, and export concepts. Output for each industry in the home region is determined by industry demand in all regions in the nation, the home region's share of each market, and international exports from the region.

For each industry, demand is determined by the amount of output, consumption, investment, and capital demand on that industry. Consumption depends on real disposable income per capita, relative prices, differential income elasticities, and population. Input productivity depends on access to inputs because a larger choice set of inputs means it is more likely that the input with the specific characteristics required for the job will be found. In the capital stock adjustment process, investment occurs to fill the difference between optimal and actual capital stock for residential, non-residential, and equipment investment. Government spending changes are determined by changes in the population.

Block 2. Labor and Capital Demand

The Labor and Capital Demand block includes the determination of labor productivity, labor intensity, and the optimal capital stocks. Industry-specific labor productivity depends on the availability of workers with differentiated skills for the occupations used in each industry. The occupational labor supply and commuting costs determine firms' access to a specialized labor force.

Labor intensity is determined by the cost of labor relative to the other factor inputs, capital and fuel. Demand for capital is driven by the optimal capital stock equation for both non-residential capital and equipment. Optimal capital stock for each industry depends on the relative cost of labor and capital, and the employment weighted by capital use for each industry. Employment in private industries is determined by the value added and employment per unit of value added in each industry.

Block 3. Population and Labor Supply

The Population and Labor Supply block includes detailed demographic information about the region. Population data is given for age, gender, and race, with birth and survival rates for each group. The size and labor force participation rate of each group determines the labor supply. These participation rates respond to changes in employment relative to the potential labor force and to changes in the real after-tax compensation rate. Migration includes retirement, military, international, and economic migration. Economic migration is determined by the relative real after-tax compensation rate, relative employment opportunity, and consumer access to variety.

Block 4. Compensation, Prices and Costs

This block includes delivered prices, production costs, equipment cost, the consumption deflator, consumer prices, the price of housing, and the compensation equation. Economic geography concepts account for the productivity and price effects of access to specialized labor, goods, and services.

These prices measure the price of the industry output, taking into account the access to production locations. This access is important due to the specialization of production that takes place within each industry, and because transportation and transaction costs of distance are significant. Composite prices for each industry are then calculated based on the production costs of supplying regions, the effective distance to these regions, and the index of access to the variety of outputs in the industry relative to the access by other uses of the product.

The cost of production for each industry is determined by the cost of labor, capital, fuel, and intermediate inputs. Labor costs reflect a productivity adjustment to account for access to specialized labor, as well as underlying compensation rates. Capital costs include costs of non-residential structures and equipment, while fuel costs incorporate electricity, natural gas, and residual fuels.
The consumption deflator converts industry prices to prices for consumption commodities. For potential migrants, the consumer price is additionally calculated to include housing prices. Housing prices change from their initial level depending on changes in income and population density.

Compensation changes are due to changes in labor demand and supply conditions and changes in the national compensation rate. Changes in employment opportunities relative to the labor force and occupational demand change determine compensation rates by industry.

Block 5. Market Shares

The market shares equations measure the proportion of local and export markets that are captured by each industry. These depend on relative production costs, the estimated price elasticity of demand, and the effective distance between the home region and each of the other regions. The change in share of a

specific area in any region depends on changes in its delivered price and the quantity it produces compared with the same factors for competitors in that market. The share of local and external markets then drives the exports from and imports to the home economy.

Appendix 2: Detailed Methodology for Data Preparation

As detailed in the Data Collection section, Pinck & Co. provided UMDI with quarterly files containing the number of employees and total payroll by zip code, as well as the amount spent on vendors by each 6-digit North American Industry Classification System (NAICS) code and the primary location of that vendor (by state). In order to transform this data into information that could be entered into the REMI model, a few steps needed to be taken. For a visual representation of this process, see Figure 17 on page 32.

The first step in this process was to convert the geographic and industry concepts used by Pinck into those recognized by REMI's PI$^+$ model. The model purchased by SEIGMA includes 6 regions and 70 sectors. Each of the 6 regions in the model is built from Massachusetts counties, and the 70 industry sectors roughly correspond to 3-digit NAICS codes. UMDI built tools to aggregate the more granular Pinck data into the regions represented in the PI$^+$ model.

Once wages and employment were aggregated to the level of the model's regions, wages were ready to be entered. Wages were used rather than employment because an analysis of the data made it clear that many of the workers hired to work on Plainridge Park Casino did not work for the entirety of the quarter. This was clear because the average quarterly wages for some zip codes were only a few hundred dollars. Since the REMI concept of employment represents job-years (e.g. a worker who works for only 6 months is considered half of a job by REMI), an estimate of total construction employment in terms of job-years was made by dividing the total wage bill for construction in each year by the average annual wage for construction workers in the Plainville region for that year. The result of the calculation showed that roughly every 4.5 workers represent one job-year.

With the employment data broken out by zip code, UMDI was able to determine the precise number of commuters coming in from each model region, as well as from out of state. In the absence of this information, the PI$^+$ model would use its own assumptions about commuter flows to estimate the residence of construction employees. UMDI made adjustments to the flow of commuter earnings by taking the difference between the model's assumptions and the data gathered by Pinck & Co.

When wages are entered into the PI$^+$ model, assumptions about employment and intermediate inputs associated with that level of economic activity are made by the model. Since UMDI was provided with much more detailed information regarding intermediate inputs, the model's assumptions needed to be nullified. There is a feature in PI$^+$ to do this, but it is based on employment levels, not wages. The employment levels calculated above based on average annual wages were used for this purpose.

Another concept in the model that needed to be adjusted was value added, which is calculated as a firm or industry's total output minus the cost of all its intermediate inputs. Calculating the value added of Plainridge Park construction first required calculating the output of the project. This was accomplished by multiplying the job-years calculated above by the average labor productivity for the construction sector in Bristol and Norfolk Counties for each year of the construction project, as found in the PI$^+$ model's baseline forecast. The total cost of intermediate inputs (spending by industry except for those industries classified as construction, see below for more information) were subtracted from the

calculated output to determine actual value added. The difference between this value and the number which would have been calculated within PI+ (which was slightly lower) was entered into the model.

The vendor spending data provided by Pinck was provided at a very detailed industry level but only at a state level for geography. In order to share out this new demand for goods and services by REMI region, the spending was shared out based on the REMI model's assumptions on trade flows. In other words, if businesses in Bristol and Norfolk Counties generally buy a certain proportion of their goods and services from another region, UMDI assumed that they would purchase the same share of the total vendor spending on that industry from that region.

For most of the industries, this spending was captured in PI+ using the intermediate demand variable, which increases wages and employment in the associated region and industry, but does not increase final output in any industry, since the good is part of another industry's output.

Two exceptions were made to this method. One was for the vendor spending on other construction firms. These firms were not so much providing goods or services to the prime contractor as performing construction services on behalf of the contractor, and it was determined that the most sensible way to capture this distinction was to model this spending as exogenous final demand for construction. In the second case a small share of the vendor spending reflected the cost of various permits within the Town of Plainville. UMDI made the assumption that the increased revenue from permits to the Town of Plainville would be somehow spent by the town in the same year, and this money was modeled as an increase in local government spending in Bristol and Norfolk Counties.

UMDI also estimated the economic impact of the architecture, engineering, and design work that took place prior to the construction of Plainridge Park. Data on this activity was provided to the team directly by Plainridge Park Casino, with the help of the MGC, and includes spending by Penn National Gaming, Plainridge Park's current owners, as well as the previous owners, Ourway Realty. The data, which went as far back as 2010, gave the amount spent on each vendor prior to the construction phase of the project. UMDI took the vendor list and assigned a region and a NAICS code to each firm, with nearly all of the spending occurring in the Professional and Technical Services NAICS code. In contrast to the construction phase data, the pre-construction data provided for this analysis did not include employment and wage information.

When the preconstruction data were run in the PI+ model, all of the spending was treated as having occurred in a single year, 2014. The reason for this is that the PI+ model includes data from past years to inform its future projections. Once a year has been included in the model's history, it is no longer available for simulations. In other words, the model will not allow for changes to the past. Because there is a two-year lag before all the data necessary for the construction of historical years in the model become available, 2014 was the first forecast year available in UMDI's PI+ model. Facing this constraint, UMDI opted to run all the economic activity in a single year by first converting the spending in each year from 2010 to 2014 into 2014 dollars and then running the five-year total in 2014. The results were then presented as representative of the total activity occurring over the five-year preconstruction phase rather for 2014 alone.

Table 16: PI+ Model Regions

Region	County
Lower Pioneer Valley	Hampden
	Hampshire
Bristol and Norfolk Counties	Bristol
	Norfolk
Metro Boston	Essex
	Middlesex
	Suffolk
Rest of Western MA	Berkshire
	Franklin
Central MA	Worcester
Rest of Southeastern MA	Barnstable
	Dukes
	Nantucket
	Plymouth

Figure 16: PI+ Model Regions

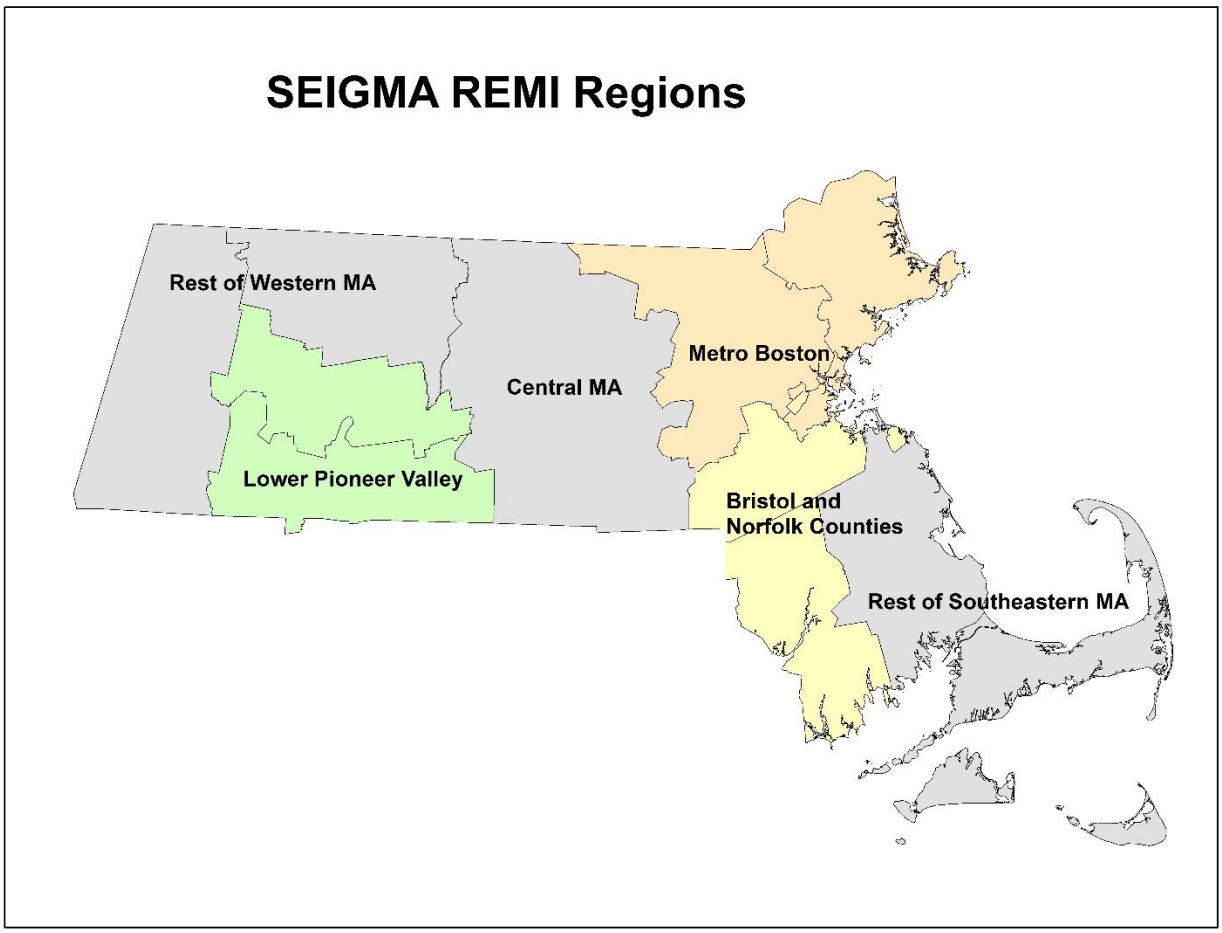
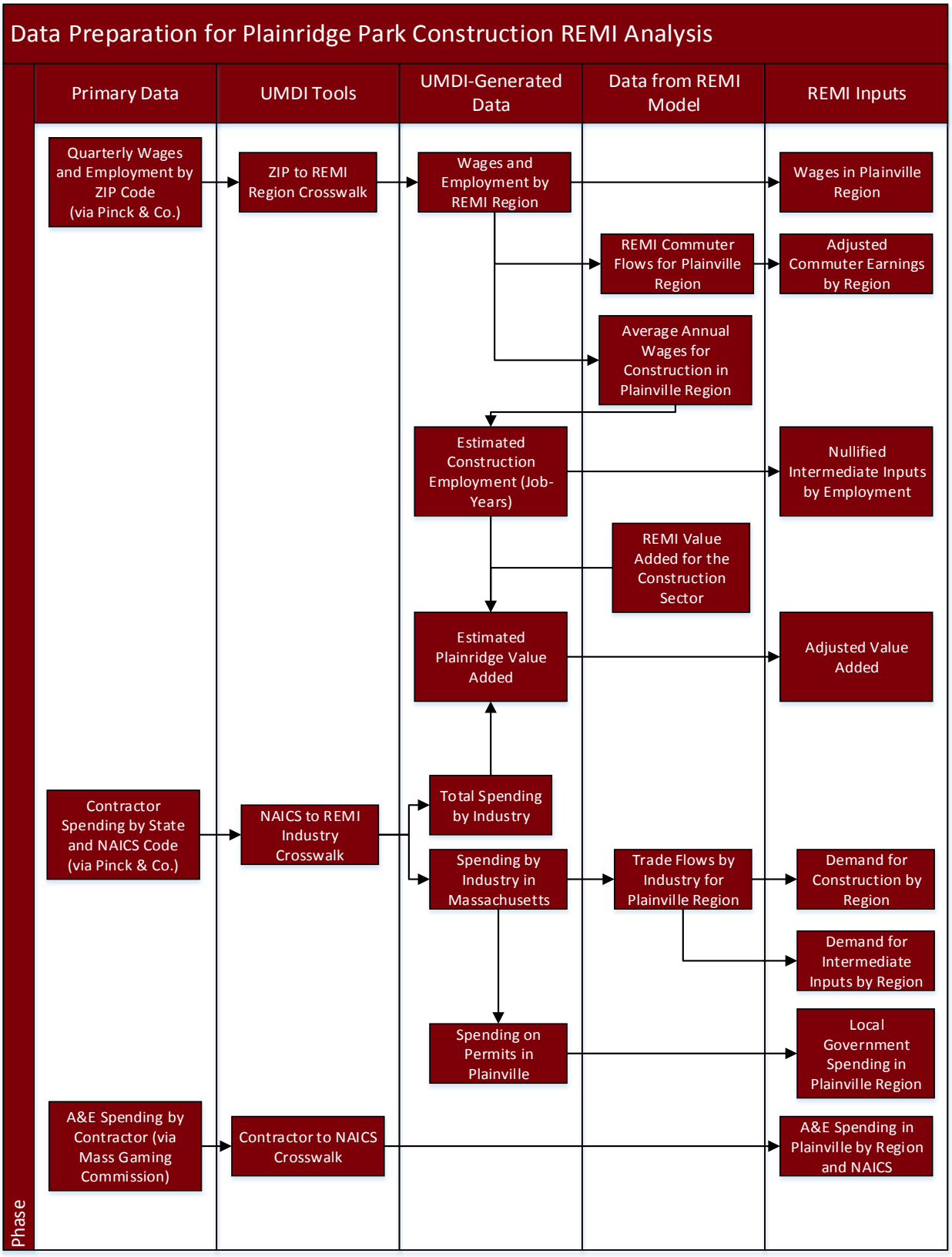


Figure 17: Pinck & Co. Data Preparation



Appendix 3: Maps of Wages

Figure 18: Construction Wages by County

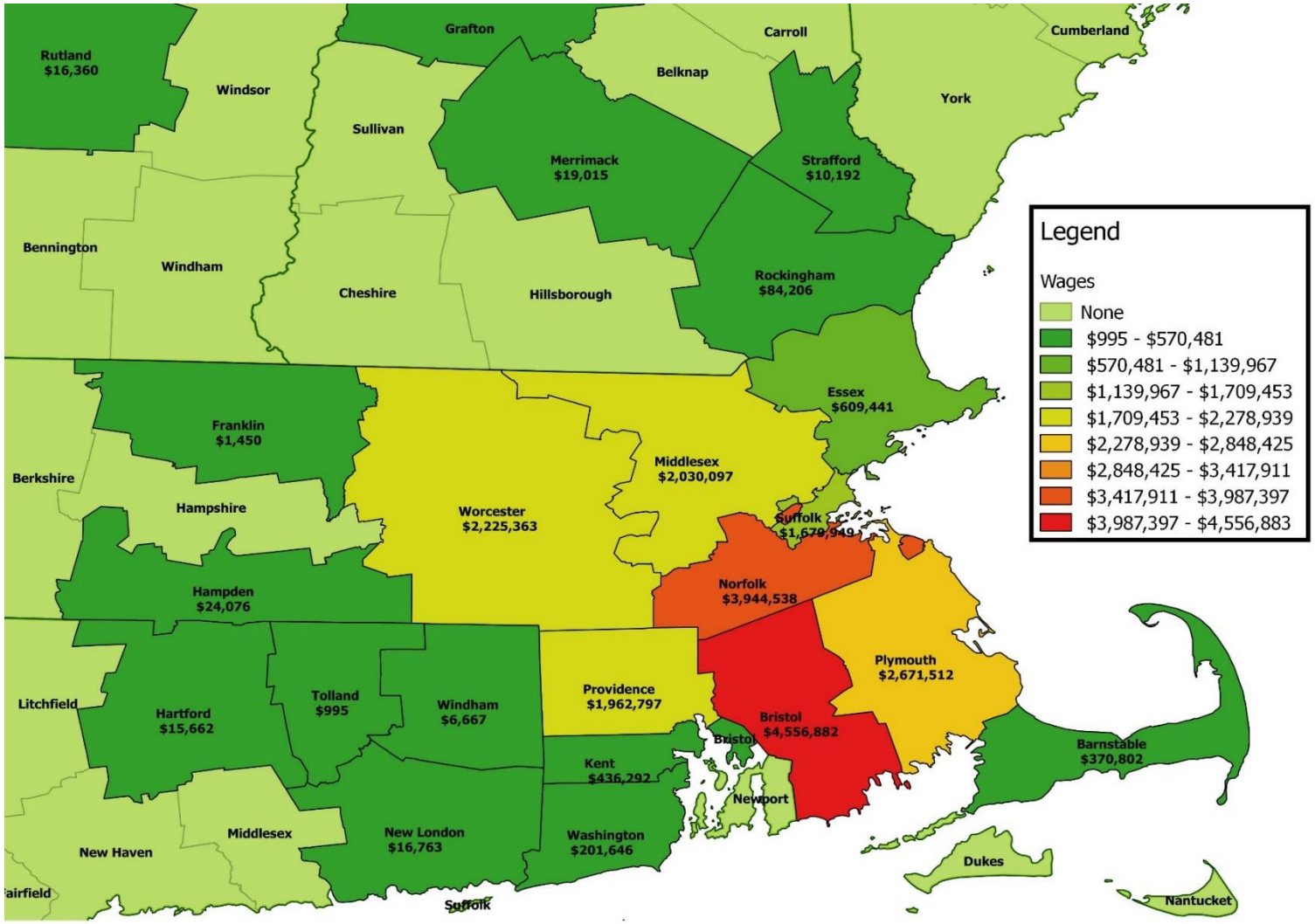
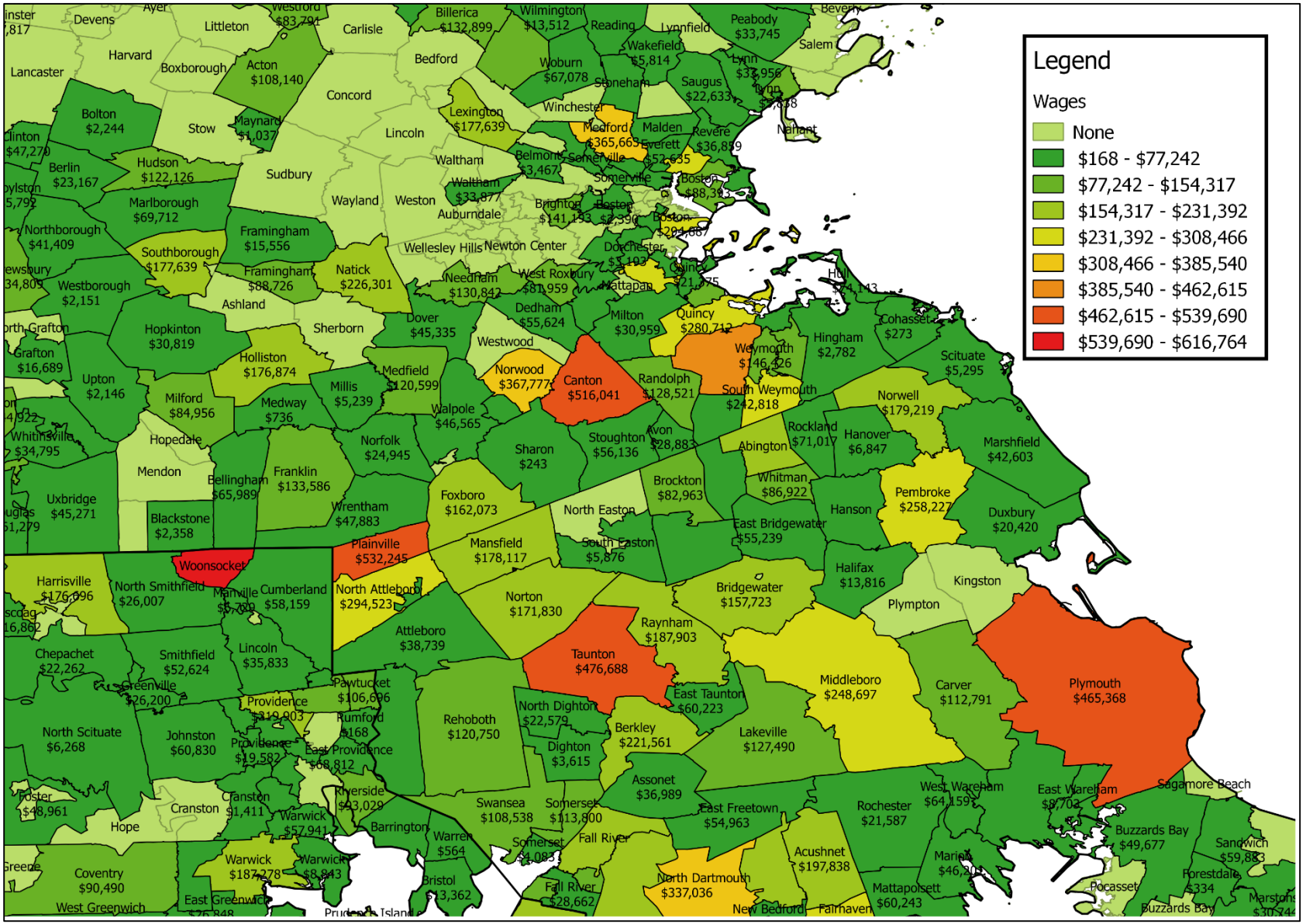


Figure 19: Construction Wages by Zip Code with Town Name

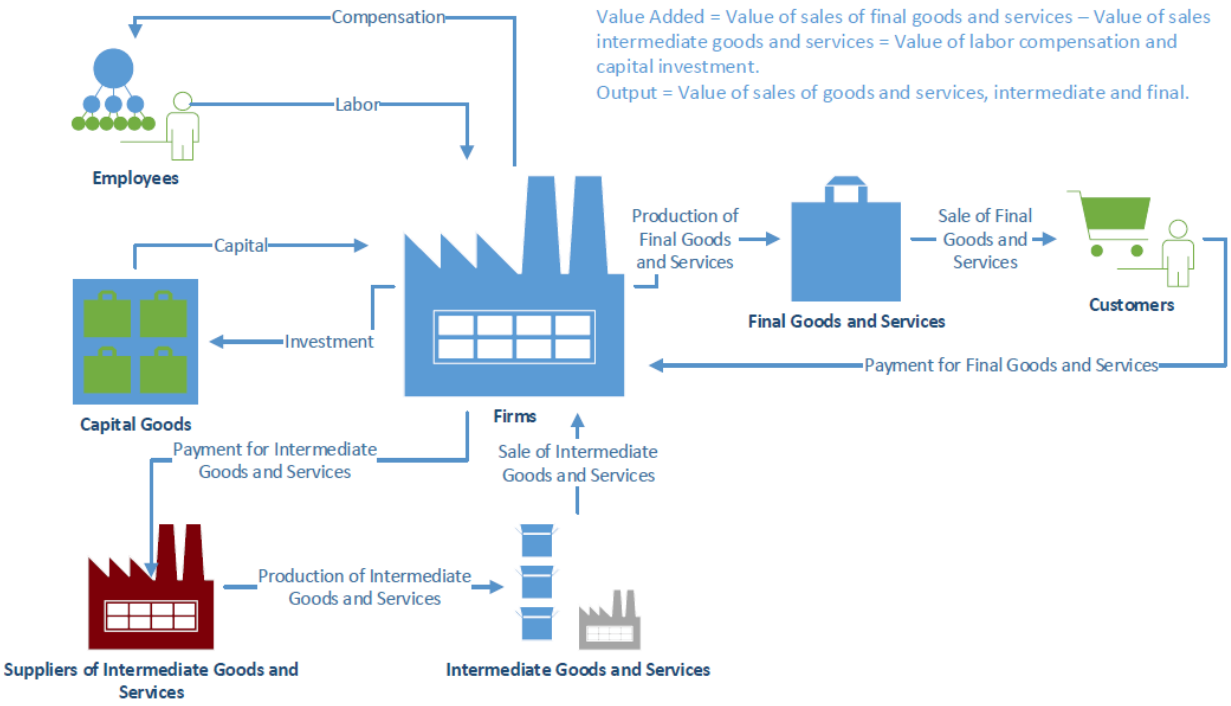


Appendix 4: The Concepts of Output and Value-Added

This appendix serves to clarify the distinctions between two related economic concepts discussed in this report – output and value added.

For any firm to produce goods and services to be sold on the market, it needs to pay for the things required to produce them. It needs to compensate workers for their labor, and it needs to invest in the capital goods (machinery, for example) which those workers will use. It also needs to purchase intermediate goods and services from other firms. Workers then use the firm's capital goods to turn the intermediate goods and services purchased from other firms into final goods and services. These are the output of the firm, and are equivalent to the value of its sales.

The concept of **value added** captures only the portion of the output which is directly created by the firm's capital goods and labor. In other words, value added is the value of the final goods and services produced minus the value of the intermediate goods and services which were purchased to produce them. This can be interesting when examining an individual firm, since two firms can have similar outputs but very different value added, depending on the cost of their intermediate inputs.



Consider the example of two different t-shirt manufacturers whose economic impact on a region is being evaluated. Both of the manufacturers ultimately sell $100 million in t-shirts, and in order to produce them, both manufacturers use $50 million in cotton. However, the structure of their supply chains is different. One of the firms takes the cotton and performs every step required to turn the cotton into t-shirts at their facility. For this firm, value added is $50 million ($100 million in t-shirts minus

$50 million in cotton) and output is $100 million. The other manufacturer instead opts to purchase fabric from a third party fabric manufacturer, which has taken the $50 million in cotton and turned it into $70 million in fabric. When considering the economic impact of this operation, both firms will need to be considered. The fabric manufacturer has a value added of $20 million ($70 million in fabric minus $50 million in cotton) and an output of $70 million. The t-shirt manufacturer has a value added of $30 million ($100 million in t-shirts minus $70 million in fabric) and an output of $100 million, the same as the original factory. Considered together, this second operation has a combined value added of $50 million, the same as the first example, but a combined output of $170 million, much higher than the initial example. The lesson from this is that while output is a useful economic metric in many contexts, it has the potential to double count the production of goods and services and is best when presented alongside value added for context.

Example: How change in supply chains can change output without changing value added