BGO

The Economic and Fiscal Impacts of MEPT Fund Investments Across the United States

1982-2023

Direct economic impacts associated with MEPT investments in new construction projects and second-generation tenant improvements.*

388
construction projects analyzed

$14.2B
economic activity generated

66,930
construction jobs created

131.0M
job hours generated

8,128
jobs for women created

20,088
jobs for minorities created

$5.1B
wages and benefits earned by construction workers

$200.5M
state personal income taxes paid

52
markets

1,203
green construction jobs supported in 2023

74%
of jobs created in 2023 were direct green construction jobs

*Since inception on April 1, 1982 through December 31, 2023, except green construction jobs, which include data for expenditures in sustainable development and energy-efficient property operations classified as green buildings in 2023.

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Section I Executive Summary

Pinnacle Economics, Inc., ("Pinnacle") analyzed 388 projects acquired, built, or invested in by Multi-Employer Property Trust ("MEPT") from its inception on April 1, 1982 through December 31, 2023. MEPT seeks to invest in projects that provide competitive returns and, as a secondary benefit, strengthen communities, provide work for a variety of industries, and create jobs for members of its pension plan investors.

This study estimates the economic and fiscal impacts associated with MEPT investments in new construction projects and second-generation tenant improvements ("TI"). Both new construction and tenant improvement projects generate economic benefits for the communities in which they are located. Expenditures on skilled union construction labor, special trade contractors, architectural, engineering, pre-design, legal, insurance, and permitting services create jobs and lead to additional economic impacts for workers and business owners in other sectors of the economy.

Although the direct impacts associated with MEPT investment spending occur over a specific time period, additional economic benefits continue to ripple through the economy after the construction project has been completed. The economic impacts include the direct, indirect (supply-chain), and induced (consumption-driven) effects on local economies as measured by changes in economic activity such as output or sales, personal income, jobs, and hours worked. In addition, this study provides estimates of the fiscal impacts from MEPT investments as measured by changes in state personal income taxes and state and local sales taxes.

Economic, Fiscal and Demographic Impacts

Overall, as measured by changes in state output, MEPT has directly generated $14.2 billion in economic activity in 52 markets, and the District of Columbia and 30 states throughout the United States since 1982. (All dollars are in 2023 dollars.) See Table ES1. The direct economic impacts attributed to MEPT investment spending are significant and consist of:

- Hard cost investments (spending on construction) that generated $11.6 billion in output, including $5.1 billion in wages and benefits, and 66,930 union construction jobs with 131.0 million hours of work. This construction activity directly generated or paid $200.5 million in state personal income taxes.
- Soft cost investments that generated $2.6 billion in output, including $1.4 billion in wages and benefits for 14,838 employees in professional services and government. Soft cost investments directly generated or paid $61.0 million in state personal income taxes.

In addition to these direct effects, MEPT investment spending has a multiplier effect on communities through additional supply-chain and consumption-driven spending. Between 1982 and 2023, the total economic impacts attributed to MEPT investment spending amount to:

- $28.8 billion in economic activity (output or sales),
- $11.9 billion in personal income, including wages, health care insurance, retirement, and other benefits,

- 170,063 jobs with 314.3 million hours of work, and
- $490.7 million in state personal income tax revenues and $364.2 million in state and local sales tax revenues.

Table ES1: MEPT Impacts, by Type of Impact, 1982-2023, (2023 dollars)

Type of Impact	Output	Personal Income	Jobs	Hours Worked	State Income Taxes
Direct - Hard Cost	$11,559,184,839	$5,077,685,902	66,930	131,009,199	$200,501,815
Direct - Soft Cost	$2,606,728,799	$1,426,427,443	14,838	27,168,631	$61,042,668
Indirect	$5,151,505,681	$2,053,006,310	29,179	53,365,657	$84,222,001
Induced	$9,459,300,047	$3,390,877,795	59,116	102,764,799	$144,955,574
Total	**$28,776,719,366**	**$11,947,997,450**	**170,063**	**314,308,286**	**$490,722,058**

Sales Tax: $364,185,430

Pinnacle measured the employment impacts by gender and race using detailed demographic data from the U.S. Equal Employment Opportunity Commission ("EEOC") that was mapped to the state-level IMPLAN models. (See Table ES2.) Between 1982 and 2023, MEPT investment spending:

- Directly generated 8,128 jobs and 15.9 million hours of work for women construction trades and 20,088 jobs and 39.3 million hours of work for minority construction trades.
- As spending and economic activity spreads to other industries, the impacts for women and minorities increase. MEPT investment spending is associated with a total of 51,608 jobs with 92.8 million hours of work for women and 58,540 jobs with 107.4 million hours of work for minority workers throughout the U.S.

Table ES2: Direct and Total Employment Impacts, by Gender and Race, 1982-2023

Demographic Group	Direct HC Jobs	Direct HC Hours of Work	Total Jobs	Total Hours of Work
Men	58,802	115,110,598	118,456	221,541,291
Women	8,128	15,898,601	51,608	92,766,995
Total All Genders	**66,930**	**131,009,199**	**170,063**	**314,308,286**
White	46,842	91,725,219	111,524	206,901,789
Black	3,667	7,165,644	15,001	27,066,253
Hispanic	13,671	26,726,009	30,230	55,929,158
Asian	1,163	2,278,477	8,604	15,771,065
All Other	1,587	3,113,851	4,704	8,640,021
Total All Races	**66,930**	**131,009,199**	**170,063**	**314,308,286**
Total Minority	**20,088**	**39,283,981**	**58,540**	**107,406,496**

Note: Columns may not add up exactly due to rounding.

MEPT has become an industry leader in "green building" and has made a meaningful commitment to incorporate sustainable development and energy-efficient property operations in its investment strategy:

- **Sustainable development and redevelopment.** MEPT seeks to achieve U.S. Green Building Council® (USGBC) Leadership in Energy & Environmental Design (LEED®) Silver certification or higher for all development and redevelopment projects, as well as seek LEED certification on tenant build outs, wherever possible.

- **High-performance, energy-efficient operations.** MEPT has long sought to improve the energy efficiency of its existing portfolio. MEPT participates in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR Portfolio Manager Program with an aim to achieve the ENERGY STAR labels, whenever feasible for operating assets. Additionally, MEPT has certified assets through the USGBC's LEED-Existing Building Operations and Maintenance (EBO&M®) program and maintains a quality control and assurance program for all appropriate office buildings. Furthermore, MEPT benchmarks properties in EcoTracker, a proprietary Key Performance Indicator tracking tool.

In the context of this study, the project team, in cooperation with MEPT leadership, developed a methodology for identifying impacts from sustainable development and energy-efficient property operations. Expenditures on hard costs and soft costs for projects that were certified or were in the process of gaining certification for LEED, ENERGY STAR, or LEED-EBOM are classified as expenditures on green buildings with their resulting direct hard cost and direct soft cost impacts being counted as green. This green building classification extended to 63 of the 93 projects invested in by MEPT in 2023. As a result, MEPT spending directly supported 1,203 green construction jobs or 73.9 percent of direct construction employment in 2023, and 240 green jobs in professional services and government or 73.5 percent of direct soft cost employment in 2023.[1] For comparison, in 2022, green construction jobs accounted for 65.3 percent of all direct construction jobs, and green jobs in professional services and government accounted for 58.1 percent of all direct soft costs jobs.

Table ES3: Direct Green Impacts Green Industries, 2023

Type of Impact	Green Jobs	All Jobs	Green Jobs % of All Jobs
Direct - Hard Cost	1,203	1,630	73.9%
Direct - Soft Cost	240	326	73.5%
Total Direct Green Jobs	**1,443**	**1,956**	**73.8%**

According to MIT's Living Wage Calculator, a living wage is the wage needed to support a family's basic needs budget, to include food, childcare, health insurance, housing, transportation, and other basic necessities. The MIT Living Wage Calculator publishes living wages for twelve different family units across 384 metropolitan areas and all 50 states.

Pinnacle used data from MIT's Living Wage Calculator to identify the average hourly "living wage" needed to support the following two types of families: one adult with two children, and two adults (one working) with two children. These thresholds were then compared to the average income, by MSA and by industry sector, to identify jobs that earn a living wage. In 2023, MEPT spending supported the following living wage jobs:

- **Single adult with two children.** Living wage jobs include 91 direct construction jobs, 326 direct soft cost jobs, 83 indirect jobs, and 39 induced jobs. In 2023, MEPT project

[1] To estimate the indirect and induced jobs associated with MEPT project spending that occur in green industries, Pinnacle mapped the U.S. Bureau of Labor Statistics' Green Goods and Services Industries, by NAICS, to the IMPLAN model. Through this mapping, 273 of IMPLAN's 546 industries were identified as having some role in providing green goods and/or services. MEPT spending on green buildings in 2023 is linked to additional supply-chain and consumption-driven spending that supports 728 jobs for workers in green industry sectors. To be clear, these secondary jobs may or may not be green, but they potentially occur in green industry sectors.

spending is linked to 3,497 jobs of which 539 jobs (15.4 percent) received a living wage for a single adult with two children.

- **Two adults (one working) with two children.** Living wage jobs include 217 direct construction jobs, 326 direct soft cost jobs, 129 indirect jobs, and 81 induced jobs. In 2023, MEPT project spending is linked to 3,497 jobs of which 753 jobs (21.5 percent) received a living wage for a family of two adults (one working) and two children.

Estimates of living wage jobs attributed to MEPT project spending are conservative for the following reasons: 1) They are geographic specific but based on a comparison of MIT Living Wages to the average income across IMPLAN's 546 industry sectors without regard to occupations within an industry sector. This is particularly important for the construction sector (1,630 jobs or 46.6 percent of total job impacts) where a breakout of trade effort (jobs and hours) is provided, but not trade income. This makes it impossible to identify and include trades that earn a living wage. Given that MEPT projects employ union construction workers that are paid prevailing wages, it is likely that many of these trades do, in fact, earn a living wage. 2) Many of MEPT's projects occur in MSA's with high costs of living, such as New York City, Chicago, and Los Angeles where reaching the living wage threshold is more difficult to achieve. In this analysis, MSA's in Texas, Florida, and Georgia constitute locations where direct construction jobs receive a living wage.

The following sections of the report provide greater details regarding the impact analysis of MEPT investment spending. Section II provides background information on the modeling approach used in this analysis. Section III reports the findings of the economic impact analysis. Appendices have been included to provide additional information regarding the economic impact modeling approach, the qualifications of Pinnacle Economics, and a brief Glossary of key terms.

Section II: Methodology

Introduction

This study represents a follow up to our previous study published in 2023.[2] The objective of this study is to update the findings from our previous analysis to include the economic and fiscal impacts of MEPT investments made between January 1 and December 31, 2023. This section of the report contains information on the methodology used to measure economic and fiscal impacts.

Modeling Framework

Economic impact analysis provides a framework for analyzing how some activity—such as the entry or exit of an industry, changes in government policies, or a business expansion project—affects regional economic activity. The most widely used modeling framework for economic impact analysis is known as input-output modeling.[3] Input-output models are mathematical representations of an economy and how different parts (or sectors) are linked to one another.
Input-output models generally are not available for state and regional economies. As a result, special data techniques have been developed to estimate the necessary empirical relationships from a combination of national technological relationships and county-level measures of economic activity. This non-survey approach means that input-output models can be economically constructed using commercially available modeling software that relies on secondary source data collected and vetted by government agencies.

The IMPLAN Model

The most commonly used input-output modeling software is called IMPLAN (for IMpact Analysis for PLANning).[4] This is the modeling software that Pinnacle used in this analysis. In simple terms, the IMPLAN model works by tracing how and where money spent on MEPT investments circulates through the economy. The three types of impacts are discussed below within the context of this analysis.

- **Direct** impacts represent the output, income, jobs, hours of work, and sales and income taxes generated as a result of MEPT spending on the construction of new buildings or improvements to existing structures. Specifically, in this analysis, direct impacts include construction services (hard costs), and professional services provided by architects and engineers, attorneys, insurers, and state and local governments (soft costs) necessary to construct or improve a building.
- **Indirect** impacts occur as businesses that are directly impacted by MEPT spending buy from other businesses. The construction contractor, for example, may purchase tools or

[2] This 2024 report represents a follow up to studies completed in 2023, 2022, 2019, 2016, 2013, 2009, and 2006, as well as a previous analyses conducted by Scott Lindall of the Minnesota IMPLAN Group, Inc., ("MIG") and reported in *The Impact of Multi-Employer Property Trust Investments Across the United States*, 2000 and 2002.
[3] Input-output analysis was first put to practical use by Wassily Leontief in the late 1930's. While at Harvard, Leontief used his input-output system to construct an empirical model of the United States economy. This research gave rise to his 1941 classic, "Structure of American Industry, 1919-1929." For his research, Leontief was awarded the Nobel Prize in Economics in 1973.
[4] IMPLAN was initially developed as part of a joint effort by the USDA Forest Service, the Federal Emergency Management Agency, and the USDI Bureau of Land Management. IMPLAN is currently licensed and distributed by the IMPLAN Group, LLC. Huntersville, NC. IMPLAN.com.

lease construction equipment. The tool supplier will, in turn, purchase utilities, accounting, and landscaping services. These purchases of goods and services by businesses from other businesses indirectly generate sales, jobs, and income for others. Indirect impacts are often referred to as *supply-chain* impacts.

- **Induced** impacts result from the increased income and purchasing power of households who are either directly or indirectly affected by MEPT spending. The construction worker, for instance, will take their family to dinner or purchase health care services for their children. Employees at the tool supply business will spend their income in much the same way. This spending induces sales, jobs, and income for workers and businesses in other sectors of the economy. Induced impacts are often referred to as *consumption-driven* impacts.

Economic impact multipliers allow researchers to follow the initial change in economic activity as it "ripples" through each industry sector. The IMPLAN model produces multipliers for all impact measures that are specific to each of the 546 industry sectors in the model and the economy being studied. Impacts can be in terms of direct and indirect effects (commonly known as Type I multipliers), or in terms of direct, indirect, and induced effects (Type SAM multipliers).[5] These multipliers will be discussed in greater detail in the appendix to this report. However, it is important to note that the project team relies on the same Type SAM multipliers that were used in our previous reports and the early reports prepared by MIG.

Report Tables

The economic impacts measured in this analysis will be reported in tables that show the direct effects (broken out by hard and soft costs), as well as the indirect and induced effects. Within these tables are six measures of the impacts attributed to MEPT investments, including: output, personal income, employment, hours worked, state personal income taxes, and state and local sales taxes. All economic and fiscal impacts are temporary in nature and occur as project spending unfolds. The impact measures are:

- **Output** is the broadest measure of economic activity. It represents the total value of production or, alternatively, business revenues. Output includes the purchase of intermediate goods and services plus the value added in production which includes personal income (discussed below), other income (profits), and indirect business taxes.
- **Personal income** consists of the wages and fringe benefits to workers, plus the income (sometimes called small business income) earned by self-employed workers and the working owners of small businesses.
- **Employment** represents the total number of full- and part-time employees. Given the temporal nature of construction spending, job impacts can be thought of as person-years of employment. For example, one person-year of employment would include a laborer working for three months, followed by a carpenter working for six months, and an electrician working for three months. In other words, one job lasting for twelve months is the same as two jobs lasting for six months each.

[5] A Type I multiplier is used to evaluate the linkages among backward linked industries, i.e., those that supply other industries with goods and services. A Type I multiplier is useful to isolate the indirect impacts. All other multipliers include the indirect impacts, but then add the impacts from additional consumption spending.

- **Hours worked** represents the total number of hours required to produce the output, and is calculated using the job estimates produced by IMPLAN, and job and full-time equivalents ("FTE") data from the US Bureau of Economic Analysis ("BEA") National Income and Product Accounts ("NIPA") for each of the 546 industry sectors in the IMPLAN model.[6]
- **State income taxes** are personal income taxes paid by households on their income. Income taxes may also include taxes paid by corporations and individuals on other types of income, such as rental income, dividend income, interest income, capital gains, and retirement income.
- **State and local sales taxes** consist of state and local retail sales taxes, as well as a host of taxes related to the sale of specific goods and services, including alcohol, cigarettes, gasoline, lodging or occupancy, public utilities, and more. As such, states that do not have general retail sales taxes will still report some sales tax revenues.

Model Inputs

MEPT provided annual expenditure data for all hard and soft costs associated with the construction of new buildings and tenant improvements to existing structures.[7] Hard costs represent expenditures on actual construction. Soft costs represent expenditures on architectural and engineering services, as well as legal, insurance, financial, and permitting.

The IMPLAN model has 546 industry sectors, with several sectors that are closely aligned to the expenditure data provided by MEPT. Hard costs for new construction were allocated to IMPLAN sectors for the construction of new commercial buildings or to the construction of new multi-family residential structures, depending on the type of project. Hard costs for tenant improvements were assigned to IMPLAN sectors for maintenance and repair construction of nonresidential structures and maintenance and repair construction of multi-family residential structures. Soft costs were allocated as follows: 75 percent to architectural and engineering services, 5 percent to banking and finance, 5 percent to insurance, 5 percent to legal services, and 10 percent to permitting services provided by state and local governments.

MEPT provided expenditure data consisting of hard costs, soft costs, and land costs for projects built or committed to from 1981 through 2023. The current analysis models all incremental project activity in 2023. Importantly, MEPT's investment expenditures were modeled for the state and year in which they occurred, and then converted to current, 2023 dollars. All dollar amounts in the economic impact tables in this report are in 2023 dollars.

Changes Across Studies

This analysis reports cumulative impacts over the 1982 to 2023 time period by measuring the additional or incremental economic impacts that have occurred in 2023 and adding those impact results to the impacts measured in our previous analysis.

The original studies, conducted by MIG (IMPLAN) in 2000 and 2002, relied on 1999 IMPLAN data with a Standard Industrial Classification or SIC-based sectoring scheme. Pinnacle's previous and current analyses rely on IMPLAN data based on a North American Industry Classification

[6] U.S. BEA Tables 6.4D and 6.5D.
[7] MEPT also provided land costs for each project, where relevant. Since the purchase of land represents a transfer rather than the creation of new economic activity, these costs were excluded from the modeling.

System or NAICS-based sectoring scheme.[8] As a result, Pinnacle did not re-run project spending from the early MIG analysis through input-output models built with NAICS-based IMPLAN data. Instead, the economic impacts measured by MIG in 2000 and 2002 were converted to current dollars and added to the additional impacts measured in recent studies using more recent IMPLAN data.

Since the 2016 report, soft cost expenditures are allocated across the following sectors: architectural and engineering, banking, legal, insurance, and state and local governments. Although the overall effect of this adjustment on the resulting economic impacts is modest, it does enhance the accuracy of the economic impact results.

Starting with the 2019 report, additional details on the direct construction jobs and hours of work are broken out by construction trade. To do this, Pinnacle allocated the direct construction jobs and hours of work attributed to MEPT hard cost spending, as estimated by IMPLAN, across building trade matrices for new construction and tenant improvements developed using detailed occupational employment statistics from the U.S. Bureau of Labor Statistics.[9]

To measure the job impacts by race and gender, Pinnacle augmented the IMPLAN economic impact models of each state with detailed demographic data from the U.S. Equal Employment Opportunity Commission ("EEOC") using EEO-1 and EEO-4 reports. Through these reports, EEOC provides employment patterns and participation rates, by industry sector at a three-digit NAICS code level, for every state. These state participation rates were mapped to the 546 industry sectors in IMPLAN. Participation rates refer to the percent of total employment in a given industry that is occupied by a gender and/or racial group.

Lastly, to estimate green economic impacts, Pinnacle relied on MEPT's classification of green projects. Expenditures on hard costs and soft costs for projects that were certified or were in the process of gaining certification for LEED, ENERGY STAR, or LEED-EBOM are classified as expenditures on green buildings with their resulting direct hard cost and direct soft cost impacts being counted as green. For green projects, all economic impacts associated with direct hard costs and soft costs were counted as green. Pinnacle then mapped the U.S. Bureau of Labor Statistics' "Green Goods and Services Industries" to industry sectors in the IMPLAN model to identify secondary (indirect and induced) impacts that may occur in green industries.

[8] According to the U.S. Census Bureau, "*On April 9, 1997, the Office of Management and Budget (OMB) announced its decision to adopt… NAICS as the industry classification system used by the statistical agencies of the United States. NAICS replaces the 1987 Standard Industrial Classification (SIC). NAICS is a unique, all-new system for classifying business establishments. It is the first economic classification system to be constructed based on a single economic concept. Economic units that use like processes to produce goods or services are grouped together. This "production-oriented" system means that statistical agencies in the United States will produce data that can be used for measuring productivity, unit labor costs, and the capital intensity of production; constructing input-output relationships; and estimating employment-output relationships and other such statistics that require that inputs and outputs be used together.*"

[9] See United States Department of Labor, Bureau of Labor Statistics, http://www.bls.gov/oes/tables.htm. Construction building trade matrices consists of national, occupational data for six construction NAICS codes (residential construction #2361; nonresidential construction #2362; foundation, structure, and building exterior contractors #2381; building equipment contractors #2382; building finishing contractors #2383; and other contractors #2389). BLS data was obtained for the 15-year, 2006 through 2020 period.

Section III: Impact Results

Introduction

Between April 1982 and December 2023, MEPT investment spending has funded 388 construction projects in 52 markets located in 30 states and the District of Columbia. This is an increase of 15 projects and three markets from the previous study.[10]

Cumulative MEPT project spending, as measured by changes in both hard cost and soft cost direct output, increased from $13.5 billion in 2022 to $14.2 billion, or by 4.9 percent year-over-year. On a cumulative basis, the number of direct jobs (both hard and soft costs) increased from 79,812 jobs in 2022 to 81,768 in 2023, or by 2.5 percent year-over-year. This section of the report provides a summary of the economic and fiscal impacts, and then detailed economic impacts by market and state, associated with MEPT investment spending.

Total MEPT Impacts

Table 1 shows the cumulative economic impacts resulting from MEPT spending on new construction and tenant improvements (TI) since its inception in 1982. As shown in the first row of Table 1, MEPT spending on hard costs directly generated $11.6 billion in output, including $5.1 billion in personal income, and 66,930 jobs with 131.0 million hours of work for union construction workers and special trade contractors over the 1982 to 2023 time period. Additionally, MEPT hard cost expenditures directly generated $200.5 million in state income taxes over this time period.

Table 1: MEPT Impacts, by Type of Impact, 1982-2023, (2023 dollars)

Type of Impact	Output	Personal Income	Jobs	Hours Worked	State Income Taxes
Direct - Hard Cost	$11,559,184,839	$5,077,685,902	66,930	131,009,199	$200,501,815
Direct - Soft Cost	$2,606,728,799	$1,426,427,443	14,838	27,168,631	$61,042,668
Indirect	$5,151,505,681	$2,053,006,310	29,179	53,365,657	$84,222,001
Induced	$9,459,300,047	$3,390,877,795	59,116	102,764,799	$144,955,574
Total	**$28,776,719,366**	**$11,947,997,450**	**170,063**	**314,308,286**	**$490,722,058**

Sales Tax: $364,185,430

The total economic and fiscal impacts from MEPT spending are significant. In total, MEPT investments have generated $28.8 billion in economic activity (or output) to impacted communities throughout the United States. As seen in Table 1, between 1982 and 2023, the total benefits for workers and business owners amount to 170,063 jobs with 314.3 million hours of work, and $11.9 billion in personal income. The total fiscal benefits of MEPT investment spending for state and local taxing jurisdictions consist of $490.7 million in state personal income taxes and $364.2 million in state and local sales taxes.

[10] The previous 2022 report counted 377 projects. However, the current analysis included a detailed review of project names and identified four historical assets with discrepancies in their project names. After correcting these four projects, the revised project count for the 2022 report is 373 projects. The current report identifies 388 projects for a gain of 15 projects between 2022 and 2023. The three new markets are in California and include Sacramento, Stockton, and Riverside.

Table 2 reports the direct jobs and hours of work for the Building Trades that benefit from MEPT hard cost expenditures on new construction and tenant improvements. This table details the direct construction jobs and hours of work attributed to MEPT, as estimated by IMPLAN, for various Building Trades developed using detailed occupational employment statistics from the U.S. Bureau of Labor Statistics.

Table 2: Direct MEPT Union Construction Job Impacts, by Building Trade, 1982-2023

Building Trade	Jobs	Hours Worked
Bricklayers (including tile setters)	3,195	6,233,243
Carpenters	11,419	22,327,626
Cement Masons	2,193	4,298,040
Electrical Workers	11,615	22,729,485
Elevator Installers and repairers	746	1,477,291
Insulation (including asbestos removal)	846	1,650,674
Ironworkers	1,155	2,255,723
Laborers	8,472	16,627,113
Operating Engineers	1,206	2,384,536
Other	5,576	10,890,331
Painters	6,949	13,588,165
Plumbers	7,661	15,009,195
Roofers	2,263	4,426,795
Sheet Metal Workers	2,967	5,795,814
Teamsters	670	1,315,168
Total All Construction Trades	**66,930**	**131,009,199**

As shown in Table 3, the linkages between MEPT hard cost spending and union construction can be assessed or quantified by calculating how much construction activity is supported by $1.0 million in MEPT hard cost spending. On average, between 1982 and 2023, every $1.0 million in MEPT hard cost spending is linked to $439,277 in personal income and 5.8 jobs with 11,334 hours of work for union construction trades. Every $1.0 million in MEPT hard cost spending is associated with, on average, $17,346 in state income tax revenues. (Please recall that some states do not tax income.)

Table 3: MEPT Hard Cost Spending and Direct Construction Impacts, 1982-2023 (2023 dollars)

Direct Construction Impact Measure	Per $1 Million in Hard Cost Spending
Personal Income	$439,277
Construction Jobs	5.8
Construction Hours of Work	11,334
State Income Taxes	$17,346

Table 4 shows how MEPT spending benefits every sector of impacted communities. Since much of MEPT spending consists of project hard costs, most of the direct impacts occur in the construction sector. The construction sector also receives additional economic benefits as spending "ripples" through other industry sectors and institutions that utilize construction services. Indeed,

the total economic impacts for the construction sector amount to $11.7 billion in output, $5.2 billion in personal income, and 68,035 jobs with 133.2 million hours of work.[11]

Table 4: Total MEPT Impacts, by Major Industry Sector, 1982-2023, (2023 dollars)

Major Industry Sector	Output	Personal Income	Jobs	Hours Worked
Agriculture	$83,673,264	$23,280,469	807	1,414,322
Mining	$73,376,843	$16,755,053	168	349,014
Construction	$11,748,662,605	$5,160,824,589	68,035	133,155,299
Manufacturing	$1,699,721,612	$337,905,939	4,269	8,519,169
TCPU	$1,199,550,552	$326,963,636	3,678	7,153,416
Trade	$2,493,819,821	$1,077,877,134	23,126	37,898,613
FIRE	$3,108,639,068	$561,239,831	7,418	14,093,736
Services	$8,020,044,294	$4,246,799,827	60,145	107,896,662
Other	$10,654,108	$10,637,612	556	658,198
Government	$338,578,195	$185,713,363	1,859	3,169,857
Total	**$28,776,719,366**	**$11,947,997,450**	**170,063**	**314,308,286**

Note: "FIRE" stands for Finance, Insurance and Real Estate. "TCPU" stands for Transportation, Communication, and Public Utilities.

Table 4 also shows significant economic impacts for the service and trade sectors. Economic impacts in the service sector begin with expenditures on soft costs, but economic impacts for both major industry sectors reveal the potency or ripple effect associated with MEPT spending.

All the impact measures described previously can be summarized across direct, indirect, and/or induced impact categories using mathematical formulae to measure and explain what economists refer to as the "multiplier effect." The economic and fiscal impact multipliers presented in this report are Type SAM multipliers and are calculated by dividing the total economic impacts by the direct economic impacts. Multipliers are a shorthand way to better understand the linkages between an activity and other sectors of the economy, i.e., the larger the multipliers, the greater the interdependence between MEPT project spending and other sectors in state economies where the projects occur.

Table 5 reports the economic and fiscal impact multipliers associated with MEPT project spending. (These multipliers are calculated from state-level IMPLAN models and do not include additional potential spillover impacts—i.e., imports—from one state to another.) Over the years, the economic impact multipliers have stabilized and don't change very much from year to year, suggesting that they have become more reliable at summarizing the economic impacts associated with MEPT project spending.

Table 5: MEPT Economic Impact Multipliers, 1982-2023

Impact Measure	Multiplier
Output	2.03
Personal Income	1.84
Jobs	2.09
Hours Worked	1.99
Income Tax	1.88

[11] Construction impacts reported in Table 4 include the construction impacts from hard cost spending, as well as the construction impacts from indirect and induced economic activity.

In aggregate, on average MEPT project spending (both hard costs and soft costs) between 1982 and 2023 has the following multiplier effects:

- **Output multiplier equals 2.03.** Thus, every $1.0 million in MEPT project spending is linked to another $1.03 million in output (sales) in other sectors of the economy.
- **Personal income multiplier equals 1.84.** This shows that every $1.0 million in direct personal income generated by MEPT project spending is linked to another $840,000 in personal income for workers and small business owners in other sectors of the economy.
- **Employment multiplier is 2.09.** Thus, every 10 direct jobs attributed to MEPT project spending is linked to another 10.9 jobs elsewhere in the economy.

MEPT Demographic Impacts – Employment Impacts for Women and Minorities

To measure the job impacts by race and gender, Pinnacle augmented the IMPLAN economic impact models of each state with detailed demographic data from the U.S. Equal Employment Opportunity Commission ("EEOC").[12] The EEOC requires employers to file reports on the composition of their work forces by sex and by race/ethnic category.[13] Key among these reports are the EEO-1, which is collected annually from private employers with 100 or more employees or federal contractors with 50 or more employees, and EEO-4, which is collected biannually from state and local governments with more than 100 employees.

Through these reports, EEOC provides employment patterns and participation rates, by industry sector at a three-digit NAICS code level, for every state. These state participation rates were mapped to the 546 industry sectors in IMPLAN. Participation rates refer to the percent of total employment in a given industry that is occupied by a gender and/or racial group.[14] Pinnacle used 2018 EEOC data to measure the demographic impacts for projects between 2019 and 2023, and 2014 EEOC data to measure the demographic impacts for project activities before 2019.

As shown in Table 6, between 1982 and 2023, MEPT project spending directly generated 66,930 jobs and 131.0 million hours of work for union construction trades, with 8,128 jobs and 15.9 million hours of work accruing to women and 20,088 jobs and 39.3 million hours of work accruing to minority workers.

As spending and economic activity spreads to other industries, the impacts for women and minorities increase. Between 1982 and 2023, MEPT project spending is associated with a total of

[12] See U.S. Equal Employment Opportunity Commission at https://www.eeoc.gov/statistics/employment/jobpatterns/eeo1.

[13] The terminology used by Pinnacle to describe races/ethnicities is identical to that employed by the EEOC. According to EEOC documentation, "*Race/ethnic designations as used by the Equal Employment Opportunity Commission do not denote scientific definitions of anthropological origins. For the purposes of this report (EEO-1), an employee may be included in the group to which he or she appears to belong, identifies with, or is regarded in the community as belonging. However, no person should be counted in more than one race/ethnic group. The race/ethnic categories for the EEO-1 survey are as defined in U.S. Department of Commerce, Office of Federal Statistical Policy and Standards' Directive No. 15. Accordingly, the race/ethnic categories reported in this analysis include (EEOC definitions): 1) White (all persons having origins in any of the original peoples of Europe, North Africa, or the Middle East (not of Hispanic origin)); 2) Black (all persons having origins in any of the Black racial groups of Africa (not of Hispanic origin)); 3) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race); 4) Asian (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and 5) All other races (includes American Indian or Alaskan Native, Hawaiian, or persons of two or more races.)*"

[14] For example, if an industry has 1,000 employees and a participation rate of 13.0 percent for Hispanic women, then Hispanic women account for 130 jobs in that industry.

51,608 jobs with 92.8 million hours of work for women and 58,540 jobs with 107.4 million hours of work for minority workers throughout the U.S.

Table 6: Direct and Total Employment Impacts, by Gender and Race, 1982-2023

Demographic Group	Direct HC Jobs	Direct HC Hours of Work	Total Jobs	Total Hours of Work
Men	58,802	115,110,598	118,456	221,541,291
Women	8,128	15,898,601	51,608	92,766,995
Total All Genders	**66,930**	**131,009,199**	**170,063**	**314,308,286**
White	46,842	91,725,219	111,524	206,901,789
Black	3,667	7,165,644	15,001	27,066,253
Hispanic	13,671	26,726,009	30,230	55,929,158
Asian	1,163	2,278,477	8,604	15,771,065
All Other	1,587	3,113,851	4,704	8,640,021
Total All Races	**66,930**	**131,009,199**	**170,063**	**314,308,286**
Total Minority	**20,088**	**39,283,981**	**58,540**	**107,406,496**

Note: Numbers may not add up exactly due to rounding.

As discussed previously, MEPT has become an industry leader in "green building" and has made a meaningful commitment to incorporate sustainable development and energy-efficient property operations in its investment strategy. Pinnacle first started measuring green jobs for the 2022 project year using the following classification: First, direct jobs associated with expenditures on hard costs and soft costs are classified as green jobs for new construction projects that achieve U.S. Green Building Council® (USGBC) Leadership in Energy & Environmental Design (LEED®) Silver certification or higher, or for tenant improvements that achieve LEED certification. Second, indirect and induced jobs represent jobs that occur in green industries as defined by the U.S. Bureau of Labor Statistics' *Green Goods and Services Industries* NAICS code mapping to the 546 industries in state-level IMPLAN models.[15]

The direct green jobs and secondary jobs that potentially occur in green industries are shown in Table 7, for 2022 and 2023. Key green job findings include:

- In 2023, 1,204 direct hard cost construction jobs are classified as green (73.9 percent of all direct construction jobs). In addition, 240 direct jobs in professional services and government are classified as green (73.5 percent of all direct soft cost jobs).
- Compared to 2022, the number of green jobs in 2023 increased in both magnitude (+127 green or green-related jobs) and in relative terms (from 50.1 percent to 62.1 percent).

Table 7: Direct Green Jobs and Secondary Jobs in Green Industries, 2022 and 2023

	2022			2023		
Type of Impact	Green Jobs	All Jobs	Green Jobs as % of All Jobs	Green Jobs	All Jobs	Green Jobs as % of All Jobs
Direct - Hard Cost	1,323	2,025	65.3%	1,204	1,630	73.9%
Direct - Soft Cost	147	253	58.1%	240	326	73.5%
Indirect	243	657	37.0%	288	550	52.4%
Induced	331	1,141	29.0%	439	990	44.4%
Total	2,044	4,076	50.1%	2,171	3,497	62.1%

[15] To be clear, these secondary job impacts may or may not be green jobs, but they potentially occur in industry sectors that have been defined as green by the U.S. BLS.

MEPT Economic Impacts by Market

Figure 1: Summary of Direct Hours of Work for Union Construction Trades from MEPT Hard Cost Spending, by Market, 1982-2023

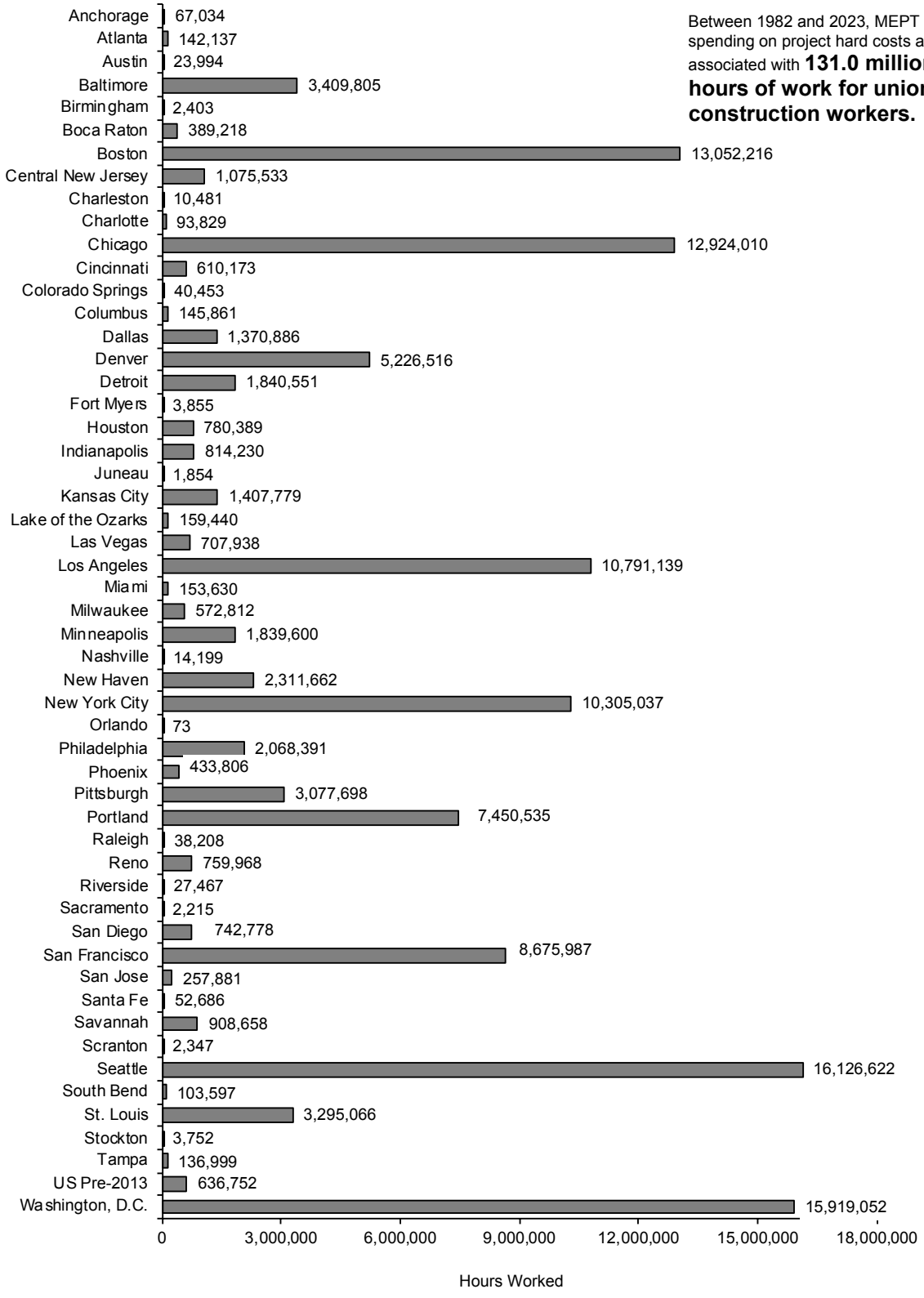

Table 8: Detailed Direct Hours of Work for Union Construction Trades from MEPT Hard Cost Spending, by Market, 1982-2023

Market	Bricklayers (including tile setters)	Carpenters	Cement Masons	Electrical Workers	Elevator Installers and repairers	Insulation (includes asbestos removal)	Iron-workers	Laborers
Anchorage	2,268	11,226	2,464	10,445	1,348	720	1,151	10,727
Atlanta	5,579	14,288	5,207	33,510	4,887	42	67	19,004
Austin	938	2,457	879	5,602	815	14	23	3,226
Baltimore	115,854	564,862	125,322	538,665	69,889	35,654	57,000	543,212
Birmingham	95	237	88	572	84	0	0	319
Boca Raton	13,167	65,181	14,306	60,646	7,827	4,180	6,682	62,283
Boston	445,336	2,139,152	479,669	2,089,457	272,438	132,884	212,440	2,070,271
Central New Jersey	36,579	177,727	39,529	170,437	22,139	11,177	17,869	171,168
Charleston	413	1,034	384	2,495	365	0	0	1,393
Charlotte	3,655	9,767	3,438	21,720	3,155	80	128	12,677
Chicago	449,460	2,013,118	474,761	2,194,344	292,149	115,197	184,165	2,008,646
Cincinnati	20,725	101,156	22,426	96,302	12,490	6,392	10,219	97,236
Colorado Springs	1,594	3,990	1,482	9,629	1,407	0	0	5,378
Columbus	4,934	24,427	5,361	22,727	2,933	1,566	2,504	23,341
Dallas	48,975	197,480	50,329	251,935	34,412	9,715	15,531	206,750
Denver	183,177	796,644	191,963	908,259	121,870	43,862	70,121	805,436
Detroit	62,271	308,172	67,652	286,857	37,028	19,756	31,583	294,502
Fort Myers	152	380	141	918	134	0	0	513
Houston	28,699	102,284	28,631	155,517	21,749	3,950	6,314	113,710
Indianapolis	27,546	136,357	29,928	126,868	16,375	8,744	13,979	130,293
Juneau	63	311	68	289	37	20	32	297
Kansas City	49,398	213,850	51,704	245,513	32,981	11,701	18,706	216,660
Lake of the Ozarks	5,394	26,701	5,860	24,843	3,206	1,712	2,737	25,514
Las Vegas	23,950	118,557	26,021	110,307	14,237	7,602	12,154	113,285
Los Angeles	369,510	1,752,259	396,544	1,746,982	228,721	107,318	171,569	1,705,215
Miami	5,453	22,563	5,641	27,717	3,764	1,156	1,848	23,340
Milwaukee	19,378	95,928	21,055	89,252	11,520	6,151	9,834	91,662
Minneapolis	62,416	305,820	67,613	289,328	37,476	19,403	31,020	293,487
Nashville	559	1,400	520	3,380	494	0	0	1,888
New Haven	78,793	379,856	84,955	368,875	48,039	23,690	37,873	367,054
New York City	361,757	1,563,447	378,476	1,799,498	241,841	85,345	136,440	1,585,202
Orlando	2	12	3	11	1	1	1	12
Philadelphia	70,224	343,297	76,021	325,976	42,256	21,730	34,739	329,769
Phoenix	14,761	71,600	15,943	68,846	8,948	4,495	7,186	69,005
Pittsburgh	105,347	500,241	113,098	497,669	65,129	30,684	49,054	486,529
Portland	254,901	1,212,526	273,791	1,202,932	157,338	74,519	119,133	1,178,399
Raleigh	1,505	3,768	1,399	9,095	1,329	0	0	5,080
Reno	26,931	112,182	27,906	136,431	18,500	5,808	9,285	115,678
Riverside	1,082	2,709	1,006	6,538	956	0	0	3,652
Sacramento	87	218	81	527	77	0	0	294
San Diego	25,497	119,840	27,294	121,170	15,908	7,267	11,617	117,070
San Francisco	299,479	1,379,195	318,763	1,439,915	190,202	81,665	130,557	1,359,339
San Jose	9,120	38,294	9,470	46,024	6,229	2,006	3,207	39,343
Santa Fe	1,782	8,823	1,937	8,209	1,060	566	905	8,431
Savannah	30,740	152,171	33,399	141,582	18,274	9,758	15,600	145,404
Scranton	92	231	86	559	82	0	0	312
Seattle	547,896	2,671,898	592,707	2,547,140	330,454	168,688	269,680	2,569,269
South Bend	3,505	17,349	3,808	16,142	2,083	1,112	1,779	16,578
St. Louis	112,787	535,576	121,085	532,813	69,728	32,851	52,519	520,893
Stockton	148	370	137	893	131	0	0	499
Tampa	5,382	13,705	5,018	32,378	4,724	30	48	18,291
US Pre-1995	21,541	106,636	23,405	99,215	12,805	6,838	10,932	101,893
Washington, D.C.	548,313	2,545,219	584,906	2,624,559	345,874	152,122	243,196	2,499,916
Total All Markets	**4,509,212**	**20,986,494**	**4,813,684**	**21,551,512**	**2,837,897**	**1,258,172**	**2,011,424**	**20,589,344**

Table 8 (Continued): Detailed Direct Hours of Work for Union Construction Trades from MEPT Hard Cost Spending, by Market, 1982-2023

Market	Operating Engineers	Other	Painters	Plumbers	Roofers	Sheet Metal Workers	Teamsters	Total All Trades
Anchorage	2,707	5,530	5,753	7,397	1,984	2,264	1,050	67,034
Atlanta	158	323	19,957	25,810	6,123	7,119	61	142,137
Austin	53	109	3,332	4,309	1,025	1,191	21	23,994
Baltimore	134,075	273,913	297,680	382,838	102,167	116,668	52,005	3,409,805
Birmingham	0	0	341	441	104	121	0	2,403
Boca Raton	15,717	32,110	33,405	42,950	11,520	13,146	6,096	389,218
Boston	499,696	1,020,875	1,158,270	1,489,976	395,724	452,206	193,822	13,052,216
Central New Jersey	42,030	85,867	94,257	121,228	32,315	36,908	16,303	1,075,533
Charleston	0	0	1,488	1,924	456	530	0	10,481
Charlotte	301	616	12,901	16,681	3,975	4,618	117	93,829
Chicago	433,188	884,999	1,232,518	1,587,094	412,988	473,357	168,025	12,924,010
Cincinnati	24,037	49,107	53,207	68,427	18,267	20,859	9,323	610,173
Colorado Springs	0	0	5,743	7,428	1,758	2,045	0	40,453
Columbus	5,890	12,033	12,519	16,096	4,317	4,926	2,285	145,861
Dallas	36,531	74,633	143,829	185,434	47,041	54,123	14,170	1,370,886
Denver	164,937	336,965	512,676	660,414	170,532	195,684	63,976	5,226,516
Detroit	74,289	151,772	158,016	203,169	54,490	62,179	28,815	1,840,551
Fort Myers	0	0	547	708	168	195	0	3,855
Houston	14,852	30,342	90,137	116,343	28,819	33,279	5,761	780,389
Indianapolis	32,880	67,174	69,882	89,850	24,100	27,500	12,754	814,230
Juneau	75	153	159	205	55	63	29	1,854
Kansas City	43,999	89,889	138,685	178,660	46,080	52,886	17,066	1,407,779
Lake of the Ozarks	6,438	13,154	13,684	17,594	4,719	5,385	2,497	159,440
Las Vegas	28,588	58,405	60,759	78,121	20,954	23,910	11,089	707,938
Los Angeles	403,559	824,469	970,925	1,249,229	330,459	377,846	156,532	10,791,139
Miami	4,348	8,882	15,766	20,320	5,185	5,960	1,686	153,630
Milwaukee	23,131	47,257	49,162	63,210	16,954	19,346	8,972	572,812
Minneapolis	72,964	149,065	159,723	205,398	54,903	62,681	28,301	1,839,600
Nashville	0	0	2,016	2,607	617	718	0	14,199
New Haven	89,083	181,996	204,330	262,831	69,886	79,848	34,553	2,311,662
New York City	320,932	655,661	1,016,774	1,309,878	337,702	387,601	124,483	10,305,037
Orlando	3	6	6	8	2	2	1	73
Philadelphia	81,712	166,937	180,042	231,536	61,844	70,612	31,694	2,068,391
Phoenix	16,903	34,532	38,087	48,987	13,051	14,907	6,556	433,806
Pittsburgh	115,383	235,726	276,517	355,770	94,151	107,645	44,755	3,077,698
Portland	280,221	572,489	668,145	859,620	227,613	260,216	108,692	7,450,535
Raleigh	0	0	5,424	7,015	1,661	1,931	0	38,208
Reno	21,839	44,617	77,526	99,917	25,532	29,344	8,471	759,968
Riverside	0	0	3,899	5,043	1,194	1,389	0	27,467
Sacramento	0	0	314	407	96	112	0	2,215
San Diego	27,325	55,825	67,460	86,808	22,902	26,196	10,599	742,778
San Francisco	307,093	627,387	804,755	1,035,875	271,649	311,000	119,115	8,675,987
San Jose	7,544	15,413	26,122	33,663	8,618	9,902	2,926	257,881
Santa Fe	2,128	4,347	4,522	5,814	1,559	1,779	825	52,686
Savannah	36,693	74,964	77,986	100,270	26,895	30,689	14,233	908,658
Scranton	0	0	333	431	102	119	0	2,347
Seattle	634,335	1,295,940	1,407,554	1,810,208	483,120	551,685	246,045	16,126,622
South Bend	4,183	8,547	8,891	11,432	3,066	3,499	1,623	103,597
St. Louis	123,534	252,380	296,043	380,893	100,800	115,247	47,916	3,295,066
Stockton	0	0	533	689	163	190	0	3,752
Tampa	114	233	19,290	24,948	5,915	6,878	44	136,999
US Pre-1995	25,713	52,532	54,650	70,265	18,847	21,506	9,974	636,752
Washington, D.C.	572,039	1,168,671	1,464,680	1,885,111	495,488	567,074	221,882	15,919,052
Total All Markets	**4,731,222**	**9,665,846**	**12,021,222**	**15,471,281**	**4,069,657**	**4,657,087**	**1,835,144**	**131,009,199**

Table 9: Direct Hard Cost and Total Economic Impacts Attributed to MEPT Project Spending, by Market, 1982-2023 (2023 dollars)

Market	Direct Hard Cost Output	Direct HC Labor Income	Direct HC Jobs	Total Output	Total Labor Income	Total Jobs
Anchorage	$7,781,797	$3,026,874	35	$18,553,163	$7,407,564	109
Atlanta	$14,431,969	$3,965,254	71	$31,926,888	$10,174,800	184
Austin	$2,248,621	$902,211	12	$6,036,011	$2,368,056	34
Baltimore	$289,106,500	$129,265,348	1,768	$804,858,387	$337,149,175	5,154
Birmingham	$206,191	$66,268	1	$385,275	$122,348	2
Boca Raton	$37,056,616	$12,258,792	202	$91,307,835	$33,647,407	596
Boston	$1,042,953,561	$535,816,889	6,536	$2,252,845,443	$1,035,491,262	13,407
Central New Jersey	$110,159,121	$47,160,529	557	$366,980,457	$157,105,129	1,978
Charleston	$942,246	$341,590	5	$2,288,058	$899,415	13
Charlotte	$8,039,188	$2,734,200	47	$44,500,711	$18,428,304	300
Chicago	$1,194,557,642	$510,365,624	6,596	$3,033,762,767	$1,232,765,199	17,445
Cincinnati	$51,408,534	$20,148,207	316	$129,712,409	$50,201,986	876
Colorado Springs	$3,920,446	$1,396,331	20	$11,702,140	$4,578,933	68
Columbus	$15,006,788	$5,109,813	75	$42,048,766	$15,766,015	274
Dallas	$115,247,869	$49,808,589	683	$285,743,851	$113,809,233	1,650
Denver	$438,647,453	$184,966,160	2,688	$1,094,334,675	$438,274,703	6,758
Detroit	$187,981,036	$70,762,412	953	$482,857,898	$189,081,411	2,938
Fort Myers	$330,829	$106,326	2	$618,164	$196,304	4
Houston	$78,719,962	$28,308,833	395	$192,813,340	$71,131,749	1,098
Indianapolis	$79,643,728	$27,630,834	422	$209,540,481	$76,148,439	1,376
Juneau	$215,284	$83,739	1	$381,241	$148,790	2
Kansas City	$116,192,079	$42,822,969	728	$273,601,269	$100,865,342	1,827
Lake of the Ozarks	$16,288,416	$5,497,376	83	$35,314,017	$12,692,292	223
Las Vegas	$58,770,707	$28,451,098	368	$130,506,261	$57,749,983	836
Los Angeles	$963,190,991	$449,902,849	5,546	$2,784,402,770	$1,177,593,067	15,881
Miami	$12,073,334	$4,163,238	77	$37,081,429	$13,781,646	237
Milwaukee	$59,097,106	$21,391,901	297	$161,451,449	$61,001,513	1,071
Minneapolis	$189,513,181	$67,771,713	928	$426,254,959	$157,576,758	2,362
Nashville	$1,587,225	$483,524	7	$2,723,016	$852,240	15
New Haven	$174,576,410	$90,507,478	1,199	$349,444,443	$164,710,416	2,221
New York City	$939,165,032	$406,069,915	5,261	$2,263,270,607	$947,844,308	12,570
Orlando	$4,635	$2,199	0	$99,814	$44,595	1
Philadelphia	$217,157,536	$82,081,237	1,070	$733,191,957	$296,852,989	4,312
Phoenix	$37,827,237	$14,860,049	225	$91,706,212	$36,224,589	602
Pittsburgh	$263,541,367	$113,055,037	1,560	$704,867,975	$283,572,357	4,285
Portland	$654,571,500	$255,162,559	3,833	$1,640,738,119	$626,023,816	10,669
Raleigh	$3,141,246	$1,112,155	19	$7,237,242	$2,607,867	46
Reno	$79,348,597	$31,549,723	389	$162,080,000	$64,630,167	930
Riverside	$3,557,340	$1,129,959	14	$6,727,408	$2,141,846	28
Sacramento	$286,815	$91,104	1	$542,406	$172,689	2
San Diego	$79,416,781	$31,436,108	383	$244,136,340	$100,117,949	1,359
San Francisco	$795,285,051	$353,465,255	4,407	$2,221,292,927	$921,461,585	12,266
San Jose	$20,671,668	$9,316,042	128	$86,907,742	$38,032,894	480
Santa Fe	$4,909,893	$1,454,135	27	$14,161,675	$5,025,302	102
Savannah	$73,181,613	$25,205,646	451	$147,980,288	$51,553,513	875
Scranton	$283,459	$89,561	1	$527,095	$170,241	2
Seattle	$1,394,865,889	$639,877,804	8,156	$3,115,174,260	$1,275,789,050	18,266
South Bend	$9,811,876	$3,491,537	54	$24,927,908	$9,102,632	166
St. Louis	$289,697,015	$119,729,478	1,705	$779,169,367	$308,499,291	4,905
Stockton	$485,900	$154,342	2	$918,902	$292,557	4
Tampa	$11,968,946	$3,772,754	68	$25,900,845	$8,562,744	158
US Pre-1995	$66,194,022	$22,829,608	330	$329,243,241	$116,859,022	1,896
Washington, D.C.	$1,343,916,594	$616,532,725	8,231	$2,871,939,464	$1,310,695,969	17,202
Total All Markets	**$11,559,184,83**	**$5,077,685,902**	**66,930**	**$28,776,719,36**	**$11,947,997,450**	**170,063**

Table 10: Total Fiscal Impacts Attributed to MEPT Project Spending, by Market, 1982-2023 (2023 dollars)

Market	Sales Taxes	Income Taxes
Anchorage	$203,830	$0
Atlanta	$413,005	$211,706
Austin	$75,796	$0
Baltimore	$10,053,024	$26,925,648
Birmingham	$5,650	$0
Boca Raton	$1,471,921	$0
Boston	$17,549,250	$39,520,459
Central New Jersey	$4,217,272	$6,053,720
Charleston	$21,102	$21,105
Charlotte	$558,395	$1,050,212
Chicago	$39,822,166	$36,759,181
Cincinnati	$1,751,883	$3,307,227
Colorado Springs	$136,221	$84,284
Columbus	$602,040	$1,052,541
Dallas	$3,648,956	$0
Denver	$14,345,186	$15,836,635
Detroit	$6,619,907	$8,822,926
Fort Myers	$9,066	$0
Houston	$2,589,137	$0
Indianapolis	$2,812,991	$4,307,888
Juneau	$4,216	$0
Kansas City	$3,834,444	$4,029,209
Lake of the Ozarks	$511,733	$622,884
Las Vegas	$1,841,432	$0
Los Angeles	$40,838,885	$52,947,386
Miami	$580,922	$4,071
Milwaukee	$2,117,130	$4,019,189
Minneapolis	$6,954,119	$5,597,952
Nashville	$27,089	$4,020
New Haven	$3,726,281	$8,056,402
New York City	$28,767,799	$60,145,784
Orlando	$773	$0
Philadelphia	$10,386,512	$13,867,804
Phoenix	$1,365,558	$1,031,428
Pittsburgh	$9,630,294	$11,591,034
Portland	$3,636,036	$42,442,441
Raleigh	$87,798	$60,787
Reno	$2,272,082	$43,893
Riverside	$206,126	$108,147
Sacramento	$16,619	$8,719
San Diego	$3,812,946	$4,757,841
San Francisco	$31,188,825	$36,030,936
San Jose	$1,002,759	$1,165,109
Santa Fe	$208,010	$212,816
Savannah	$1,785,753	$983,497
Scranton	$6,948	$3,884
Seattle	$57,403,385	$0
South Bend	$343,586	$514,956
St. Louis	$10,525,467	$12,783,244
Stockton	$28,155	$14,772
Tampa	$392,339	$0
US Pre-1995	$5,464,542	$5,092,647
Washington, D.C.	$28,310,069	$80,627,673
Grand Total	**$364,185,430**	**$490,722,058**

MEPT Economic Impacts by State

Figure 2: Summary of Direct Hours of Work for Union Construction Trades from MEPT Hard Cost Spending, by State, 1982-2023

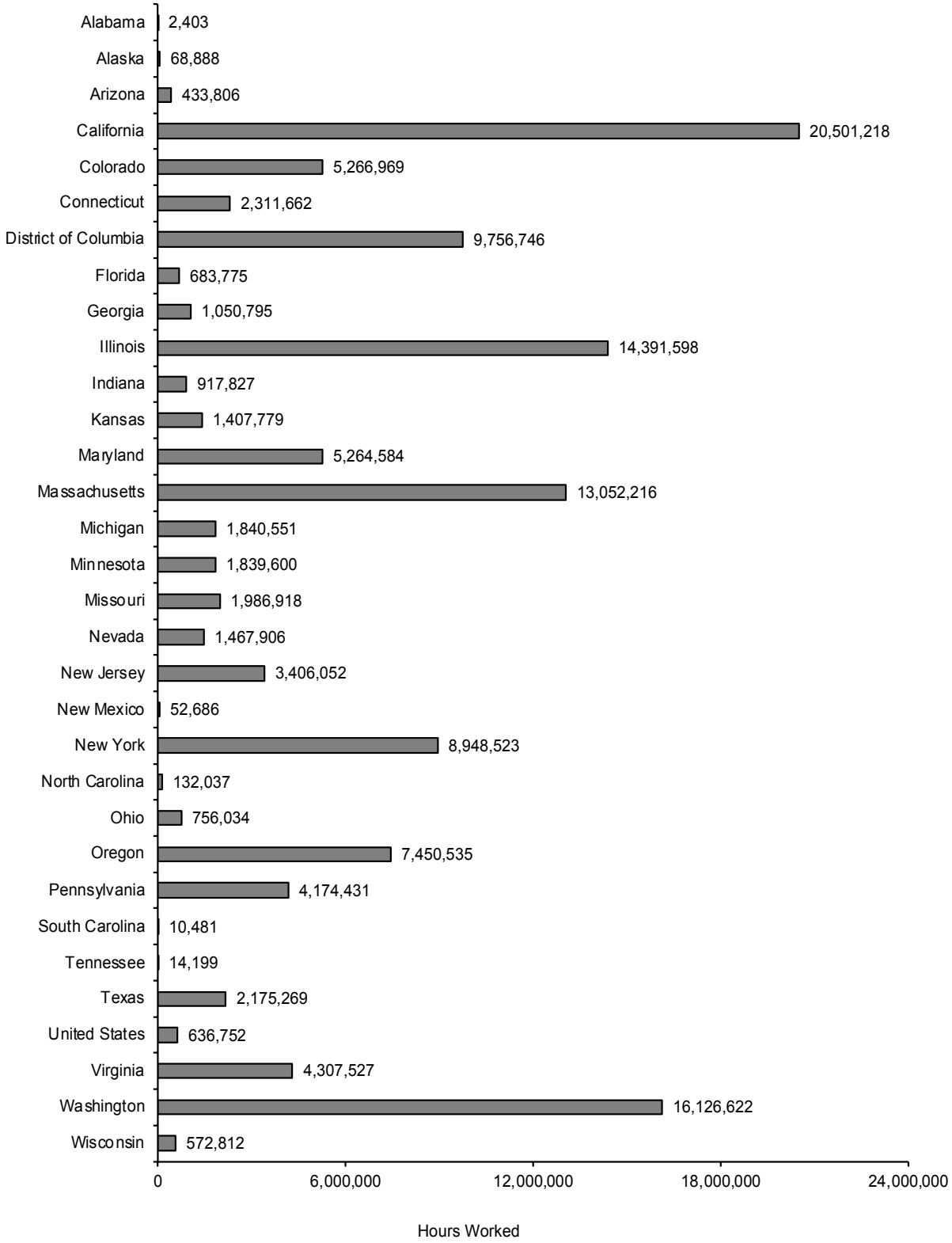

Table 11: Detailed Direct Hours of Work for Union Construction Trades from MEPT Hard Cost Spending, by State, 1982-2023

State	Bricklayers (including tile setters)	Carpenters	Cement Masons	Electrical Workers	Elevator Installers and repairers	Insulation (including asbestos removal)	Iron-workers	Laborers
Alabama	95	237	88	572	84	0	0	319
Alaska	2,331	11,537	2,532	10,734	1,385	740	1,183	11,024
Arizona	14,761	71,600	15,943	68,846	8,948	4,495	7,186	69,005
California	704,922	3,292,886	753,295	3,362,049	442,223	198,256	316,950	3,225,412
Colorado	184,771	800,634	193,444	917,888	123,277	43,862	70,121	810,814
Connecticut	78,793	379,856	84,955	368,875	48,039	23,690	37,873	367,054
DC	334,771	1,575,876	358,517	1,589,578	208,592	95,718	153,023	1,538,450
Florida	24,157	101,842	25,110	121,669	16,452	5,367	8,580	104,438
Georgia	36,319	166,459	38,606	175,092	23,161	9,800	15,667	164,408
Illinois	500,094	2,246,725	528,682	2,437,544	324,257	129,060	206,326	2,238,707
Indiana	31,050	153,707	33,736	143,010	18,458	9,856	15,757	146,871
Kansas	49,398	213,850	51,704	245,513	32,981	11,701	18,706	216,660
Maryland	179,917	859,219	193,467	847,081	110,655	53,036	84,789	833,623
Massachusetts	445,336	2,139,152	479,669	2,089,457	272,438	132,884	212,440	2,070,271
Michigan	62,271	308,172	67,652	286,857	37,028	19,756	31,583	294,502
Minnesota	62,416	305,820	67,613	289,328	37,476	19,403	31,020	293,487
Missouri	67,547	328,671	73,025	314,455	40,827	20,701	33,095	316,346
Nevada	50,880	230,739	53,927	246,738	32,737	13,410	21,438	228,963
New Jersey	121,587	491,816	125,048	624,557	85,250	24,318	38,878	514,141
New Mexico	1,782	8,823	1,937	8,209	1,060	566	905	8,431
New York	309,949	1,409,382	328,751	1,500,834	198,977	82,181	131,382	1,396,874
North Carolina	5,161	13,535	4,837	30,815	4,484	80	128	17,757
Ohio	25,660	125,583	27,787	119,029	15,424	7,958	12,723	120,577
Oregon	254,901	1,212,526	273,791	1,202,932	157,338	74,519	119,133	1,178,399
Pennsylvania	142,463	683,747	153,410	668,748	87,219	42,436	67,842	661,965
South Carolina	413	1,034	384	2,495	365	0	0	1,393
Tennessee	559	1,400	520	3,380	494	0	0	1,888
Texas	78,612	302,221	79,840	413,054	56,977	13,678	21,868	323,686
United States	21,541	106,636	23,405	99,215	12,805	6,838	10,932	101,893
Virginia	149,478	674,986	158,244	726,566	96,515	39,022	62,384	671,056
Washington	547,896	2,671,898	592,707	2,547,140	330,454	168,688	269,680	2,569,269
Wisconsin	19,378	95,928	21,055	89,252	11,520	6,151	9,834	91,662
Total ALL	**4,509,212**	**20,986,494**	**4,813,684**	**21,551,512**	**2,837,897**	**1,258,172**	**2,011,424**	**20,589,344**

Table 11 (continued): Detailed Direct Hours of Work for Union Construction Trades from MEPT Hard Cost Spending, by State, 1982-2023

State	Operating Engineers	Other	Painters	Plumbers	Roofers	Sheet Metal Workers	Teamsters	Total All Trades
Alabama	0	0	341	441	104	121	0	2,403
Alaska	2,782	5,683	5,912	7,602	2,039	2,327	1,079	68,888
Arizona	16,903	34,532	38,087	48,987	13,051	14,907	6,556	433,806
California	745,521	1,523,094	1,874,009	2,411,714	635,080	726,634	289,172	20,501,218
Colorado	164,937	336,965	518,419	667,841	172,290	197,729	63,976	5,266,969
Connecticut	89,083	181,996	204,330	262,831	69,886	79,848	34,553	2,311,662
DC	359,938	735,350	884,721	1,138,442	300,478	343,679	139,612	9,756,746
Florida	20,182	41,231	69,014	88,934	22,790	26,181	7,828	683,775
Georgia	36,852	75,288	97,943	126,081	33,018	37,809	14,294	1,050,795
Illinois	485,315	991,495	1,368,395	1,761,989	458,877	525,889	188,244	14,391,598
Indiana	37,064	75,721	78,773	101,282	27,166	30,999	14,376	917,827
Kansas	43,999	89,889	138,685	178,660	46,080	52,886	17,066	1,407,779
Maryland	199,438	407,449	470,124	604,813	160,340	183,275	77,358	5,264,584
Massachusetts	499,696	1,020,875	1,158,270	1,489,976	395,724	452,206	193,822	13,052,216
Michigan	74,289	151,772	158,016	203,169	54,490	62,179	28,815	1,840,551
Minnesota	72,964	149,065	159,723	205,398	54,903	62,681	28,301	1,839,600
Missouri	77,846	159,038	173,850	223,591	59,630	68,100	30,195	1,986,918
Nevada	50,427	103,022	138,285	178,038	46,486	53,255	19,560	1,467,906
New Jersey	91,447	186,826	356,401	459,483	116,641	134,189	35,470	3,406,052
New Mexico	2,128	4,347	4,522	5,814	1,559	1,779	825	52,686
New York	309,033	631,353	840,746	1,082,394	282,828	323,971	119,868	8,948,523
North Carolina	301	616	18,325	23,697	5,635	6,549	117	132,037
Ohio	29,927	61,140	65,726	84,522	22,584	25,785	11,608	756,034
Oregon	280,221	572,489	668,145	859,620	227,613	260,216	108,692	7,450,535
Pennsylvania	159,576	326,013	370,777	476,966	126,645	144,726	61,896	4,174,431
South Carolina	0	0	1,488	1,924	456	530	0	10,481
Tennessee	0	0	2,016	2,607	617	718	0	14,199
Texas	51,436	105,084	237,298	306,086	76,884	88,593	19,951	2,175,269
United States	25,713	52,532	54,650	70,265	18,847	21,506	9,974	636,752
Virginia	146,739	299,786	407,516	524,694	136,838	156,788	56,917	4,307,527
Washington	634,335	1,295,940	1,407,554	1,810,208	483,120	551,685	246,045	16,126,622
Wisconsin	23,131	47,257	49,162	63,210	16,954	19,346	8,972	572,812
Total ALL	**4,731,222**	**9,665,846**	**12,021,222**	**15,471,281**	**4,069,657**	**4,657,087**	**1,835,144**	**131,009,199**

Table 12: Direct Hard Cost and Total Economic Impacts from MEPT Project Spending, by State, 1982-2023 (2023 dollars)

State	Direct HC Output	Direct HC Labor Income	Direct HC Jobs	Total Output	Total Labor Income	Total Jobs
Alabama	$206,191	$66,268	1	$385,275	$122,348	2
Alaska	$7,997,080	$3,110,613	36	$18,934,404	$7,556,353	111
Arizona	$37,827,237	$14,860,049	225	$91,706,212	$36,224,589	602
California	$1,862,894,545	$845,495,659	10,481	$5,344,928,495	$2,239,812,587	30,019
Colorado	$442,567,899	$186,362,491	2,708	$1,106,036,815	$442,853,637	6,826
Connecticut	$174,576,410	$90,507,478	1,199	$349,444,443	$164,710,416	2,221
DC	$796,864,343	$398,821,744	5,051	$1,453,003,651	$736,093,099	8,275
Florida	$61,434,360	$20,303,309	348	$155,008,086	$56,232,697	995
Georgia	$87,613,582	$29,170,900	522	$179,907,176	$61,728,314	1,059
Illinois	$1,313,287,990	$568,669,411	7,355	$3,351,880,303	$1,366,505,958	19,320
Indiana	$89,455,604	$31,122,372	475	$234,468,389	$85,251,071	1,542
Kansas	$116,192,079	$42,822,969	728	$273,601,269	$100,865,342	1,827
Maryland	$456,998,689	$203,821,764	2,726	$1,229,962,508	$519,035,933	7,742
Massachusetts	$1,042,953,561	$535,816,889	6,536	$2,252,845,443	$1,035,491,262	13,407
Michigan	$187,981,036	$70,762,412	953	$482,857,898	$189,081,411	2,938
Minnesota	$189,513,181	$67,771,713	928	$426,254,959	$157,576,758	2,362
Missouri	$187,255,082	$66,923,067	1,028	$496,365,848	$187,450,823	3,253
Nevada	$138,119,303	$60,000,821	756	$292,586,261	$122,380,150	1,766
New Jersey	$348,813,263	$145,897,610	1,739	$1,003,228,518	$427,283,555	5,445
New Mexico	$4,909,893	$1,454,135	27	$14,161,675	$5,025,302	102
New York	$807,728,953	$349,910,242	4,583	$1,914,488,158	$797,137,268	10,644
North Carolina	$11,180,434	$3,846,355	66	$51,737,953	$21,036,170	346
Ohio	$66,415,321	$25,258,020	392	$171,761,176	$65,968,001	1,150
Oregon	$654,571,500	$255,162,559	3,833	$1,640,738,119	$626,023,816	10,669
Pennsylvania	$373,764,299	$152,648,427	2,128	$1,151,121,415	$461,124,200	7,058
South Carolina	$942,246	$341,590	5	$2,288,058	$899,415	13
Tennessee	$1,587,225	$483,524	7	$2,723,016	$852,240	15
Texas	$196,216,452	$79,019,633	1,089	$484,593,201	$187,309,037	2,782
United States	$66,194,022	$22,829,608	330	$329,243,241	$116,859,022	1,896
Virginia	$379,160,062	$143,154,565	2,222	$993,831,694	$392,716,114	6,339
Washington	$1,394,865,889	$639,877,804	8,156	$3,115,174,260	$1,275,789,050	18,266
Wisconsin	$59,097,106	$21,391,901	297	$161,451,449	$61,001,513	1,071
Total All	**$11,559,184,839**	**$5,077,685,902**	**66,930**	**$28,776,719,366**	**$11,947,997,450**	**170,063**

Table 13: Total Fiscal Impacts from MEPT Project Spending, by State, 1982-2023 (2023 dollars)

State	Sales Taxes	Income Taxes
Alabama	$5,650	$0
Alaska	$208,046	$0
Arizona	$1,365,558	$1,031,428
California	$77,094,315	$95,032,910
Colorado	$14,481,407	$15,920,920
Connecticut	$3,726,281	$8,056,402
District of	$10,997,332	$49,644,612
Florida	$2,455,022	$4,071
Georgia	$2,198,758	$1,195,203
Illinois	$43,740,393	$41,124,317
Indiana	$3,156,577	$4,822,844
Kansas	$3,834,444	$4,029,209
Maryland	$15,348,648	$40,639,667
Massachusetts	$17,549,250	$39,520,459
Michigan	$6,619,907	$8,822,926
Minnesota	$6,954,119	$5,597,952
Missouri	$7,118,973	$9,040,991
Nevada	$9,565,416	$43,893
New Jersey	$11,823,308	$14,371,131
New Mexico	$208,010	$212,816
New York	$18,998,291	$56,452,165
North Carolina	$1,230,333	$1,110,999
Ohio	$2,353,923	$4,359,768
Oregon	$3,636,036	$42,442,441
Pennsylvania	$16,151,184	$20,838,930
South Carolina	$21,102	$21,105
Tennessee	$27,089	$4,020
Texas	$6,313,889	$0
United States	$5,464,542	$5,092,647
Virginia	$12,017,112	$17,269,042
Washington	$57,403,385	$0
Wisconsin	$2,117,130	$4,019,189
Total All	**$364,185,430**	**$490,722,058**

Table 14: Direct Hard Cost and Total Economic Impacts for Women and Minorities from MEPT Project Spending, by State, 1982-2023

	Women				Minorities			
State	Direct HC Jobs	Direct HC Hours	Total Jobs	Total Hours	Direct HC Jobs	Direct HC Hours	Total Jobs	Total Hours
Alabama	0	339	1	1,377	0	53	0	105
Alaska	5	8,955	32	59,442	11	20,667	40	73,790
Arizona	27	52,046	183	324,024	119	229,080	296	538,145
California	1,060	2,073,307	9,224	16,601,825	5,714	11,176,928	16,940	31,212,243
Colorado	431	839,131	2,328	4,175,941	1,065	2,071,505	2,272	4,183,961
Connecticut	173	333,449	685	1,217,699	148	286,380	496	885,777
District of	772	1,489,840	2,312	4,185,154	2,186	4,225,699	3,549	6,568,701
Florida	77	151,563	373	682,757	129	256,574	433	800,985
Georgia	67	136,622	335	638,996	194	390,683	460	889,387
Illinois	743	1,456,009	6,045	10,794,403	1,552	3,036,726	5,698	10,345,880
Indiana	48	92,497	481	843,504	99	192,017	452	805,250
Kansas	63	121,814	572	1,005,510	157	302,771	412	745,399
Maryland	419	809,438	2,255	3,961,583	1,156	2,231,920	3,340	6,001,147
Massachusetts	724	1,446,540	3,962	7,323,850	1,025	2,047,079	2,952	5,550,079
Michigan	101	195,863	868	1,524,161	135	260,936	615	1,093,007
Minnesota	150	297,758	780	1,440,042	120	238,836	371	695,860
Missouri	145	280,811	1,042	1,837,696	93	180,247	503	892,337
Nevada	120	232,542	614	1,100,598	347	673,697	814	1,488,750
New Jersey	364	711,935	2,047	3,712,408	355	698,135	1,934	3,523,303
New Mexico	3	6,321	31	54,984	14	27,822	50	91,319
New York	490	956,480	3,025	5,423,310	1,183	2,319,769	3,495	6,391,778
North Carolina	7	14,162	112	198,319	10	18,554	91	160,751
Ohio	39	76,192	359	629,735	82	158,169	337	601,176
Oregon	390	758,436	3,185	5,638,545	600	1,166,940	2,055	3,722,495
Pennsylvania	243	475,219	2,130	3,817,442	255	499,490	1,317	2,382,742
South Carolina	0	1,295	5	8,833	1	3,089	5	8,883
Tennessee	1	1,646	5	8,891	1	2,838	4	7,052
Texas	142	283,960	902	1,672,166	601	1,203,473	1,529	2,898,241
United States	46	88,608	597	1,052,542	93	179,726	618	1,108,906
Virginia	339	656,429	1,680	2,984,009	934	1,810,149	2,685	4,871,827
Washington	886	1,756,680	5,085	9,223,170	1,667	3,298,595	4,606	8,563,516
Wisconsin	48	92,716	354	624,079	39	74,368	168	301,569
Total All States	**8,128**	**15,898,601**	**51,608**	**92,766,995**	**20,088**	**39,283,981**	**58,540**	**107,406,496**

Appendix 1: Modeling Economic Impacts

This appendix begins with a discussion of what economic impacts are and how they can be measured using an input-output modeling framework. It then discusses the limitations of input-output analysis, with recommendations on when an input-output model should be used. This appendix concludes with a discussion of the IMPLAN modeling software and how it was used to measure the economic impacts associated with MEPT investment spending.

Economic and Fiscal Impact Analysis

Simply put, *economic impacts* are changes in economic activity as a result of some initial change in the economy. Although the initial stimuli can vary, economic impacts are typically measured as changes in output (or sales), income (a component of value added), and jobs. Economic impacts often lead to changes in government revenues and expenditures. These *fiscal impacts* occur as changes in output, income, and jobs, lead to changes in the regional tax base and demand for government services. These fiscal impacts represent an additional dimension or measure of economic impacts.

Input-Output Modeling for Impact Analysis

To conduct an economic impact analysis, a mathematical model is developed that accounts for exchanges between local industries, as well as with households as suppliers of the factors of production, with industries outside of the region, and with final users of goods and services. The most widely used modeling framework for economic impact analysis is known as input-output modeling.[16] The most accurate regional input-output models are constructed from survey data acquired from local businesses. The survey helps to determine what goods and services are being purchased, and whether local or non-local sources are being used. Conducting these surveys is expensive and time consuming. Indeed, survey based input-output models place significant demands on data and are uneconomical to use in most situations.

Fortunately, special data techniques have been developed to estimate the necessary empirical relationships and regional measures of economic activity using secondary source data. This non-survey approach means that input-output models can be economically constructed using commercially available economic impact modeling software that relies on secondary source data collected by government agencies.

Several important points about input-output models:

- An input-output model provides a reasonably comprehensive picture of the economic activities within a region and can be constructed for almost any region or study area.
- Input-output models use a simple, rectangular accounting framework called double-entry accounting. This results in a model structure that is well ordered, symmetric, and where, by definition, inputs must be equal to outputs. This important aspect of the input-output

[16] Although initially inspired by Quesnay's "Tableau Economique," and the Marxian and Walrasian analysis of general equilibrium, input-output analysis was first put to practical use by Wassily Leontief in the late 1930's. While at Harvard, Leontief used his input-output system to construct an empirical model of the United States economy. This research gave rise to his 1941 classic, "Structure of American Industry, 1919-1929." For his research, Leontief was awarded the Nobel Prize in Economics in 1973.

modeling framework allows the analyst to "shock" an economy and trace the impacts from one sector to another as the economy goes from one equilibrium to another.

- In order to provide a common unit of measure, all transaction flows in an input-output model are stated in dollars.

Input-output models serve two general purposes. First, the input-output framework is useful for organizing information about the structure of a regional economy. Using standard accounting conventions, the transactions table in input-output models describe the flow of commodities between producing and consuming sectors, the flow of income between businesses and institutions, and the trade in commodities between regions. In this manner, the input-output modeling framework can be used for *descriptive* purposes. For instance, researchers can evaluate the relative importance of various industry sectors to the local economy, e.g., the number of jobs or purchases from other local industries.

Once the information on the various transactions within an economy has been gathered and organized using the input-output framework, the data can be manipulated using a special field of mathematics called matrix algebra. This phase of input-output modeling produces "multipliers" and allows researchers to use the input-output model for *prescriptive* purposes. The first step to calculating multipliers is to convert the inter-industry transactions into direct purchase coefficients. This is accomplished by dividing each inter-industry purchase by the total inputs purchased by that industry.[17] The columns in the table of direct purchase coefficients represent the "production function" of each industry. Calculating the inverse matrix of the direct purchase coefficients yields a table of multipliers. Mathematically, the inverse matrix is $[(1-A)^{-1}]$, where A represents the matrix of direct purchase coefficients. Wassily Leontief is credited with this matrix procedure, hence, the name the Leontief Inverse Matrix.

The multipliers allow a researcher to trace the economic impacts associated with a change in final demand through all the sectors of the economy. That is, economic impact multipliers allow researchers to follow the initial change in economic activity as it "ripples" through each industry sector. For any given type of change in economic activity, the impacts on the economy can be reported on one of three levels.

- Direct impacts represent the initial change in final demand for the industry sector(s) in question. Direct impacts describe the changes in economic activity for sectors that first experiences a change in demand because of a project, policy decision, or some other stimuli.
- Indirect impacts represent the response as supplying industries increase output in order to accommodate the initial change in final demand. These indirect beneficiaries will then spend money for supplies and services, which results in another round of indirect spending, and so on.
- Induced impacts are generated by the spending of households who benefit from the additional wages and business income they earn through all of the direct and indirect activity. The increase in income, in effect, increases the purchasing power of households.

[17] The table of direct purchase coefficients is often called the "A matrix".

Limitations of Input-Output Modeling

The input-output modeling framework for economic impact analysis has grown in popularity. Much of this growth is due to significant improvements in computer technology that now make it possible to quickly perform the complex matrix operations. Some of this growth is due to improvements in government data collection efforts. Lastly, the growth in input-output modeling has been fueled by the desire of policy-makers, industry officials, and others to obtain information that will help them to better understand and respond to economic change.

Like many quantitative tools, input-output models rely on a set of assumptions. Indeed, without simplifying assumptions it would be impossible for researchers to model something as complex and dynamic as a regional economy. The use of simplifying assumptions, however, also imposes certain limitations on the use of input-output modeling. These limitations should be fully understood and guide its use.

Static Models

Input-output models are static models in that they measure the flow of inputs and outputs in an economy at a point in time. With this information and the balanced accounting structure of an input-output model, an analyst can: 1) describe an economy at one time period, 2) introduce a change to the economy, and then 3) evaluate the economy after it has fully accommodated that change. This type of analysis is called "partial equilibrium" analysis. Measurement in this sense is really a before and after comparison. Partial equilibrium analysis permits comparison of the economy at two points in time but yields little information about how the economy actually moves from one equilibrium to the next. In fact, in partial equilibrium analysis, other than the initial economic stimulus, the researcher assumes that all other relationships in the economy remain the same. The assumptions and their implications for input-output modeling are discussed below.

1. **Fixed Production Relationships.** Input-output models are a representation—as reported in the transactions table—of economic relationships that exist at a moment in time. For industries, this means that input-output models are based on production relationships that are fixed. This assumption results in:
    a. Constant Returns to Scale means that an industry's production function is linear, and an increase in output requires all inputs to increase proportionately. If the demand for milk doubled, for instance, then the demand for all of the inputs used to produce milk would also double. In the long run, production processes exhibit economies and diseconomies of scale that vary with the level of output. An industry with scale economies would be able to double production without necessarily doubling all inputs.
    b. Fixed Commodity Input Structure means that input-output models do not allow changing input prices to affect the production decisions of businesses. Input-output models assume that changes in an economy will affect the output of industries but not the mix of inputs that they use. Using the previous example, dairies respond to the increase demand for milk by simply increasing production of milk. Input-output models, in effect, ignore possible changes in the prices of inputs used to produce milk.

2. **No Supply Constraints.** Input-output models show how local industries respond to some initial change in final demand but assume that supplies of raw materials and intermediate goods are unlimited, i.e., perfectly elastic. Under an assumption of no supply constraints, an industry simply responds to a change in final demand by increasing output, and it increases output by acquiring inputs that are readily available at current prices.
3. **Sector Homogeneity.** An industry consists of businesses producing goods and services—these are called commodities in input-output modeling. Businesses can produce more than one type of commodity, i.e., they produce a primary commodity, but can also produce secondary commodities or by-products. In input-output modeling, industry sectors are assumed to be homogenous. That is, all businesses within an industry sector produce commodities in fixed proportions and produce identical commodities that are perfectly substitutable.

Input-Output Modeling—Practical Considerations

Apart from the limitations imposed by the static nature of input-output models, there are also some very practical considerations that should also guide their use. These practical considerations are discussed below.

1. **Lag Between Data Collection and Modeling.** Input-output models can be constructed for almost any geographic region. Typically, their structure is based on a national input-output model[18] that is then combined with national and regional economic data to tailor the model to a specific study area. However, there is often a lag between actual data collection and incorporation of that data into the modeling software. With this implementation lag, changes in the structure of an economy—such as improvements in technology, changes in demand, and changes in regional trade patterns—will affect the multipliers and make the results less reliable.
2. **Time.** Economic impacts occur over time. The implications for impact analysis are two-fold. First, sometimes the effects of a large project can span several years. The direct hires and payment of wages and benefits will also span that period of time. In this context, the researcher must fully describe the temporal nature of project spending and the implications for reported impacts, and consider the fact that inflation erodes purchasing power over time. If economic impacts are to be reported accurately, each dollar needs to be presented in terms of its economic value today. Second, the indirect and induced impacts take time to filter through the economy. Researchers use economic multipliers calculated in input-output analysis as a mathematical short cut for providing an estimate of final impacts. These final impacts are generated as spending cycles between businesses, consumers, governments, and foreigners. This multiplier process takes time.
3. **Scale.** From a modeling perspective, the input-output framework is suitable for analysis of economic changes that do not threaten the underlying assumptions embedded in the model. This suggests that the economic change being evaluated should be short-run in duration and of modest size relative to the economy under consideration. A large project,

[18] The U.S. Bureau of Economic Analysis constructs national benchmark input-output accounts every five years. The most current version available is the 1997 benchmark accounts. BEA estimates that the 2002 benchmark accounts will be completed by the summer of 2007.

for instance, may affect an economy's production possibilities or involve supply constraints. This, in turn, may cause equilibrium prices to change resulting in substitutions in production and/or imports.

The IMPLAN Input-Output Modeling Software

Perhaps the most common software package used to conduct input-output analyses is IMPLAN (IMpact analysis for PLANning). IMPLAN was originally developed by the Minnesota IMPLAN Group, Inc. ("MIG") and the US Forest Service in cooperation with the Federal Emergency Management Agency and the Bureau of Land Management to assist federal agencies in their land and resource management planning.[19] Currently there are over 1,500 public and private users of the IMPLAN modeling software.

IMPLAN Structure and Data

IMPLAN relies on a commodity/industry accounting framework that corresponds closely to that used in the Bureau of Economic Analysis "Input-Output Study of the U.S. Economy" and those recommended by the United Nations. IMPLAN uses a large database of regional and national data to forecast economic activity. The main sources of data are:

- US Bureau of Economic Analysis Benchmark I/O Accounts
- US Bureau of Economic Analysis Output Estimates
- US Bureau of Economic Analysis REIS Program
- US Bureau of Labor Statistics Covered Employment and Wages or ES202 data
- US Bureau of Labor Statistics Consumer Expenditure Survey
- US Census Bureau County Business
- US Census Bureau Decennial Census and Population Surveys
- US Census Bureau Economic Censuses and surveys
- US Department of Agriculture Crop and Livestock Statistics
- US Geological Survey

IMPLAN breaks an economy down to 546 separate industry sectors based on the North American Industrial Classification System ("NAICS").[20] A sector consists of industries that produce similar products or services. Final demand is sum of all purchases of goods and services for final consumption within an economy. In the IMPLAN model, final demands are allocated among industry sectors. In addition, final demands are adjusted or "margined" to reflect the transportation, wholesale, and retails costs of getting products from industries to consumers.

The IMPLAN model has the following major categories of final demand:

- Personal Consumption Expenditures. The largest component of final demand comes from household spending. Households consume a wide variety of goods and services, including food, energy, housing, and transportation. They also use some of their personal income to pay taxes, save for the future, pay debts, or purchase new housing. In IMPLAN, households are disaggregated by income levels to account for different spending patterns across income levels.

[19] IMPLAN is currently licensed and distributed by the IMPLAN Group, LLC. Huntersville, NC. IMPLAN.com.
[20] The version of the IMPLAN model used in earliest analyses consisted of 440 industry sectors.

- Federal Government Purchases. Government purchases are broken down into two categories: military and non-military. Military expenditures include any purchases made in the interest of national defense. Non-military expenditures include all other purchases made by the federal government for the remaining services it provides.
- State and Local Government Purchases. State and local government purchases are also broken down into two categories: education and non-education. Spending on public education goes primarily to compensate teachers, but also includes things like textbooks and supplies. Non-education spending includes anything not spent for public education such as police, fire and emergency services, and state-sponsored healthcare.
- Inventory Purchases. Inventories accumulate anytime an industry fails to sell all of its output in a given year. Goods can be sold out of inventory any time sales exceed production. Industries rarely sell exactly what they produce each year, so this category is a widely used tool for reconciling economic activities.
- Capital Formation. A large component of productive capability is capital. Industries use varying quantities of capital depending on the nature of goods and services they provide. The manufacturing sector, for example, tends to require large investments in property, plant, and equipment for the goods it produces. This category of final demand contains all spending on capital equipment.
- Foreign Exports. Just as some economies must import goods and services from outside their borders, other economies sell a significant portion of their output overseas. Demand for final goods and services that come from beyond a region's borders falls into this category. Although the consumption happens elsewhere, input-output analysis is concerned with where the goods and services are produced.

Impact Measures

IMPLAN reports economic impacts as measured by changes in output, incomes (value added), jobs and taxes. The value added or income measure is broken out into four categories. These measures of economic impacts consist of:

- Output: The total value of the production of a sector is its output. For most sectors, output approximately equal to sales. The notable exceptions are government and the trade sectors. The output of government sectors is approximately equal to revenues. For the trade sector, which consists of firms that buy goods and re-sell them, output is roughly the difference between what they sell goods for and what they paid to procure them. The trade sector consists of wholesalers and retailers.
- Value Added: This is a measure of the value added to the economy by a sector. It equals the sum of the wages, proprietor income, other income, and indirect business taxes.
    - Wages represent the total cash and non-cash compensation of workers on payroll. This includes the value of benefits.
    - Proprietor Income, sometimes called small business income, is the amount earned by self-employed workers and the working owners of small businesses.

    - Other Income counts all other sources of income. The largest source of income is usually rents, but it may also include royalties, dividends, and corporate profits.
    - Indirect business taxes are the excise and sales taxes paid by individuals to businesses.
- Employment: The number of payroll employees, including part time workers.
- Taxes: Federal, state, and local tax revenues.

Modeling

The process of modeling in IMPLAN involves three steps: creation of study area database; customization of IMPLAN coefficients; and estimating the impact of an activity on the model of the study area economy. The IMPLAN model allows substitution and incorporation of primary data at each stage of the model-building process, greatly increasing the model's accuracy and flexibility. In addition to being able to directly modify the IMPLAN database statistics, the user can alter import and export relationships, utilize modified input-output functions, and change industry groupings. IMPLAN allows the creation of aggregate models consisting of industries grouped together for a specific purpose.

The IMPLAN program uses an ordered series of steps to build the model. We describe them here to provide the interested reader with a view of the sequence of steps employed, and the types of data needed to model the impacts. The first step is the definition of the study area or study areas. Study area databases are created corresponding to these areas. These databases contain the representation of the behavior of the study area economies, but do not contain any information about the specific project under study.

The process of customizing the IMPLAN model does not stop with the development of the study area databases. Part of the expertise of input-output practitioners is in the customization of the model coefficients. Depending on the type of analysis, this enables the analyst to:

- Vary structural, technological, and/or trade factors within the model.
- Exclude expenditures that do not generate current economic activity, such as the purchase of real estate, depreciation, and amortization.
- Exclude expenditures that are known to occur outside the local economy. The IMPLAN model contains purchasing assumptions[21] for each industry sector that are specific to the study area. Instead of relying entirely on these purchasing assumptions, the analyst can identify and remove spending that is known to occur outside of local economy.
- The IMPLAN system permits a sector-by-sector breakout of transportation, wholesale, and retail margins, and allows the user to over-ride these margin assumptions using primary source data if available. For instance, instead of the estimated retail margin embedded in the IMPLAN model, the analyst can use actual retail margins for the activity.

[21] These purchasing assumptions are called "Regional Purchase Coefficients." They specify the ability of local suppliers to meet or satisfy a change in demand for a good or service.

Appendix 2: Firm Qualifications

Formed in 2013, Pinnacle Economics, Inc., ("Pinnacle") is nationally recognized for our theoretically sound, data-driven, state-of-the art approaches for measuring economic and fiscal impacts using the IMPLAN economic impact modeling software. In 2015, after a survey and review of impact methodologies in the United States and Canada, the American Council for an Energy-Efficient Economy ("ACEEE") identified the hybrid modeling approach developed by Pinnacle Economics for the *ex-post* verification of energy efficiency and renewable energy job creation as the gold standard in this type of analysis.[22]

Alec Josephson is a senior economist and President of Pinnacle Economics. He has over 30 years of experience as a consulting economist. Josephson has conducted, directed, and/or authored well over 1,000 economic impact studies, and has presented advanced economic impact modeling techniques at classes and conferences, and economic impact modeling results to governments, councils, and commissions. In addition to conducting economic impact analyses for MEPT since 2006, Josephson has worked on similar projects for the AFL-CIO's Housing Investment Trust, National Electrical Benefit Fund and National Electrical Annuity Plan, National Real Estate Advisors, and ULLICO Real Estate Investment Group's "J for Jobs" fund.

Josephson has extensive experience developing economic, fiscal, and socioeconomic models for a wide variety of projects, policies, and programs. His clients are both private (Facebook, Intel, Nike) and public (Oregon Department of Energy, Portland Public Schools, City of Portland). Our clients include businesses, nonprofit organizations, and government agencies. Our project history includes economic, fiscal, and socioeconomic impact analyses across a wide range of topics, including:

- Local, state, and federal government programs and policies in natural resources, education, health care, transportation, land use, economic development, pollution control, climate change, green industries, and local food production.
- The full range of both renewable and conventional energy resources and technologies such as wind, solar, wave, geothermal, hydroelectric, bio-refineries, energy efficiency programs, green industries and building practices, combined-cycle power plants, natural gas pipelines, power transmission lines, and more.
- Colleges, universities, and other educational institutions such as medical research, charter schools, and state educational systems.
- Tourism, cultural, and recreational projects and activities such as convention centers, hotels, museums, boardwalks, major and minor league sports, ski resorts, recreational fishing, whitewater rafting, and more.
- Construction and operation of large and complex infrastructure projects, as well as a broad range of commercial and industrial projects such as highway expansion and tolling

[22] Bell, McNerney, and Barrett, "Verifying Energy Efficiency Job Creation: Current Practices and Recommendations," American Council for an Energy-Efficient Economy, 529 14th Street NW, Suite 600, Washington, DC, 20045, September 2015.

projects, data centers, downtown revitalization programs, multi-family construction projects, bond-financed school modernization programs, multi-use commercial developments, and more.

- Corporate operations and capital spending plans for Nike, Intel, Cambia Health Solutions, The Standard Insurance Company, ESCO, and more.
- Nonprofit organizations in biosciences, software and technology, arts and culture, hospitals and health systems, senior care, drug and alcohol abuse, rivers, parks, and recreational areas.
- Regional quantitative and/or cluster analyses of Portland and Gresham, Oregon; New York City and its constituent boroughs; the City of Detroit; Massachusetts and four regional economies; and the City of Pittsburgh.
- Grant programs including the New Market Tax Credit ("NMTC") program, the USCIS Immigrant Investor (or "EB-5") program, American Recovery and Reinvestment Act ("ARRA"), Transportation Investment Generating Economic Recovery ("TIGER") competitive grant program, and numerous other federal, state, and local grant programs.

Appendix 3: Glossary

Direct impacts – Changes in economic activity as a result of MEPT project spending on the construction of new buildings or improvements to existing structures. This analysis uses a project-centric approach that classifies project hard and soft costs as direct spending.

Economic impacts – Changes in economic activity initiated by changes in final demand (sales to final consumers). In this analysis, all economic impacts are temporary in nature and occur as spending on new construction or tenant improvements unfold.

Fiscal impacts – Changes in state, local, and federal tax and fee revenues that are initiated by changes in economic activity. Similar to economic impacts, all fiscal impacts are temporary in nature and occur as spending on new construction or tenant improvements unfold.

Hours of work – Hours of work have been estimated based on the number of jobs and estimated annual hours worked for each industry sector.

Indirect Impacts – Supply-chain impacts initiated by the direct changes in spending. Supply-chain impacts capture the backward-linked purchases between businesses.

Induced impacts – Consumption-driven impacts generated by direct and indirect changes in income.

Jobs – Job impacts represent a mix of full- and part-time jobs. These jobs are temporary in nature, and a job in one year may accrue to the same individual in subsequent years.

New construction – The development of a new building structure. Expenditures related to construction are tracked beginning with the acquisition of land, through the planning and design stage and the building of the structure to initial occupancy of the building and first generation space.

Nominal dollars – All MEPT spending reported in the appendices to this report are in nominal dollars, i.e., actual spending that occurred in each year without adjustments for inflation.

Personal income – Wages and benefits to workers, plus the income (sometimes called proprietor income) earned by self-employed workers and working owners of small businesses.

Personal income taxes – State income taxes paid by workers whose jobs were generated by (direct jobs), or subsequently linked to (indirect and induced jobs), MEPT investment spending.

Real dollars – All MEPT impacts reported in the main body of this report are in 2023 dollars, i.e., they have been adjusted for inflation.

Second-generation tenant improvements (TI) - TI are the customized alterations a building owner makes to rental space (previously occupied), in order to configure the space for the needs of that particular tenant. Per the lease agreement, these include changes to walls, floors, ceilings, and lighting, among others.

Total direct, indirect, and induced economic impacts attributed to MEPT investment spending.*

$28.8B
total economic activity generated (output or sales)

170,063
total jobs created

$11.9B
total personal income and benefits generated

314.3M
total jobs hours generated

$490.7M
total state personal income tax revenues generated

$364.2M
total state and local sales tax revenues generated

*Since inception on April 1, 1982 through December 31, 2023.

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