

Westover Metropolitan Development Corporation Economic Contributions

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Donahue Institute
Economic and
Public Policy Research

Westover Metropolitan Development Corporation Economic Contributions

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Contents

Executive Summary	iv
Introduction	1
Employment	4
Economic Contribution Analysis	15
Appendix A: Economic Contribution Analysis and the IMPLAN Model	19
Economic Contribution Analysis	19
The IMPLAN Model	20

List of Tables

Table 1: Counties Where WMDC Airpark and Airport Employees Live	10
Table 2: WMDC Airparks and Civilian Airport's Economic Contribution in Hampden County	15
Table 3: WMDC Airparks and Civilian Airport's Economic Contribution across Massachusetts	15
Table 4: Local Property Taxes Generated from Airparks and Westover Airport	16
Table 5: Economic Contributions of WMDC Businesses in Chicopee to Hampden County	17
Table 6: Economic Contributions of WMDC Businesses in Chicopee across Massachusetts	17
Table 7: Economic Contributions of WMDC Businesses in Ludlow to Hampden County	18
Table 8: Economic Contributions of WMDC Businesses in Ludlow across Massachusetts	18

List of Figures

Figure 1: WMDC Airparks and Civilian Airport.....	1
Figure 2: Industry Share of All WMDC-Site Jobs	5
Figure 3: Top Industries in Chicopee (Airparks North & West and Civilian Westover Airport)	6
Figure 4: Top Industries in Ludlow (Airpark East and the Stony Brook Industrial Area).....	7
Figure 5: Heat Map of Job Locations in WMDC Airparks and Civilian Airport	8
Figure 6: Where WMDC Airpark and Airport Workers Live	9
Figure 7: Hometowns of WMDC Airpark and Airport Employees.....	10
Figure 8: Educational Attainment of WMDC Airpark and Airport Employees Versus the State Average..	11
Figure 9: Earnings of WMDC Airpark and Airport Employees Versus the State Average	12
Figure 10: Gender and Age Distribution of WMDC Airpark and Airport Employees	13
Figure 11: Race and Ethnicity Distribution of WMDC Airpark and Airport Employees.....	14
Figure 12: Economic Contribution Analysis Explained.....	19

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Executive Summary

The three airparks and the civilian airport operated by the Westover Metropolitan Development Corporation (WMDC) are highly productive and active commercial and industrial districts. Continued investment by WMDC in the airport has made it a competitive and highly-utilized facility. Meanwhile, businesses in the surrounding airparks area employ over 3,600 people across more than 100 establishments. That employment is primarily in manufacturing, public administration, wholesale trade, and administrative and support services. The majority of employment in the WMDC developed areas is local, with 58 percent of workers coming from Hampden County. Jobs in the area typically pay more than the state average. Sixty-nine percent of workers in the airparks earn more than \$3,333 per month, compared to 55 percent of workers across the State. These jobs are also available to workers at all levels of education. The impact of WMDC-developed sites extends across the state and region. Business activity at WMDC-developed areas is estimated to support a total of \$2.2 billion in economic output and 8,438 jobs around Massachusetts annually. The businesses within the airparks and the airport also contribute meaningfully in their payment of local taxes. Businesses in Chicopee paid a total of \$4,322,834 in local taxes in 2021. Businesses in Ludlow paid a total of \$1,874,519 in local taxes in 2021. The development of properties around the Air Force Reserve Base by WMDC is an economic development engine for the area, providing local jobs and a strong local financial impact.

Introduction

Westover Metropolitan Development Corporation Airparks and Civilian Airport

The Westover Metropolitan Development Corporation (WMDC) is a quasi-public development corporation formed in 1974 to convert military property in the vicinity of Westover Air Force base to productive civilian uses. WMDC has developed more than 1,300 acres of land in the area and currently operates the Westover Civilian Airport and three industrial parks commonly referred to as “airparks”. Each airpark is named after its general cardinal direction in relation to the center of Westover Air Reserve Base. Airpark North is the smallest airpark of the three. Airpark West is the second largest and includes the civilian airport, while Airpark East is the largest and includes the Stony Brook Industrial Area which sits on the northwest corner of Airpark East. For the purposes of this report, the Stony Brook Industrial Area will be considered part of Airpark East. The airparks, industrial area, and airport are referred to collectively as the “industrial parks and airport” or as “WMDC-developed areas”.

Figure 1: WMDC Airparks and Civilian Airport



Source: WMDC, MassGIS, ESRI

Figure 1, on the previous page is a map depicting the WMDC-developed areas, which serve as the basis for the following employment and economic contribution analysis. Military employment from the Westover Air Reserve Base is not included in any of the data analyzed. The largest share of businesses in WMDC-developed areas are located in Chicopee, at Airparks North and West (including at the civilian airport itself). Approximately a third of all businesses that the UMass Donahue Institute (UMDI) identified are in Ludlow at Airpark East, including the Hampden County Correctional Facility which is by far the areas' largest single employer.

Overview of Activity at WMDC Developed Industrial Parks and Civilian Airport

The industrial parks are extremely active commercial and industrial districts, conveniently located adjacent to the Mass Pike (I-90) and a short drive from I-91. The businesses in the airparks are manufacturing heavy, constituting about 35 percent of employment of the airparks and airport. This is notable given that manufacturing makes up only seven percent of all jobs statewide.

In addition to manufacturing, other major industries in the industrial parks include wholesale trade and public administration. An example of a manufacturer is Tsubaki Automotive which produces a variety of machine parts for major vehicle manufacturers. A representative of a firm in wholesale is Cardinal Health which sells and distributes medical supplies. Public administration is well represented due to the presence of the Hampden County Correctional Facility in Airpark East. The broad industry category "Administrative and Support and Waste Management and Remediation Services"¹ is also well-represented, which includes firms like Pioneer Packaging which offers graphic design services for product packaging.



The civilian airport itself has undergone continuous investment and improvement. Every hangar on site has been put to use in some way. Most are used for storage of various aircraft. Others are used by businesses for activities wholly unrelated to aviation, such as a hangar operated by Hyundai, a wholesaler of quartz

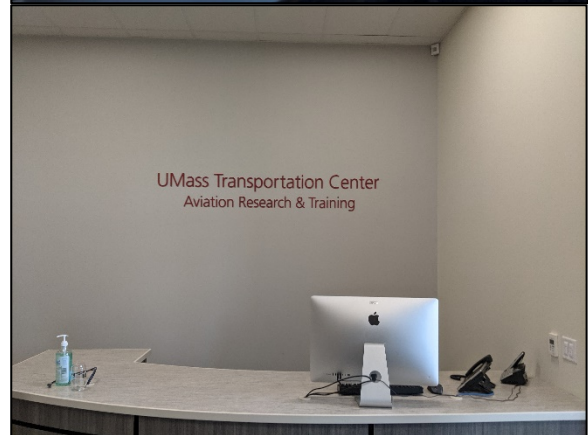
countertops. Some hangars are being refurbished to better serve private aircraft ranging from large

¹ Administrative and Support and Waste Management and Remediation Services is a broad sector made up of firms which do a wide variety of routine support activities for the day-to-day operations of other organizations. Activities can include: office administration, hiring and placing of personnel, document preparation and similar clerical services, solicitation, collection, security and surveillance services, cleaning, and waste disposal services.

business jets to small propeller planes. One hangar has been fully refurbished and is home to several aircraft, while another is well along in the process of being rebuilt. The renovation of additional hangars is anticipated. One small hangar on site was built from the ground-up to house a State Police helicopter and includes additional space for training and meetings for State Police personnel.

Airpark West includes the newly built UMass Transportation Center which provides facilities for classes related to transportation, aeronautical research and includes a state-of-the-art air traffic control simulator. The transportation center also hosts programs by Baystate Roads, which trains municipal public works employees on a wide variety of job related topics including Occupational Safety and Health Administration (OSHA) regulations, snow and ice removal, wildlife management among others. This work is part of the Federal Highway Administrations Local Technical Assistance Program (LTAP).

A major change to Westover Airport was installing a pilot-controlled lighting system which allows for 24-hour flight operations, an improvement for aircraft operators and owners who may want to undertake flight operations at any time of day. The Westover Airport is a civilian airport which serves as a convenient site for storing private and chartered passenger aircraft that typically fly to New York City, Connecticut, or Boston. Westover offers competitive aircraft hangar storage rates compared to airports within the New York and Boston metro areas. The runway at Westover, designed for large military planes, is also suitable for larger civilian aircraft that other nearby airports cannot accommodate.



Employment

Employment Distribution at WMDC Industrial Parks and Westover Airport

This report analyzes the workforce and economic contributions of Westover Metropolitan Development Corporation (WMDC) developed areas. Military employment from the Westover Air Reserve Base is not included in any of the data analyzed.

Across the three industrial parks, jobs are concentrated in Airparks West and East, evidenced by the most-heavily colored areas. The civilian airport and Airpark West are grouped together because they are adjoining, and share Census Blocks (see geographic note, following). This map was generated using OnTheMap. OnTheMap is a Census Bureau tool which can be used to estimate the demographic and economic composition of the workers in a custom geography or preexisting (municipal, county, etc.) geographies. Custom geographies were overlaid based on the footprints of the airparks and airport to complete this analysis. As noted earlier, military employment from the Westover Air Reserve Base is not included in any of the data analyzed.

Geographic note for all demographic and socioeconomic employment information from OnTheMap:

OnTheMap uses 43 Census Blocks to approximate the area developed by WMDC. A Census Block is a small unit of area “bounded by visible features such as roads, streams, and railroad tracks, and by nonvisible boundaries such as property lines, city, township, school district, county limits and short line-of-sight extensions of roads”². A Census Block may be a block of housing in a neighborhood, or a large field on one side of a road. The borders of the industrial parks are not a recognized boundary by the Census Bureau, so the Census Blocks used to generate the OnTheMap estimates sometimes cross the borders of the industrial parks. Generally, the Census Blocks conform to the industrial parks because they are heavily bounded by roads and physical features that are used to create these Blocks. However, it should be noted that the OnTheMap data may also include jobs just over the border of a given industrial park, for example if they are part of a Census Block shared by the airpark.

² Census Glossary: https://www.census.gov/programs-surveys/geography/about/glossary.html#par_textimage_5

Industry Analysis of Businesses in WMDC Sites

Figure 2: Industry Share of All WMDC-Site Jobs



Source: Data Axle; Dun & Bradstreet; Westover Metropolitan Development Corporation; UMDI analysis; Note: "All Other" includes Information; Management of Companies and Enterprises; and Finance and Insurance, each of which have ≤ 5 employees.

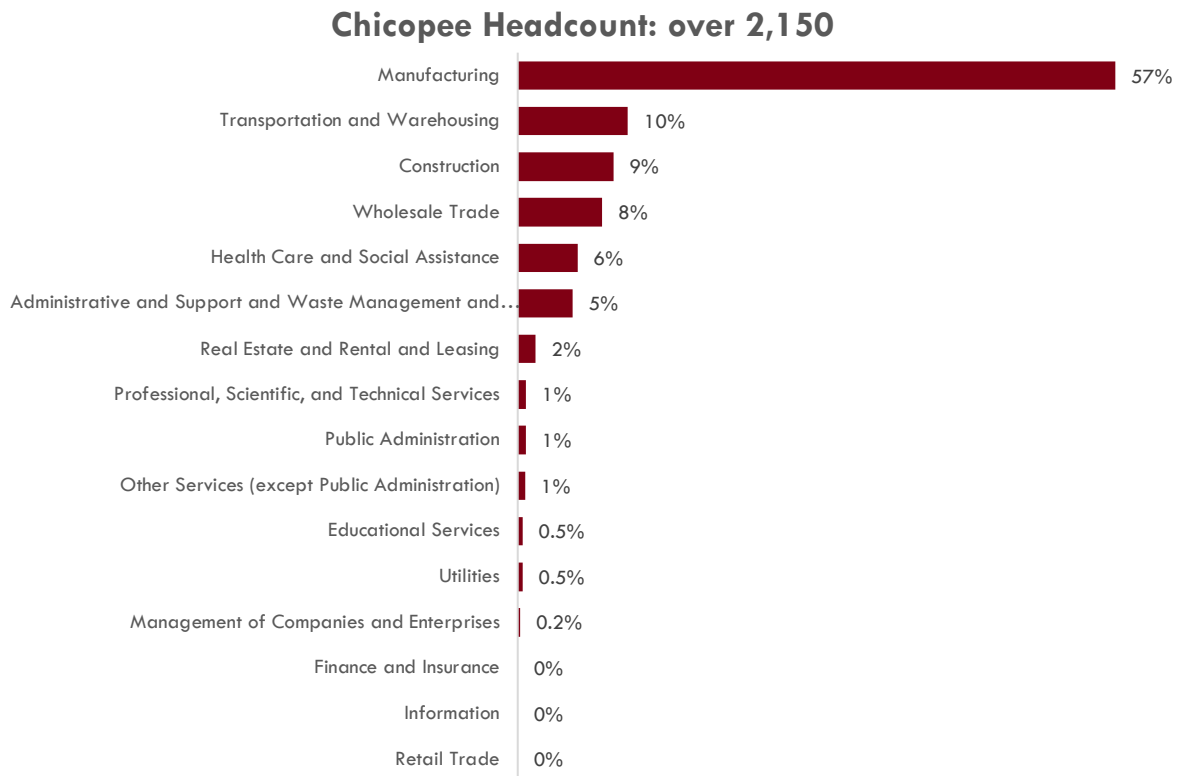
As **Figure 2** shows, the industry profile of businesses located in the industrial parks and airport is diverse. The most common industry for airport businesses is manufacturing. Historically, manufacturing employment has shrunk in Massachusetts and many parts of the country. Despite this general downward trend, manufacturing is still the largest source of employment in the WMDC developed industrial parks. Public Administration is also a major employer with the majority of sector jobs at the Hampden County Correctional Center.

This business list was constructed using a series of proprietary business databases – primarily Data Axle and Dun & Bradstreet - which provide point location data for firms all over the country, as well as basic information about the nature of each business. These databases construct lists of businesses using a wide variety of publically available documentation as well as manual verification of the continued presence of individual firms. However this data remains unstable due to the constantly shifting business landscape, so substantial additional verification is required. WMDC also provided a list of firms that own property in the business parks. Cross-referencing that list with the business databases gave UMDI a final list to work through by hand. Businesses were individually checked online to see if they were still open. If they were, more research was done to identify that business's industry and employment count. When online research was insufficient, or the database provided seemingly inaccurate information (for example if the employment count was suspiciously high or non-existent), UMDI contacted the businesses directly. Industry-

level analysis utilizes North American Industry Classification System (NAICS) codes, a system used by federal agencies to classify business establishments into industry sectors for analyzing the U.S. economy.

Figure and **Figure** depict the industry profile of WMDC developed areas for each of the two municipalities they are located in – Chicopee and Ludlow. Manufacturing constitutes the majority of employment in Chicopee and across all of WMDC sites.

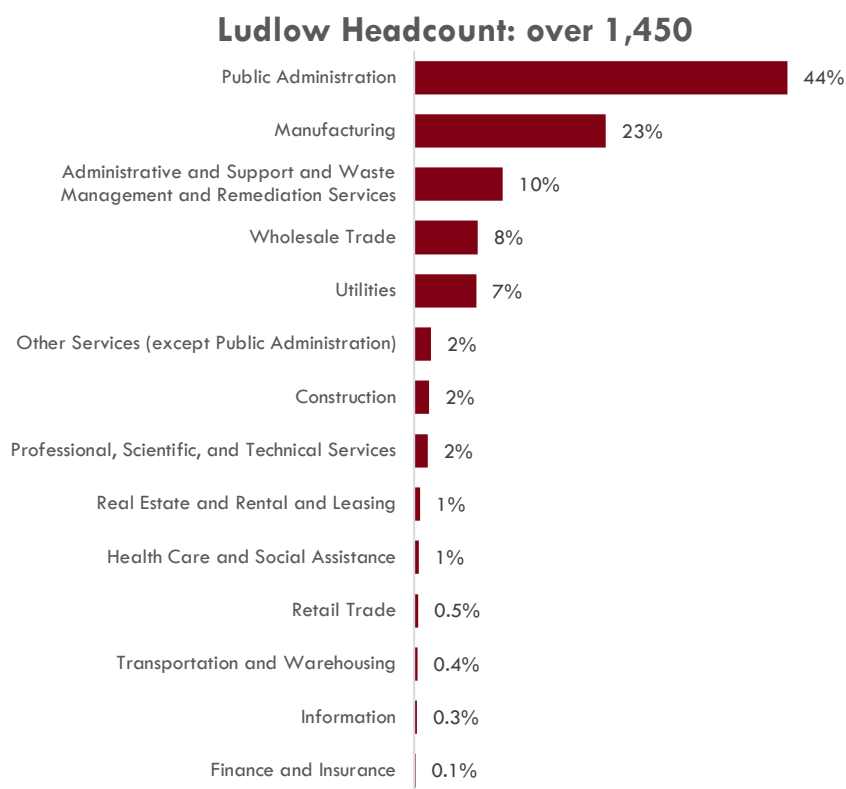
Figure 3: Top Industries in Chicopee (Airparks North & West and Civilian Westover Airport)



Source: Data Axel; Dun & Bradstreet; Westover Metropolitan Development Corporation; UMDI Analysis.

Note: Employment and economic contribution analysis only examined the WMDC managed/owned areas. Military employment on the Westover airbase is not included in any of the data analyzed.

Figure 4: Top Industries in Ludlow (Airpark East and the Stony Brook Industrial Area)



Source: Data Axel; Dun & Bradstreet; Westover Metropolitan Development Corporation; UMDI Analysis.

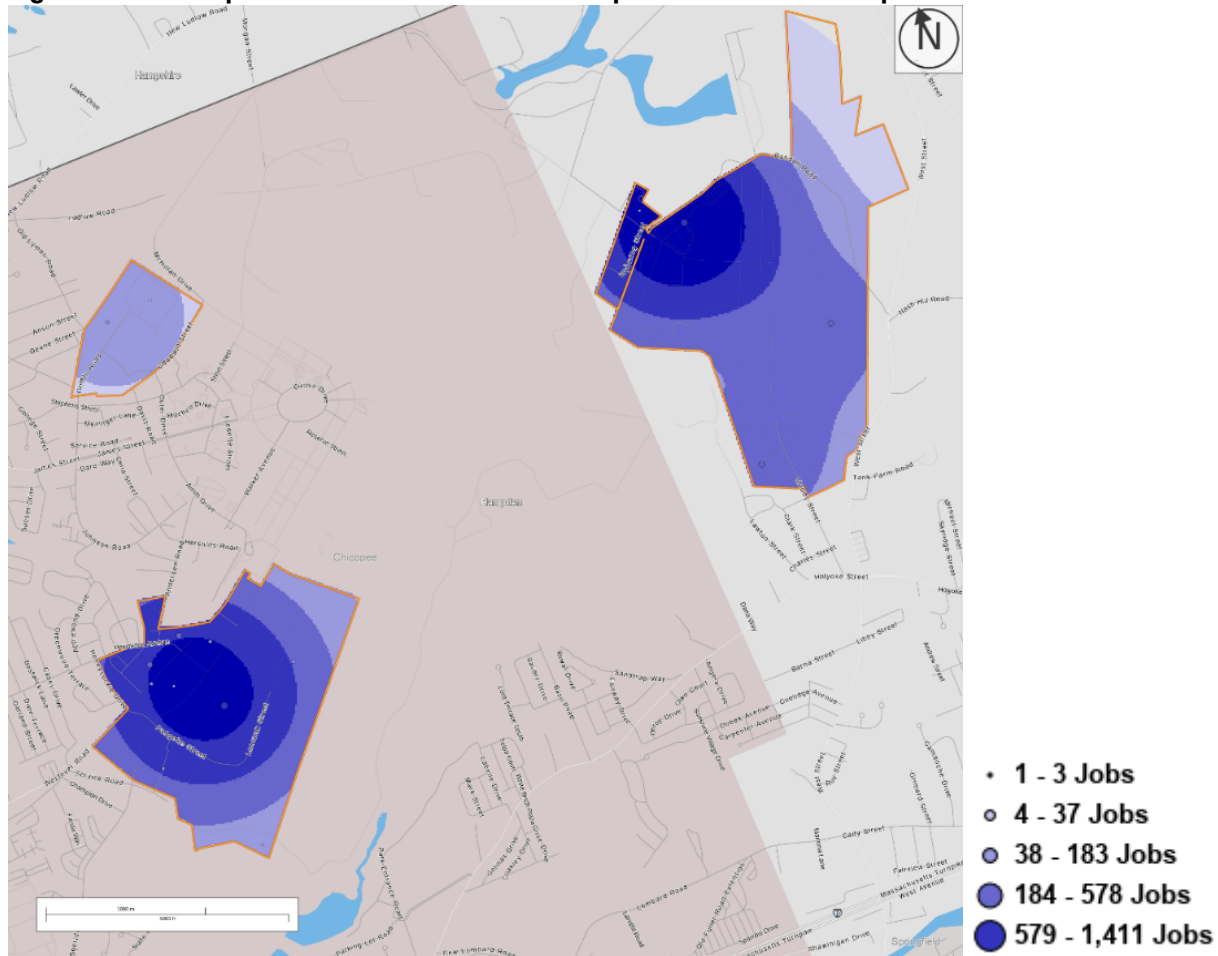
Note: Employment and economic contribution analysis only examined the WMDC managed/owned areas. Military employment on the Westover airbase is not included in any of the data analyzed.

The majority of Public Administration sector jobs are at the Hampden County Correctional Center in Ludlow, heavily skewing the industry analysis for Ludlow toward Public Administration. Manufacturing is a large part of employment across all of the WMDC areas including at the airparks in Ludlow.

Error! Reference source not found, is a heatmap of employment in each airpark and the airport. In Airpark East, employment is generally concentrated in the north end, where the correctional facility exists. In Airpark North, jobs are evenly distributed across the area. In Airpark West, jobs are more concentrated in the center of the park.

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Figure 5: Heat Map of Job Locations in WMDC Airparks and Civilian Airport

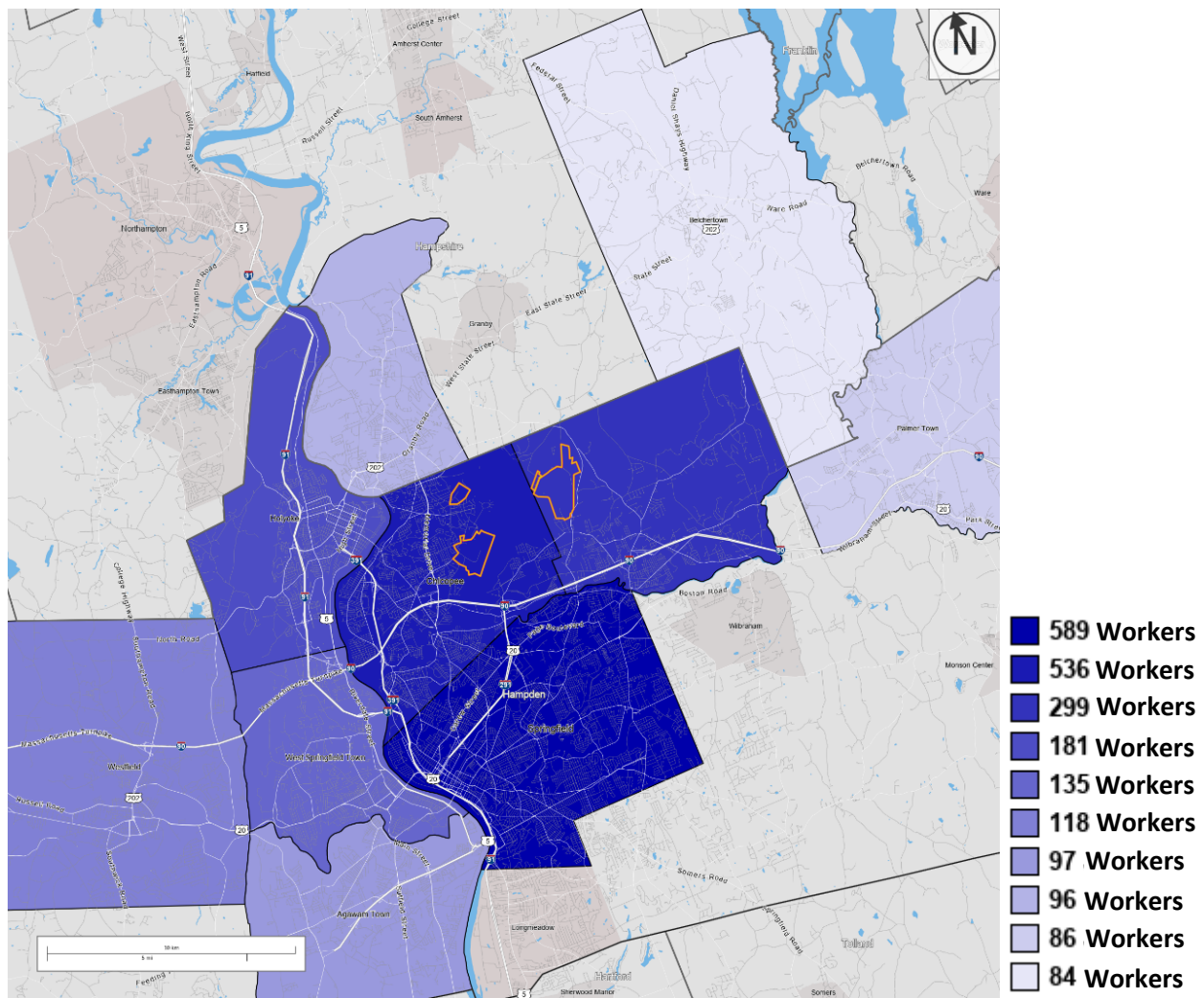


Source: U.S. Census Bureau, OnTheMap

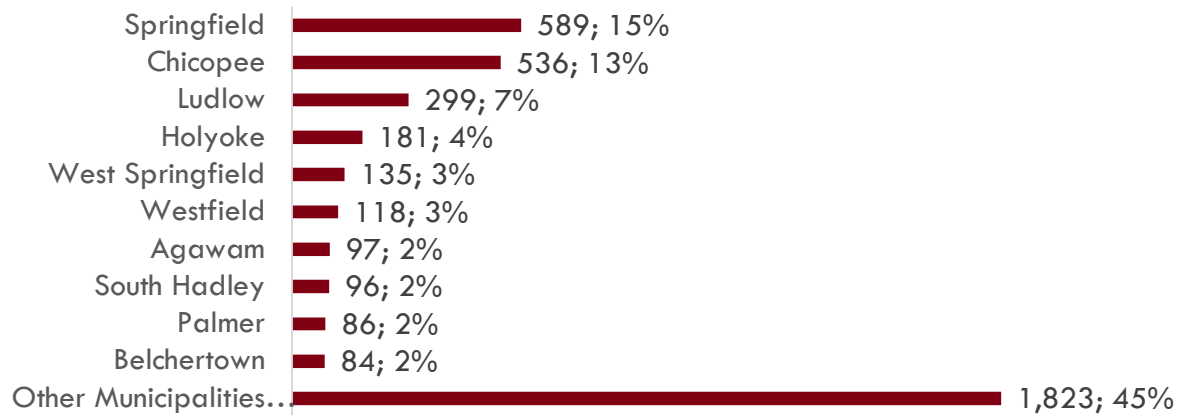
Demographics of Workers at WMDC Sites

Along with the above industry analysis, UMDI conducted an analysis of the employee demographics of WMDC developed areas. WMDC employees mostly reside in the Pioneer Valley and mainly in Hampden County. Crucially, WMDC-developed areas create more opportunities for people with limited educational attainment, than what is typical across the state. Furthermore, despite having a less educated workforce than the state overall, wages in WMDC developed areas are higher on average than in the state overall. Military employment from the Westover Air Reserve Base is not included in any of the data analyzed.

Figure 2: Where WMDC Airpark and Airport Workers Live



Source: U.S. Census Bureau, OnTheMap

Figure 3: Hometowns of WMDC Airpark and Airport Employees

Source: U.S. Census Bureau, OnTheMap; Note: "Other Municipalities" include Willbraham, Amherst, East Longmeadow, Easthampton, and additional places.

Employees working in the airparks and Westover Airport commute from a variety of towns. Most employees are based locally. Springfield, being the largest nearby urban center, is the most common home for airpark and airport employees. Together, [Figure 3](#), and [Table 1](#), show that many of the economic benefits of the WMDC developed areas, namely job creation, are enjoyed by locals: more than 70 percent of workers in the industrial parks and airport are commuting from somewhere in the Pioneer Valley, with nearly 60 percent residing in Hampden County.

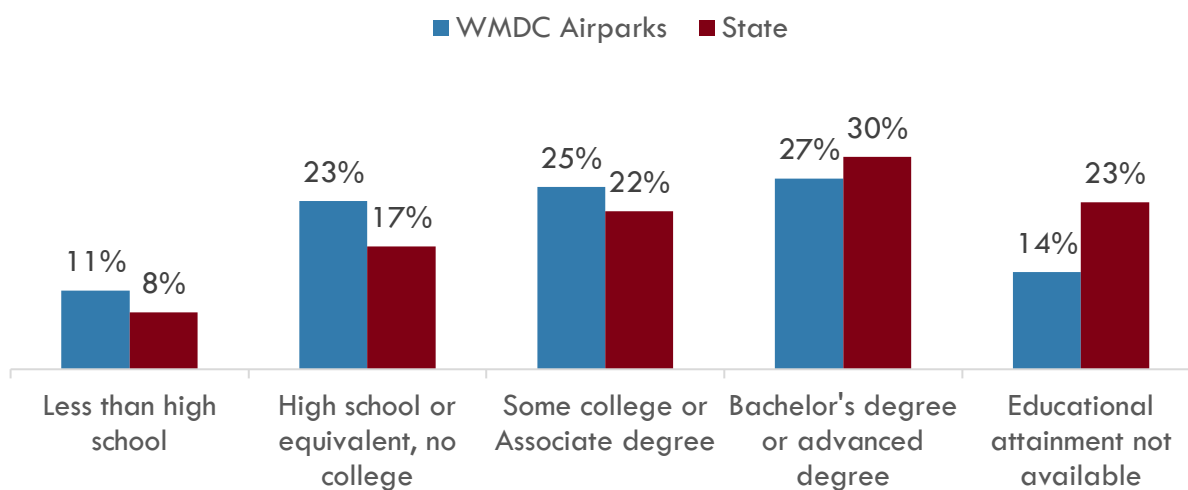
Table 1: Counties Where WMDC Airpark and Airport Employees Live

County	Employees	Share
Hampden	2,329	58%
Hampshire	541	13%
Worcester	265	7%
Middlesex	113	3%
Berkshire	108	3%
Other	688	17%

Source: U.S. Census Bureau, OnTheMap

Figure 4: Educational Attainment of WMDC Airpark and Airport Employees versus the State Average

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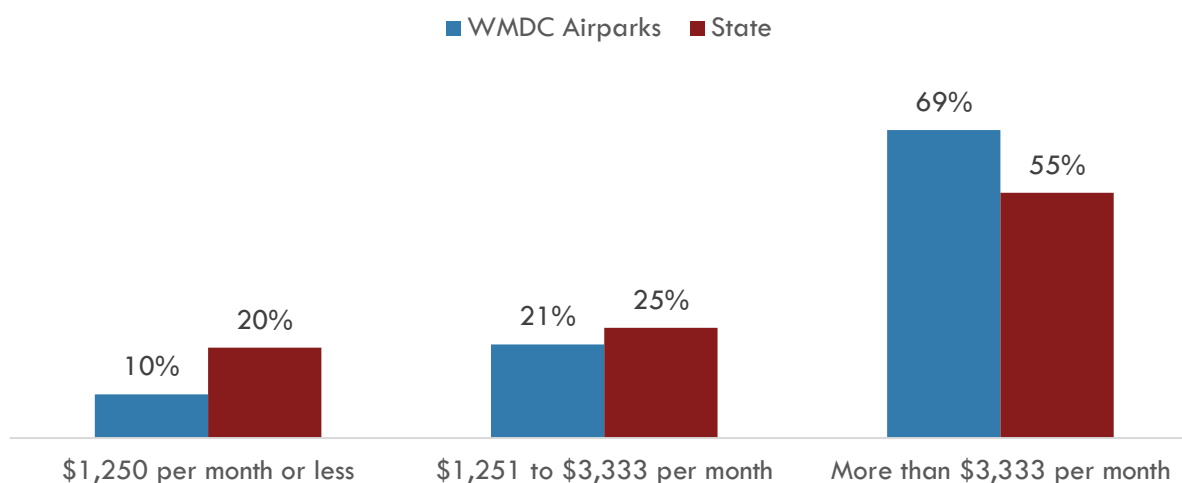


Source: U.S. Census Bureau, OnTheMap

Note: Only for workers aged 29 and older

Firms in the WMDC developed areas are more likely to employ people with a high school degree or less compared to the state average. Overall, most jobs at Westover are held by people with lower educational attainment than the state average. However, a majority of workers have at least some college education.

In a state with very high educational attainment, this suggests that the Westover industrial parks and airport are a good source of jobs for people with less than a four-year degree. High numbers of manufacturing, transportation, and correctional jobs likely drive these opportunities.

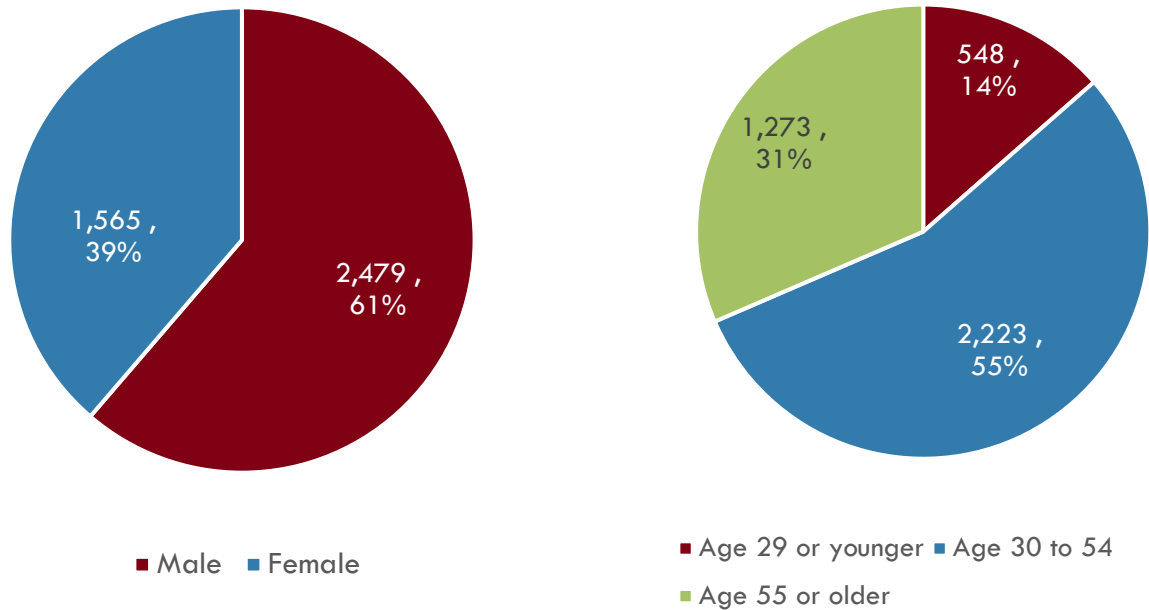
Figure 5: Earnings of WMDC Airpark and Airport Employees versus the State Average

Source: U.S. Census Bureau, OnTheMap, Note: Highest income threshold is equivalent to an annual salary of \$41,223 in 2020 dollars,

Jobs in the Westover airparks and civilian airport generally pay more than the state average. The share of WMDC airpark employees that fall into the top income bracket is much larger than that of the state, suggesting that job opportunities at WMDC industrial parks tend to be more lucrative than others around the Commonwealth, likely due to the particular industries represented there. For example, data from EMSI suggests that in Hampden County, the average salary for jobs in the manufacturing sector was over \$79,000. This is above the statewide nonfamily household median income of \$47,040 in 2020 Dollars. Higher concentrations of workers in high paying fields could help drive higher incomes in the area compared to the state overall. Higher incomes are especially important in light of the fact that WMDC airpark and airport employees tend to have lower educational attainment than the state average, suggesting that WMDC industrial parks and the airport combined provide higher paying jobs without requiring as high a level of education as may be needed elsewhere.

Figure 6: Gender and Age Distribution of WMDC Airpark and Airport Employees

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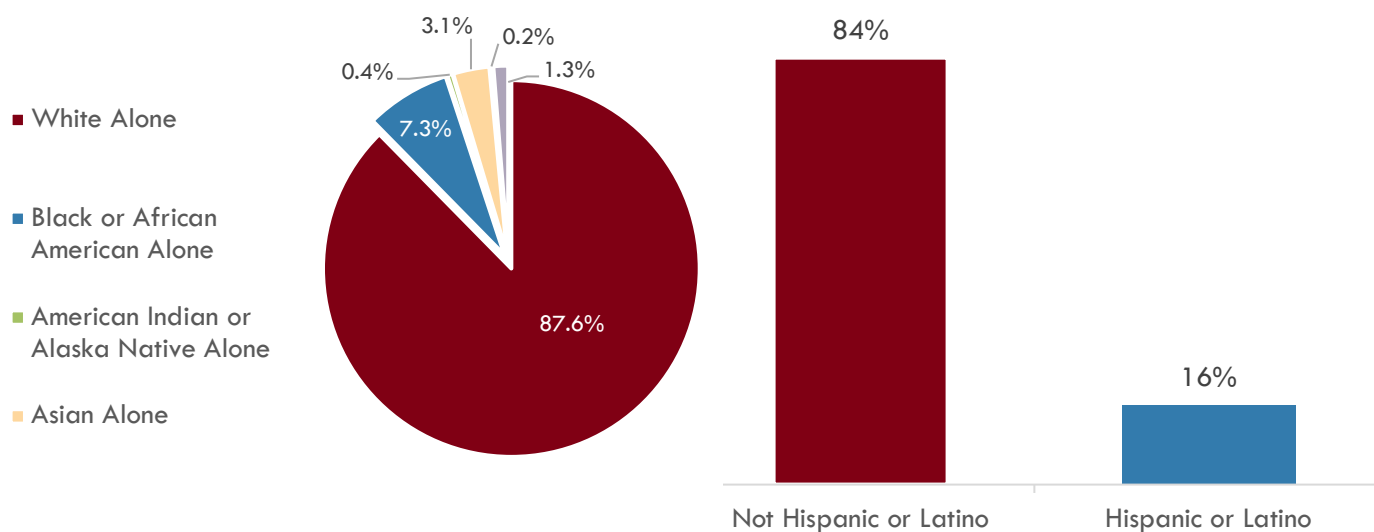


Source: U.S. Census Bureau, OnTheMap

Workers overall across all of the WMDC operations are more likely to be male (61.3%) than the state workforce (48.6%) and younger, with 31.5 percent under 30 compared to 23.3 percent statewide. This is likely due to the industry mix and representation within those industries on site.

Figure Z: Race and Ethnicity Distribution of WMDC Airpark and Airport Employees

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Source: U.S. Census Bureau, OnTheMap

The available demographic data provides information on race separately from information on ethnicity (Hispanic/Non-Hispanic) of workers on site. White workers constitute a larger share of Westover airpark and civilian airport employees than what is typical around the state but are also more likely to be Hispanic, indicative of the region's large Hispanic population. Note that some unknown portion of white workers are also Hispanic, due to race being reported separately from ethnicity. By comparison, the state's racial breakdown of jobs is 82.3 percent white. Statewide 10 percent of employees are of Hispanic ethnicity according to OnTheMap.

Economic Contribution Analysis

Westover Airpark and Civilian Airport Economic Contribution Analysis: Overall Total

This section of the report details results from the economic contribution analysis of all three industrial parks and the civilian airport using an IMPLAN model to track the economic contribution of the on-site activity, the subsequent economic repercussions of workers spending their wages, and the on-site businesses buying materials and equipment. Details about the IMPLAN model used to create these results are provided in **Appendix A**. Results in terms of total economic output and employment are presented for Hampden County as well as the state overall. Note that property taxes paid to Chicopee and Ludlow are not modeled, they were drawn from the tax records of the two respective municipalities. This economic contribution analysis is for all of the WMDC developed areas: all the airparks and the Westover Airport, all together. Note, military employment from the Westover Air Reserve Base is not included in any of the data analyzed.

Table 2: WMDC Airparks and Civilian Airport's Economic Contribution in Hampden County

Hampden County	Direct	Indirect	Induced	Total	Multiplier
Output	\$1.1 Billion	\$295 Million	\$252 Million	\$1.7 Billion	1.5
Employment	3,647	1,577	1,753	6,977	1.9

Source: UMDI Analysis, monetary output is based on employment and expressed in in IMPLAN-projected 2021 inflation-adjusted dollars

Table 2 details results of the economic contribution analysis for all three industrial parks in Hampden County and the civilian airport. Businesses in the industrial parks contribute substantially to the rest of the county, generating employment and revenue in the local region. Each job in the airpark generates an additional 0.9 other jobs in Hampden County, for a total of 6,977 jobs. Similarly, each dollar in direct economic output associated with business activity in the airparks generates an additional \$0.49, for a total output of \$1.7 billion in Hampden County alone.

Table 3: WMDC Airparks and Civilian Airport's Economic Contribution across Massachusetts

Massachusetts	Direct	Indirect	Induced	Total	Multiplier
Output	\$1.2 Billion	\$479 Million	\$475 Million	\$2.2 Billion	1.8
Employment	3,647	2,042	2,749	8,438	2.3

Source: UMDI Analysis, monetary output is based on employment and expressed in IMPLAN-projected 2021 inflation-adjusted dollars

Table 3 details results of the economic contribution analysis for all three industrial parks on the state of Massachusetts. The effect is even stronger than in Hampden County alone, with each job in the airport supporting an additional 1.3 jobs in other parts of the state. Similarly, each dollar in direct economic output associated with business activity in the airports supports an additional \$0.80 in economic output, for a total economic output of \$2.2 billion across the Commonwealth.

Table 4: Local Property Taxes Generated from Airports and Westover Airport

Geography	Airports	Tax Contributions	
		Property (Real Estate) Taxes	Other (Personal Property) Taxes
Chicopee	North and West	\$4,152,645	\$170,189
Ludlow	East and Stony Brook	\$1,874,519	-

Source: Chicopee and Ludlow tax records/WMDC; Estimated Property Taxes for 2021 annualized

Table 4 depicts the personal and property tax revenues generated by businesses at the industrial parks. The tax data provided here is not modeled; it is drawn from the assessors' records of the two respective municipalities. In addition to the jobs and economic output supported by the business activities that take place at the industrial parks, the businesses also provide substantial tax revenue for their respective municipalities, totaling just under \$6.2 million across the three industrial parks and both municipalities. The property tax revenue listed here represents over 15 percent of Chicopee's commercial and industrial tax base and over 35 percent of Ludlow's.³

³ In FY 2021 Chicopee's commercial and industrial tax levy was over \$24 million and Ludlow's over \$4.9 million according to the MA Department of Revenue Division of Local Services Community Comparison Report: Tax Levies & Rates by Class.

Westover Airpark and Civilian Airport Economic Contribution Analysis: Chicopee

This section of the report provides data on the economic contributions of businesses located in Chicopee at Airparks North and West, as well as the Westover Civilian Airport. These results are based on the same IMPLAN model referenced in the above section.

Table 5: Economic Contributions of WMDC Businesses in Chicopee to Hampden County

Chicopee-based Activity/Contribution to Hampden County	Direct	Indirect	Induced	Total	Multiplier
Output	\$665 Million	\$146 Million	\$128 Million	\$939 Million	1.4
Employment	2,187	860	892	3,939	1.8

Source: UMDI analysis; monetary output is based on employment and expressed in IMPLAN-projected 2021 inflation-adjusted dollars

Table 5 details the economic contributions of airparks North and West and the civilian airport on Hampden County. Economic contributions to Hampden County occurring from business activity in Airparks North and West constitute the majority, making up 55 percent of total economic output and 56 percent of total employment. Every dollar of economic output generated by firms in Airparks North and West supports an additional \$0.40 of output, for a total contribution of \$939 million to Hampden County. Similarly, each job in Airparks North and West supports an additional 0.8 jobs, for a total of just under 4,000 jobs.

Table 6: Economic Contributions of WMDC Businesses in Chicopee across Massachusetts

Chicopee-based Activity/Contribution to Massachusetts	Direct	Indirect	Induced	Total	Multiplier
Output	\$783 Million	\$255 Million	\$263 Million	\$1.3 Billion	1.7
Employment	2,187	1,128	1,522	4,837	2.2

Source: UMDI analysis, monetary output is based on employment and is expressed in IMPLAN-projected 2021 inflation-adjusted dollars

Table 6 details the economic contributions of airparks North and West to Massachusetts. In terms of employment, each job in Airparks North and West supports an additional 1.2 jobs around the Commonwealth. In terms of economic output, each dollar of output from Airparks North and West supports an additional \$0.70 in output around the Commonwealth, for a total of \$1.3 billion in economic output.

Westover Airpark Economic Contribution Analysis: Ludlow

This section of the report provides data on the economic contributions of businesses located in Ludlow at Airpark East, which includes the Stony Brook Industrial Area. These results are based on the same IMPLAN model referenced in the above sections.

Table 7: Economic Contributions of WMDC Businesses in Ludlow to Hampden County

Ludlow-based Activity/Contribution to Hampden County	Direct	Indirect	Induced	Total	Multiplier
Output	\$457 Million	\$149 Million	\$124 Million	\$730 Million	1.6
Employment	1,463	717	861	3,041	2.1

Source: UMDI Analysis, monetary output is based on employment and expressed in IMPLAN-projected 2021 inflation-adjusted dollars

Table 7 depicts the economic contributions of Airpark East to Hampden County. In terms of employment, each job at Airpark East supports an additional 1.1 jobs in Hampden County for a total of 3,041 jobs. In terms of economic output, each dollar of output generated by business activity in Airpark East supports and additional \$0.60 in output in Hampden County, for a total of \$730 million in economic output.

Table 8: Economic Contributions of WMDC Businesses in Ludlow across Massachusetts

Ludlow-based Activity/Contribution to Massachusetts	Direct	Indirect	Induced	Total	Multiplier
Output	\$461 Million	\$224 Million	\$212 Million	\$898 Million	1.9
Employment	1,463	915	1,229	3,608	2.5

Source: UMDI Analysis, monetary output is based on employment and expressed in IMPLAN-projected 2021 inflation-adjusted dollars

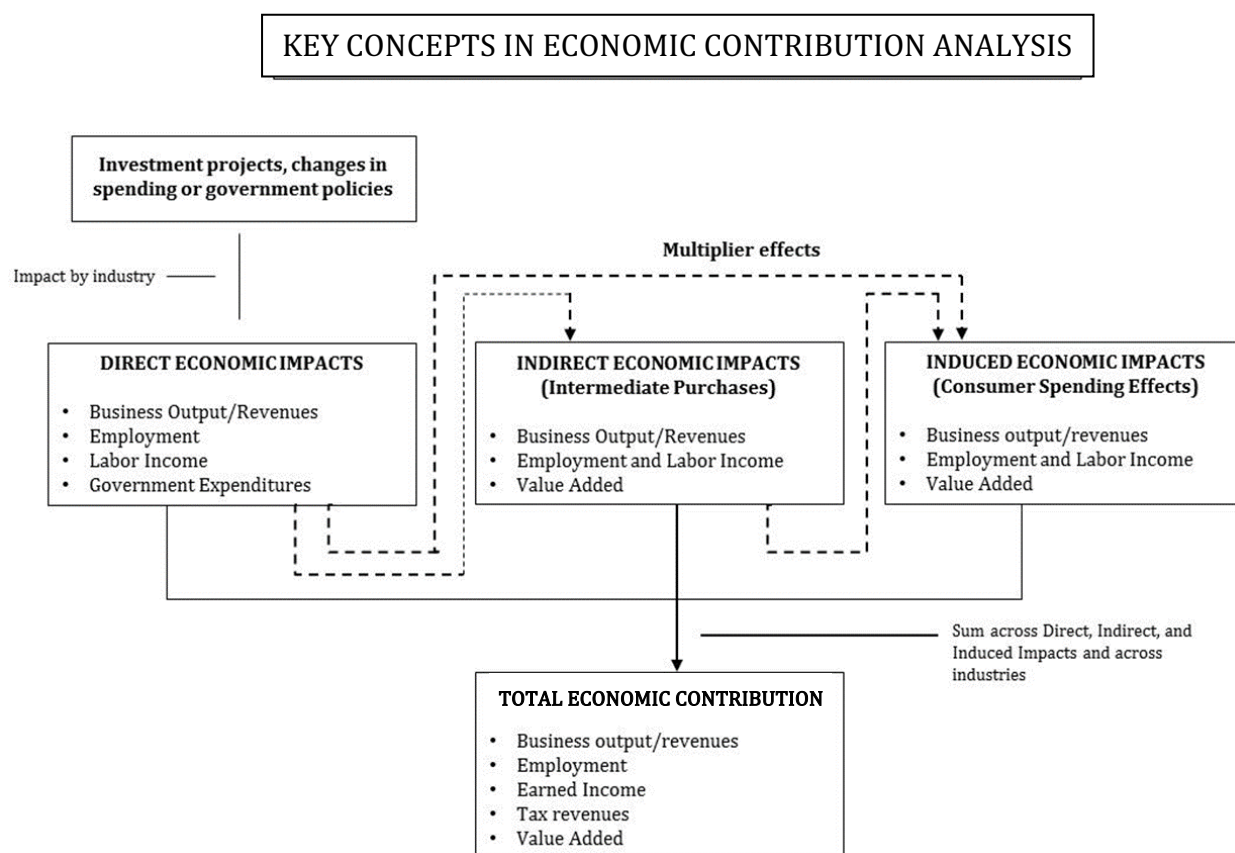
Table 8 depicts the economic contributions of Airpark East to Massachusetts. In terms of employment, each job at Airpark East supports an additional 1.5 jobs around the Commonwealth for a total of 3,608 jobs. In terms of economic output, each dollar of output generated by business activity at Airpark East supports an additional \$0.90 of economic output around the Commonwealth, for a total of \$898 million in economic output.

Appendix A: Economic Contribution Analysis and the IMPLAN Model

Economic Contribution Analysis

In a general sense, the goal of “economic contribution analysis” is to estimate the total contribution of an organization’s (in this instance, businesses operating in WMDC Airparks and the civilian airport) various economic-generating activities to a regional or state economy (e.g., Hampden County, or all of Massachusetts). The basic premise is that an initial investment in one sector of an economy (e.g., in manufacturing) spurs additional economic activity in other sectors as the money is re-spent within the region or state. The total economic contribution of the investment is estimated by tracing the flow and recirculating of money between industries and households until all of the initial investment eventually leaves the region or state through foreign or domestic trade, or is collected as a tax.

Figure 8: Economic Contribution Analysis Explained



The IMPLAN Model

Input-output models, such as the IMPLAN model, examine the flow of money between industries and households in the economy. The UMass Donahue Institute built an input-output model using the IMPLAN Professional 3.0 model building software and data packages. The data used in the model are for 2018, which are the latest available. Model outputs, when expressed in dollars, are reported in IMPLAN-projected 2021 inflation-adjusted dollars.

The IMPLAN modeling system combines the U.S. Bureau of Economic Analysis' Input-Output Benchmarks with regional employment and wage data to construct quantitative models of the flow of goods and services between a region's businesses and households (the final consumers), and estimates direct, indirect and induced effects of investments and ongoing economic activity. From these data, one can examine the effects of a change in one or several economic activities to estimate its effect on a specific state, regional, or local economy. The IMPLAN input-output accounts capture all monetary market transactions for consumption in a given time period. They are also based on industry survey data collected periodically by the U.S. Bureau of Economic Analysis and follow a balanced account format recommended by the United Nations. IMPLAN's proprietary database details economic activity across hundreds of industry sectors, as well as "institutions" such as local, state and federal government and household spending. IMPLAN models reflect the most reliable and up-to-date knowledge about local spending patterns.

The total economic contribution of businesses in WMDC airparks and airport as estimated by the IMPLAN model is the sum of **direct**, **indirect**, and **induced** effects of the employment count in the industrial parks and airport.

- **Direct effects** refer to the number of people employed, either part-time or full-time, at the WMDC Airparks and civilian airport.
- **Indirect effects** are generated by intermediate purchases for goods or services that support the businesses located at the airparks and Westover Airport. Payments made to buy the materials and equipment used in the businesses, to consulting firms for business services, and vendors of construction materials are examples of indirect effects of WMDC businesses' spending on the region and state.
- **Induced effects** occur when income is spent on household-related goods and services. Employee payroll and spending drive the majority of the induced impacts in this analysis.

The IMPLAN software and data package for Massachusetts and Hampden County are used to model the later rounds of local spending that follow. The model is specifically tailored to reflect the expenditure patterns and industry mix of Hampden County and Massachusetts, including information about when expenditures leave the state due to foreign and domestic trade and taxes. Finally, all rounds of spending are added together to produce the total contribution estimate.

This analysis reports on two major types of economic contributions that are estimated by the IMPLAN model, **output** and **employment**.

- **Output** refers to expenditures of the industry and supplier industries to produce the final goods.
- **Employment** refers to all employees required to produce the outputs, including wage and salary employees, full-time and part-time employees, and the self-employed.

A **multiplier** is an index of how many times each dollar is re-spent in the economy of a geographical area and is expressed by a ratio of total outputs or employment to direct outputs or employment. An employment multiplier is an index of how each job in an economy supports related jobs in other industries. An output multiplier of 1.5 could be understood to mean that, out of every one dollar of direct expenditure, 50 cents is re-spent in the local economy.