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The Ohio Bioscience Industry, 2000-2009

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EXECUTIVE SUMMARY

This report summarizes findings from research on the bioscience sector in Ohio and each of the state's six geographic regions. It describes trends in the bioscience sector and each of its five subsectors: *Agricultural Biotechnology, Medical & Testing Laboratories, Medical Device & Equipment Manufacturers, Pharmaceuticals & Therapeutics,* and *Research & Development*. Trends are analyzed between the years 2000 and 2009, highlighting the most recent period, 2008 to 2009. Trends in the bioscience sector are analyzed using four measures: employment, payroll, average wages, and number of establishments.

In addition to industry trends, the study also estimates the economic impact of the commercial bioscience sector in 2009. The economic impact of the bioscience sector and each of its five subsectors is measured for Ohio as a whole and each of the six regions. Economic impact is measured in terms of employment, output, value added, labor income, and taxes.

TRENDS IN BIOSCIENCE IN OHIO

In 2009, the total employment in Ohio's bioscience sector was 62,533, which showed a small decrease of 388 jobs since 2008.[1] Beginning in the year 2000, bioscience employment grew each year until 2008. During the 10-year period studied, bioscience employment increased by 19.5% (10,222 jobs), which represents an average annual percentage change of 2.0%. The overall growth in the bioscience sector is especially promising given that overall employment in Ohio decreased by 465,000 jobs since 2000.

The total payroll for Ohio's bioscience sector in 2009 was $4.3 billion. As with employment, the bioscience payroll showed a decrease between 2008 and 2009, declining by $70 million after adjusting for inflation. Since 2000, the payroll of Ohio's bioscience sector has grown 3.0% on average each year, despite a 1.6% decrease between 2008 and 2009.

The average wage for a job in the bioscience industry in 2009 was $68,384, a slight loss of $697 from 2008. Over the entire study period, average wages have increased by 1.0% on average each year.

The number of bioscience establishments has continued to grow each year between 2000 and 2009. In 2009, 1,800 bioscience establishments existed, an increase from 1,738 establishments in 2008. Since 2000, the number of bioscience establishments has increased 3.8% on average each year.

[1] The figures in this report are higher than those in the February 2010 report. A detailed analysis of how the data were created can be found on page 6. Because of the addition of new companies in this report that existed throughout the entire length of the study period, comparisons between this report and the previous one are not valid.

The shares of the bioscience sector in Ohio in terms of employment, payroll, and establishments are higher than those for the United States. Bioscience represents 1.3% of total employment in the state of Ohio and 1.1% of total employment nationwide, and for payroll the shares in Ohio and the United States are 2.1% and 2.0%, respectively; finally, the share of bioscience establishments in Ohio is 0.7% and the share in the United States is only 0.5%.

BIOSCIENCE IN THE FIVE SUBSECTORS

This report divides the bioscience sector into five subsectors: *Agricultural Biotechnology*, *Medical & Testing Laboratories*, *Medical Device & Equipment Manufacturers*, *Pharmaceuticals & Therapeutics*, and *Research & Development*. In 2009, the largest subsector in terms of employment was *Medical Device & Equipment Manufacturers* with 22,047 employees. This represents 35.3% of all bioscience employment in the state. All subsectors grew between 2000 and 2009, but the *Medical & Testing Laboratories* subsector grew at the highest rate (5.1% on average annually). Two subsectors, *Agricultural Biotechnology* and *Pharmaceuticals & Therapeutics,* saw losses in employment between 2008 and 2009 although they grew over the entire period studied.

The subsector with the largest payroll in 2009 was *Medical Device & Equipment Manufacturers* ($1.4 billion). The *Medical & Testing Laboratories* and *Research & Development* subsectors saw the most growth between 2000 and 2009 as they both grew 5.9% on average each year. Although all subsectors grew between 2000 and 2009 in terms of payroll, the same two subsectors that saw a decrease in employment between 2008 and 2009 also declined in terms of payroll; payroll in *Agricultural Biotechnology* and *Pharmaceuticals & Therapeutics* declined 3.4% and 19.2%, respectively.

The *Research & Development* subsector paid the highest average wage in 2009 ($81,105), followed closely by the *Agricultural Biotechnology* subsector ($80,983). The lowest average wage was in *Medical & Testing Laboratories* ($46,742). All subsectors except *Pharmaceuticals & Therapeutics* saw an increase between 2000 and 2009 in average wages after adjusting for inflation. This subsector also saw the largest drop in average wage between 2008 and 2009 (10.3%). The *Medical Device & Equipment Manufacturers* subsector showed the largest increase over the entire study period by growing 1.8% on average each year.

Between 2000 and 2009, the number of establishments increased in all subsectors. Despite the recession, all other subsectors gained establishments over the past year with *Medical & Testing Laboratories* showing the largest increase (25). Only one subsector, *Medical Device & Equipment Manufacturers*, slightly lost establishments between 2008 and 2009 (-3).

BIOSCIENCE IN OHIO'S SIX REGIONS

Bioscience employment in 2009 was highest in the Northeast region, which includes the greater Cleveland area (a description of the regions is located on page 2). The Northeast region represents 34.3% (21,427 jobs) of total bioscience employment in Ohio. The Southwest region, which includes Cincinnati, was the next largest region of total bioscience employment with 23.7% (14,790 jobs) followed by the Central region (Columbus and its surrounding areas) with 23.2% (14,493 jobs). The total bioscience employment in these three regions is 81.2% and is split relatively evenly between the three largest metropolitan areas in the state. The Southeast region is the smallest bioscience employment region (2.7%). Bioscience employment grew in all regions between 2000 and 2009. Between 2000 and 2009, the West Central region grew at the fastest rate of 3.9% on average each year. During the past year, between 2008 and 2009, employment declined in three regions: Central (-4.8%), Northwest (-1.5%), and Northeast (-1.3%).

The Northeast region of Ohio, which had the largest bioscience employment in the state, also had the largest payroll in 2009 ($1.4 billion), which represented 33.8% of the total bioscience payroll in the state. The Southwest and Central regions also had payrolls over $1 billion in 2009. While every region gained in payroll between 2000 and 2009 after adjusting for inflation, the Central and West Central regions both grew at the fastest rate (5.0% on average annually). Only the Southeast and West Central regions saw increases in payroll between 2008 and 2009.

The Southwest region paid the highest average wage ($77,283) in the bioscience sector in 2009. The lowest average wage was in the Northwest region ($44,316). Over the entire study period, all regions saw increases in average wages after adjusting for inflation. The Southeast region gained the most with an increase of 1.4% on average each year. Between 2008 and 2009, only two regions experienced gains in average wages: West Central (1.0%) and Northeast (0.6%).

In addition to the largest employment and payroll, the Northeast region also had the most bioscience establishments in Ohio in 2009 with 714, or 39.7% of the total in the state. The Southwest and Central regions both had over 16% of the state's total bioscience establishments. Every region grew in number of establishments between 2000 and 2009 as well as between 2008 and 2009. The largest growth between 2008 and 2009 was in the West Central region, which saw a 6.2% increase in establishments.

ECONOMIC IMPACT OF THE BIOSCIENCE SECTOR

The total economic impact of Ohio's bioscience sector in 2009, including direct, indirect, and induced impacts, was:

- Employment impact 195,835 jobs
- Output impact $61.642 billion

- Value-added impact $15.208 billion
- Labor income impact $7.691 billion
- Tax revenues $3.242 billion

The *Agricultural Biotechnology* subsector had the largest impact (direct, indirect, and induced) in all five measures of impact: employment (65,197 jobs), output ($30.2 billion), value added ($5.6 billion), labor income ($2.8 billion), and tax ($1.3 billion).[2] The *Pharmaceuticals & Therapeutics* subsector was the second- highest subsector and the *Medical Device & Equipment Manufacturers* subsector was third highest in all measures. The subsector with the smallest impact in Ohio was *Medical & Testing Laboratories*.

The Northeast region had the largest impact in terms of all five measures in 2009, a reasonable conclusion since it is the largest in terms of overall employment, payroll, and number of establishments. The Southwest region ranked second and the Central region ranked third. Rankings for the remaining regions in order of size of impact were fourth for the West Central, fifth for the Northwest, and sixth for the Southeast region.

[2] Although *Agricultural Biotechnology* has the largest economic impact, the largest subsector in terms of direct employment is *Medical Device & Equipment Manufacturers*. The *Agricultural Biotechnology* subsector has the largest economic impact because the industries included in this subsector have relatively large multipliers, especially in the indirect portion.

INTRODUCTION

This report summarizes findings from research on the bioscience sector in Ohio and the state's six geographic regions. The study was conducted by the Center for Economic Development at Cleveland State University for BioOhio, a statewide advocacy and economic development group for bioscience in Ohio. The mission of BioOhio is "to accelerate bioscience discovery, innovation, and commercialization of global value, driving economic growth and improved quality of life in Ohio."[3] This research supports the *Ohio Bioscience Growth* report, released annually by BioOhio. This is the second study conducted for BioOhio by the Center for Economic Development.

This report describes trends in the bioscience sector and each of its five subsectors: *Agricultural Biotechnology, Medical & Testing Laboratories, Medical Device & Equipment Manufacturers, Pharmaceuticals & Therapeutics*, and *Research & Development*.[4] Trends are analyzed for the years 2000 to 2009, which captures the current recession. Trends in the bioscience sector are analyzed using four measures: employment, payroll, average wages, and number of establishments.

In addition to the industry trends, this study also estimates the economic impact of Ohio's bioscience sector in 2009. Economic impact is measured in terms of employment, output, value added, labor income, and taxes. The economic impact of the bioscience sector and each of its five subsectors is measured for Ohio and each of the six geographic regions.

This report consists of six sections. The first includes the executive summary and this introduction. The second section explains the methodology for creating the database of bioscience companies in Ohio and defines the six Ohio regions by county and the five bioscience subsectors by industry. Finally, this second section outlines the methodology underlying the trend and impact analyses. The third section analyzes trends in Ohio's bioscience sector and each of its subsectors from 2000 to 2009; this third section also includes an analysis of the share of bioscience in the total economy. The fourth section analyzes trends in the bioscience sector in each of Ohio's six geographic regions. The fifth section focuses on the economic impact analysis. The analysis includes the impact of the entire bioscience sector and its subsectors on both Ohio's six regions and the state as a whole. The sixth section contains concluding comments.

[3] http://bioohio.com/about/ as of December 17, 2010

[4] While the first study divided the bioscience sector into six subsectors, this study reclassified the bioscience sector into five subsectors. See more in the report's methodology section.

METHODOLOGY

THE SIX OHIO REGIONS

This study analyzes the bioscience industry in Ohio and the six geographic regions within the state (Figure 1). The regions were defined for the Entrepreneurial Signature Program of the Ohio Department of Development.

The Central region centers on Columbus and is comprised of 15 counties: Delaware, Fairfield, Fayette, Franklin, Hocking, Knox, Licking, Logan, Madison, Marion, Morrow, Perry, Pickaway, Ross, and Union. This region includes the entire Columbus Metropolitan Statistical Area (MSA).

The Northeast region includes 21 counties in the greater Cleveland area: Ashland, Ashtabula, Carroll, Columbiana, Crawford, Cuyahoga, Erie, Geauga, Holmes, Huron, Lake, Lorain, Mahoning, Medina, Portage, Richland, Stark, Summit, Trumbull, Tuscarawas, and Wayne. It includes six metropolitan areas: the Cleveland-Elyria-Mentor MSA, the Akron MSA, the Youngstown-Warren-Boardman MSA (Ohio counties only), the Canton-Massillon MSA, the Mansfield MSA, and the Sandusky MSA.

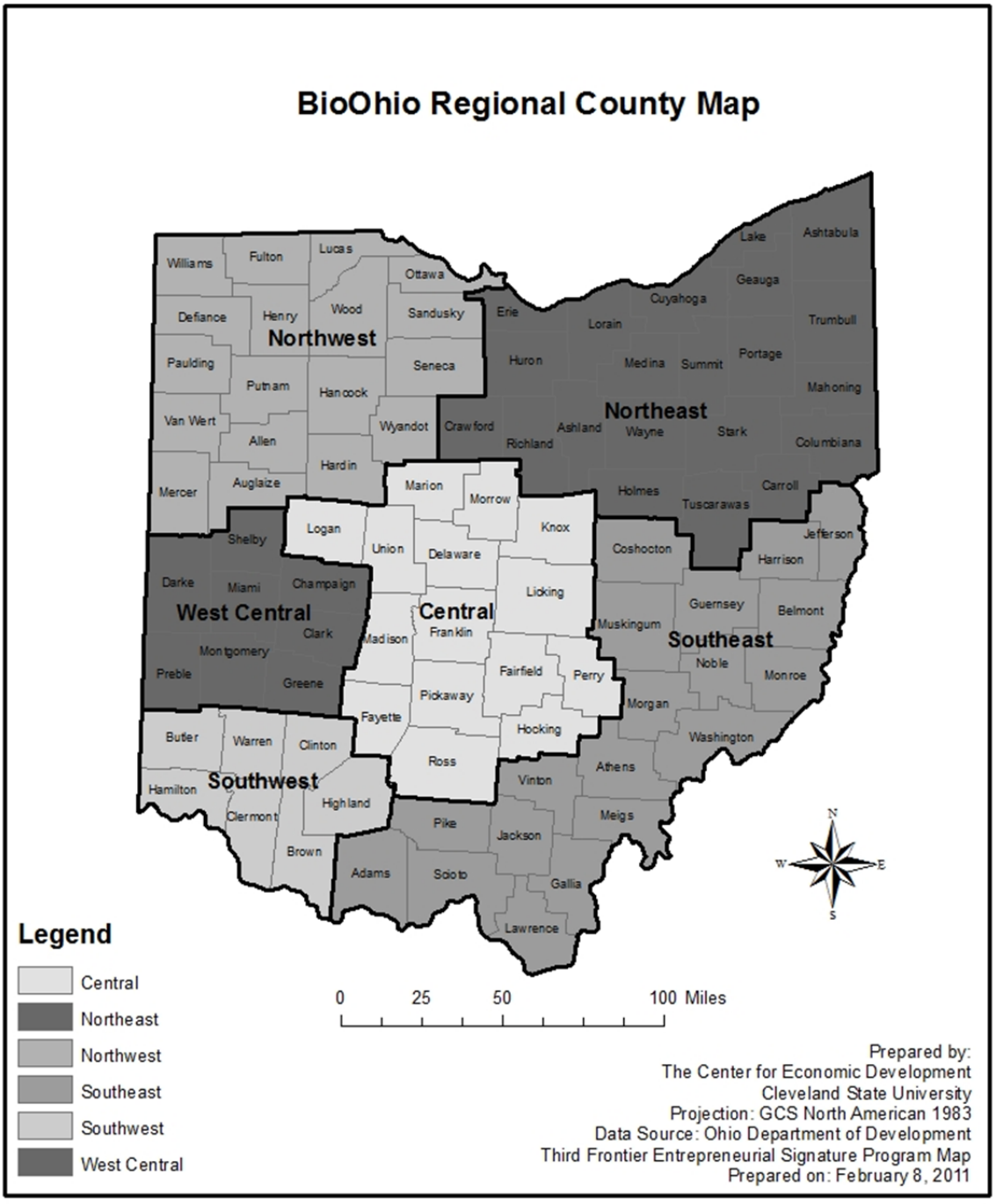
The Northwest region is home to the cities of Toledo, Bowling Green, Findlay, and Lima. It contains 18 counties: Allen, Auglaize, Defiance, Fulton, Hancock, Hardin, Henry, Lucas, Mercer, Ottawa, Paulding, Putnam, Sandusky, Seneca, Van Wert, Williams, Wood, and Wyandot. This region includes the Toledo MSA and the Lima MSA.

The Southeast region includes the cities of Marietta, Athens, Portsmouth, and Zanesville. It contains 19 counties: Adams, Athens, Belmont, Coshocton, Gallia, Guernsey, Harrison, Jackson, Jefferson, Lawrence, Meigs, Monroe, Morgan, Muskingum, Noble, Pike, Scioto, Vinton, and Washington. This region contains one Ohio county of the Weirton-Steubenville MSA, as well as one Ohio county in each of three West Virginia MSAs: Wheeling, Huntington-Ashland, and Parkersburg-Marietta-Vienna.

The Southwest region includes the greater Cincinnati area and consists of seven counties: Brown, Butler, Clermont, Clinton, Hamilton, Highland, and Warren. It includes the five Ohio counties in the Cincinnati-Middletown MSA.

The West Central region includes the cities of Dayton, Springfield, Troy, and Xenia. It encompasses eight counties: Champaign, Clark, Darke, Greene, Miami, Montgomery, Preble, and Shelby. This region includes the Dayton MSA and the Springfield MSA.

Figure 1: Map of BioOhio Regions



THE FIVE BIOSCIENCE SUBSECTORS

This study uses five subsectors to define Ohio's bioscience sector. These subsectors include: *Agricultural Biotechnology*, *Medical & Testing Laboratories, Medical Device & Equipment Manufacturers*, *Pharmaceuticals & Therapeutics*, and *Research & Development*.[5] This definition is based on the sectors that are outlined in the *Battelle/BIO State Bioscience Initiatives 2010* report.[6] This study reclassifies the industries included in the bioscience sector based on conversations between BioOhio and the Center for Economic Development. The definition of the bioscience sector is outlined in Table 1.

This report utilizes the "Bioscience Subsector Industries" outlined in the *Battelle/BIO State Bioscience Initiatives 2010* report with a few adjustments to the definitions of the subsectors. First, NAICS code 339111, *Medical Equipment and Supplies Manufacturing*, is included here despite its exclusion both as a 2007 NAICS code and from the Battelle/BIO report. It is incorporated in this report as part of the 10-year trend analysis to capture companies categorized by the Center for Economic Development with 339111 as a secondary NAICS code. Third, NAICS code 333314, *Optical Instrument and Lens Manufacturing*, is considered here to be a part of the *Medical Device & Equipment Manufacturers* subsector. This NAICS code is not contained in the Battelle/BIO analysis. Fourth, NAICS code 339116, *Dental Laboratories*, has been relocated from the *Testing Laboratories* subsector to the *Medical Device & Equipment Manufacturers* subsector. Finally, the names of each subsector in this report are slightly different from those used by Battelle/BIO.

[5] The 2009 report for BioOhio included six subsectors, which resulted from the *Testing Laboratories* and *Medical Laboratories & Diagnostic Imaging Centers* subsectors being classified separately.
[6] http://www.bio.org/local/battelle2010/Battelle_Report_2010.pdf

Table 1: NAICS Codes associated with each Subsector of the Bioscience Industry

Agricultural Biotechnology	
311221	Wet Corn Milling
311222	Soybean Processing
311223	Other Oilseed Processing
325193	Ethyl Alcohol Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325221	Cellulosic Organic Fiber Manufacturing
325311	Nitrogenous Fertilizer Manufacturing
325312	Phosphatic Fertilizer Manufacturing
325314	Fertilizer (Mixing Only) Manufacturing
325320	Pesticide and Other Agricultural Chemical Manufacturing
Medical & Testing Laboratories	
541380*	Testing Laboratories
621511	Medical Laboratories
621512	Diagnostic Imaging Centers
Medical Device & Equipment Manufacturers	
333314	Optical instrument & lens manufacturing
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
334516	Analytical Laboratory Instrument Manufacturing
334517	Irradiation Apparatus Manufacturing
339111	Medical Equipment and Supplies Manufacturing
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339114	Dental Equipment and Supplies Manufacturing
339115	Ophthalmic Goods Manufacturing
339116	Dental Laboratories
Pharmaceuticals & Therapeutics	
325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325413	In-Vitro Diagnostic Substance Manufacturing
325414	Biological Product (except Diagnostic) Manufacturing
Research & Development	
541711	Research and Development in Biotechnology
541712**	Research & Development in the Physical, Engineering, & Life Sciences

* The NAICS code 541380 "Testing Laboratories" includes some firms that are not bioscience companies. The Center for Economic Development examined each firm in this NAICS code with over 50 employees to determine if they are associated with bioscience. For establishments with less than 50 employees, the Center used the following ratios to capture bioscience testing laboratories: Establishments share = 8.38%; Employment & Wages share = 3.99%. These ratios resulted from the Battelle report "Technology, Talent and Capital: State Bioscience Initiatives, 2008."

** The NAICS code 541712 "Research & Development in the Physical, Engineering, & Life Sciences" includes some firms that are not bioscience companies. The Center for Economic Development examined each firm in this NAICS code with over 50 employees to determine if they are associated with bioscience. For establishments with less than 50 employees, the Center used the following ratios to capture the life sciences: Establishments share = 41.72%; Employment share: 30.31%; Wages share = 27.01%. These ratios are based on the U.S. Census Bureau 2007 Economic Census.

CREATING THE BIOSCIENCE DATA SET

To conduct the trend analysis and estimate the economic impact of Ohio's bioscience sector, a data set of bioscience companies in Ohio was created using two sources: a comprehensive list received from BioOhio and the Quarterly Census of Employment and Wages (QCEW) database. The list from BioOhio was received in September 2010 and included 1,952 establishments identified by BioOhio as participating in Ohio's bioscience industry.

The QCEW (also known as the ES202 data) is managed, maintained, and edited by the Center for Economic Development at Cleveland State University's Levin College of Urban Affairs ("Center"). The Center receives quarterly updates of this data from the Ohio Department of Jobs and Family Services. The QCEW includes information such as company name, address, city, county, industry classification code (NAICS), employment, and wages on most establishments with paid employees (by site location) in Ohio. It includes data for the years 2000 through 2009 that is aggregated by industry and region. Although the database includes company level information, due to confidentiality restrictions only industry level data can be reported. Moreover, information for some industries, primarily small industries in small geographic areas, is suppressed.

Using the two aforementioned data sources, the Center created a data set of bioscience in Ohio for use in this study. The data set was assembled using the following steps; we

- Included all companies in the QCEW database possessing a bioscience NAICS code (Table 1). Companies and establishments were included even if they were not on the list received from BioOhio.

- Assigned an industry code (NAICS) to every company on the list from BioOhio using as many as three sources: QCEW database, Hoover's database, and LexisNexis database. The BioOhio list was then organized into four categories:

    - Companies with a bioscience NAICS code in the QCEW database were automatically included in the bioscience data set (as noted above).
    - Companies not included in the QCEW database were not included in the bioscience data set.
    - Companies with a bioscience NAICS code in one or more of the other sources (Hoover's and LexisNexis) were added to the bioscience data set.
        - A secondary bioscience NAICS code was assigned to companies in the QCEW database in cases where their primary NAICS code was non-bioscience. These companies were included in BioOhio's list and assigned a bioscience NAICS by at least one source.
    - Companies to which none of the sources assigned a bioscience NAICS code were not included in the bioscience data set.

- Examined individual companies with over 50 employees that are assigned one of two bioscience NAICS codes in the QCEW database: *Research & Development in the Physical, Engineering, & Life Sciences* (541712) or *Testing Laboratories* (541380). As these two NAICS codes include some non-bioscience establishments, this step was done to ensure that each firm included in the data set is working in the bioscience sector.

- Examined companies with NAICS codes 541712 and 541380 with less than 50 employees and applied ratios to approximate the number of establishments, employment, and wages that are part of the bioscience sector.

- Reviewed a second list of 396 bioscience companies received from BioOhio in December 2010. Although some of these companies are new, some have also been in business but have newly been identified by BioOhio as working in the bioscience industry. These companies were not coded with a bioscience NAICS code in either Hoover's or LexisNexis, but were deemed by BioOhio to be important companies to include. This list was split into three groups:

    - Companies assigned a bioscience NAICS code in the QCEW database that were already included in the data set.
    - Companies not found in the QCEW database and not included in the data set.
    - Companies not assigned a bioscience NAICS code in the QCEW database, Hoover's, or LexisNexis.
        - For these 93 companies, an in-depth examination of each company was conducted. From this list, 81 companies were assigned a secondary bioscience NAICS code in the QCEW database and added to the data set.

- Assembled the bioscience data set including companies that had a primary bioscience NAICS code in the QCEW database, companies from the first BioOhio list identified with a bioscience NAICS code by at least one other source, and selected companies found in the QCEW database with a non-bioscience NAICS code and included in the second list of key bioscience companies provided by BioOhio.

In summary, the Center for Economic Development created a data set for bioscience based on confidential data from the QCEW database for years 2000 through 2009. The data set includes (1) all companies assigned a bioscience NAICS code in the QCEW database, (2) companies included in the first list from BioOhio that were assigned a non-bioscience NAICS code in the QCEW database but identified as a bioscience company by one of the other sources used, and (3) companies included in the second list provided by BioOhio and added specifically because they are known bioscience companies. Employment and wage data on these companies include all the workers at each business identified, regardless of their occupation. Because of confidentiality restrictions, data about individual companies cannot be reported, but industry trends can be described. Also due to confidentiality restrictions, detailed industry information for some smaller subsectors located in smaller regions is suppressed.

TREND ANALYSIS

The objective of this study is to examine the economic performance of the bioscience industry in Ohio. Trends in Ohio's six geographic regions from 2000 to 2009 are compared to trends in Ohio and the United States, detailing two time periods: 2000 to 2008 and 2008 to 2009.

Three measures of economic activity are being used for the trend analysis: employment, payroll, and number of establishments. Analysis of employment trends provides information on local jobs without differentiation between part-time and full-time employment or among low-skill, low-paying jobs and high-skill, high-paying jobs. Analysis of payroll (wage) trends describes the scale of the bioscience sector in different economies. Although payroll does not measure gross regional product, it can be viewed as a proxy for value-added output. The number of establishments counts the individual locations of businesses and captures the different functionalities that firms have at different sites.

Additionally, two other variables are included. Average wage is calculated as payroll per employee and estimates the annual average wage in each industry and region. The average number of employees per establishment is calculated as the total employment divided by the number of establishments and shows the average size of bioscience firms.

ECONOMIC IMPACT

The second part of the analysis of the bioscience industry in Ohio is its economic impact. This analysis uses IMPLAN Professional and IMPLAN Data Files. IMPLAN Professional® 3.0 is an economic impact assessment software system. The IMPLAN Data Files allow for the creation of sophisticated models of local economies in order to estimate a wide range of economic impacts.

Economic impact estimates will be provided for total employment impact (direct, indirect, and induced employment impact); total output impact (direct, indirect, and induced output impact); total value added impact (direct, indirect, and induced output impact); total labor income (household earnings) impact (direct, indirect, and induced income impact); and tax impact (federal, state, and local taxes).

The first four impact measures contain three distinct components. *Direct impact* refers to the initial value of goods and services, including labor, purchased by the bioscience industry within a defined economic region. These purchases are sometimes referred to as the "first-round effect." *Indirect impact* measures the value of labor, capital, and other inputs of production needed to produce the goods and services required by the bioscience industry (second-round and additional-round effects). *Induced impact* measures the change in spending by local households due to increased earnings by employees working in local industries that produce goods and services for the bioscience industry and its suppliers.

BIOSCIENCE SECTOR IN OHIO

TRENDS IN OHIO'S BIOSCIENCE SECTOR

Total employment in Ohio's bioscience sector in 2009 was 62,533 (Figure 2). Employment, which had increased continuously between 2000 and 2008, decreased in 2009 by 388 jobs. The losses seen in the bioscience sector, however, were less severe than the overall losses throughout the state (Figure 3). The bioscience sector lost 0.6% of its employment between 2008 and 2009 while total employment in the state decreased by 4.6%. The bioscience sector still saw growth over the entire study period, adding 10,222 jobs since the year 2000 and growing 19.5%. The state lost 8.6% of its total employment during the same time period.

Figure 2: Bioscience Employment in Ohio, 2000-2009

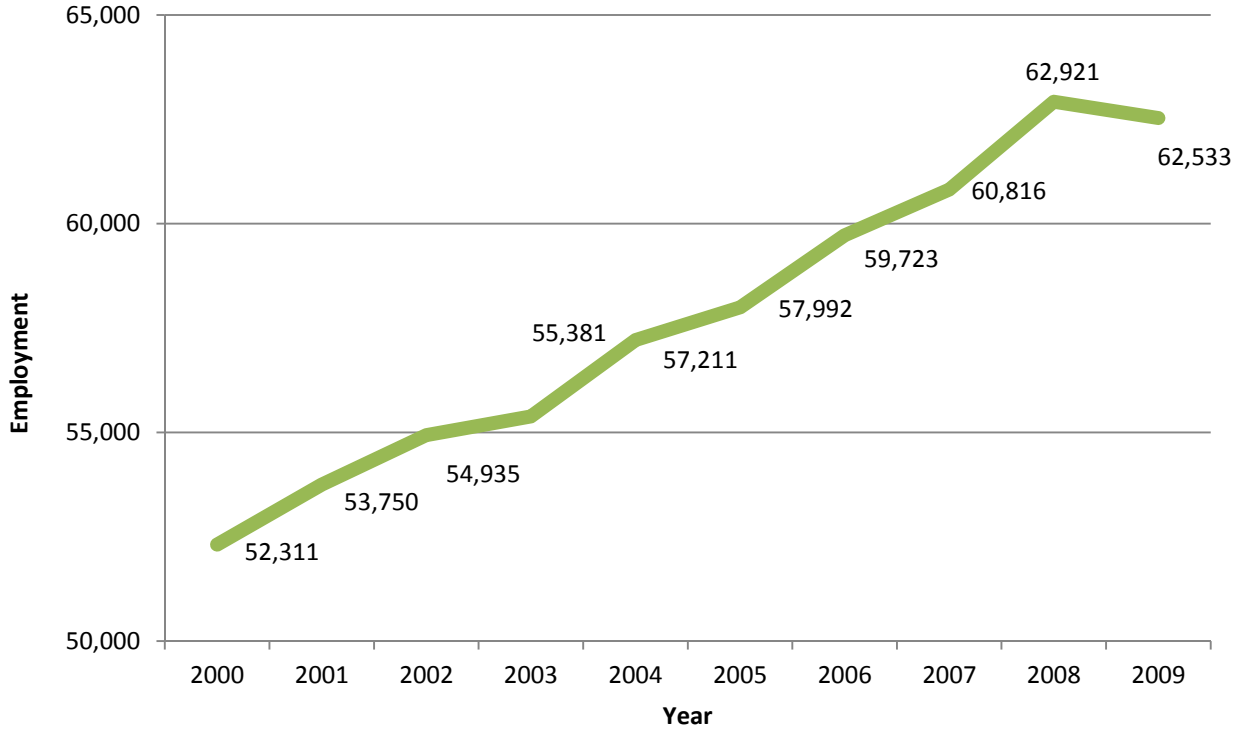
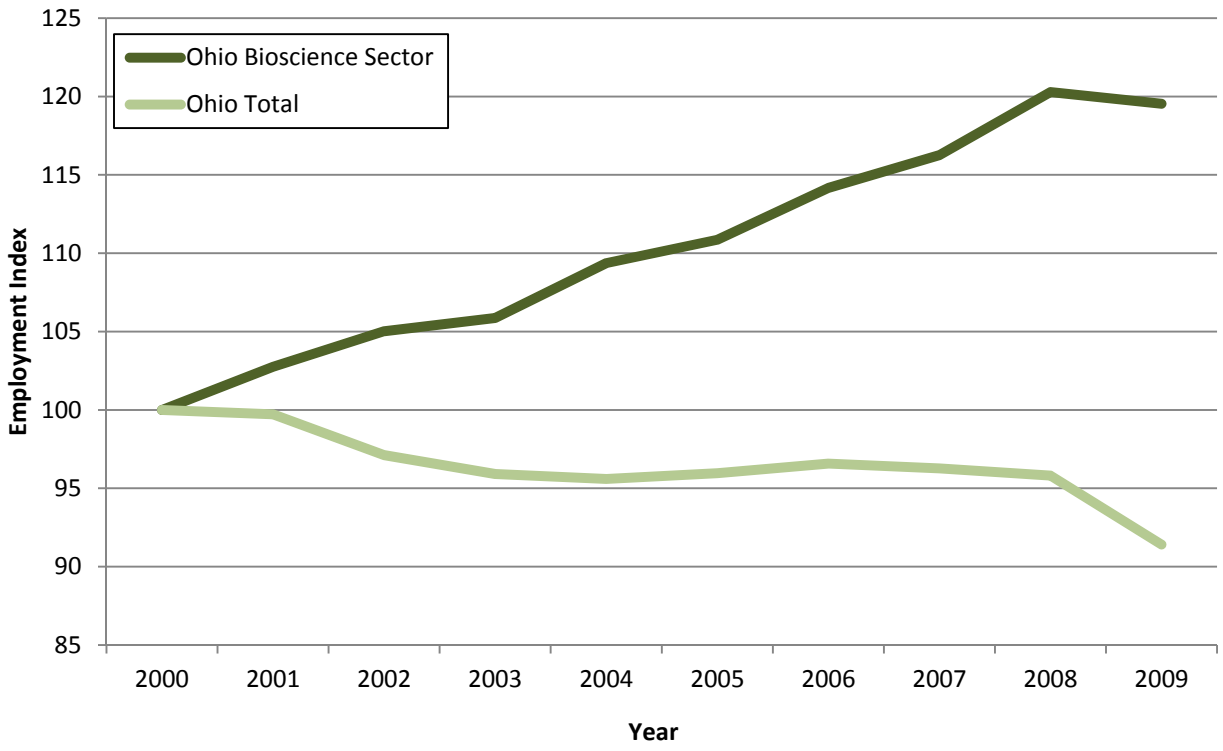


Figure 3: Bioscience Employment and Total Employment in Ohio, 2000-2009
(2000 = 100)[7]



The bioscience sector in Ohio had a payroll of $4.3 billion in 2009. Payroll decreased by $70 million (1.6%) from 2008 to 2009, mirroring the loss in employment. Despite this loss, however, payroll in the bioscience industry has increased over $1 billion (3.0% on average per year) since 2000, after inflating to 2009 dollar values.

Bioscience sector jobs paid an average wage of $68,384 in 2009. This is the average wage for all industries and occupations included in this sector, not solely for scientists and executives; therefore, it includes all staff which supports the industry within bioscience companies. The average wage in the bioscience sector rose from $62,426 in 2000 after adjustment for inflation. The average wage for bioscience industries in 2009 was 67% higher than the average wage for all industries in Ohio ($41,052).

The bioscience sector is relatively small compared to other sectors. In 2009, 1,800 bioscience establishments existed, which represents 1,345 unique companies. Despite losses in bioscience employment and payroll, the number of establishments increased by 62 between 2008 and 2009. The sector saw an increase of 510 establishments since 2000. A detailed summary of the bioscience sector in Ohio is located in Appendix Table A1.

[7] The use of an index here allows for the comparison of the change in the Ohio Bioscience sector with the total employment in Ohio over time.

SHARES OF THE BIOSCIENCE INDUSTRY IN OHIO

The bioscience sector in Ohio can be measured against all industries in Ohio and the United States, as well as in comparison to the national bioscience sector.

The Role of Bioscience in Ohio's Economy

The bioscience shares of Ohio's economy are slightly higher than bioscience shares nationally (Table 2). Bioscience employment in Ohio has grown by 2.0% on average each year since 2000. Conversely, total employment in all sectors of Ohio has declined 1.0% on average each year. As a result, the share of bioscience employment in Ohio's total employment increased slightly from 1.0% in 2000 to 1.3% in 2009; the share of bioscience employment nationally was 1.1%. The share of bioscience payroll in Ohio's total payroll increased from 1.5% in 2000 to 2.1% in 2009, and it was slightly higher than the U.S. share of 2.0%. From 2000 to 2009 the share of bioscience establishments in Ohio grew slightly from 0.5% to 0.7%; the national share of 0.5% remained stable over the period. Although these shares are small, by 2009 the bioscience sector was playing a more dominant role in Ohio's economy than in the national economy, a comparison evidenced by higher bioscience shares in Ohio than in the United States.

Table 2: Share of Ohio Bioscience Sector in the Total Ohio and U.S. Economies, 2009

	OH	US
Employment	1.3%	1.1%
Payroll	2.1%	2.0%
Establishments	0.7%	0.5%

Ohio Bioscience in Comparison to U.S. Bioscience

In the year 2000, the bioscience employment share and bioscience establishments share were the same for Ohio and the United States. Also in 2000, a higher share of payroll existed in the United States than in Ohio.

The shares of the bioscience sector in Ohio and the United States show that the bioscience sector is now more concentrated in the state relative to the nation. Moreover, its relative employment concentration, measured by location quotients[8], has increased from 0.98 in 2000 (lower concentration of bioscience employment in Ohio than nationally) to 1.18 in 2009 (higher concentration than nationally).

[8] A location quotient is an economic base analysis tool that compares the local economy to the national economy to determine the relative specialization of the industry (bioscience) in the local economy.

Between 2000 and 2008 Ohio's percentage share of national bioscience industries grew (Table 3). Although the percentage decreased in 2009, 4.5% of total employment in the bioscience industry nationwide was located in the state of Ohio, which shows overall growth since 2000.

Table 3: Ohio Bioscience as Shares of Bioscience in the U.S.: 2000, 2008, & 2009

	2000	2008	2009
Employment	4.16%	4.56%	4.53%
Payroll	3.50%	3.86%	3.56%
Establishments	3.56%	3.91%	3.91%

Ohio's share of payroll was 3.6% of the national bioscience sector in 2009. As with employment, this percentage decreased between 2008 and 2009; however, a small increase is still seen in the overall study period.

Ohio's share of establishments in the national bioscience sector grew between 2000 and 2008 to a high point of 3.9%. The share of establishments remained constant between 2008 and 2009.

BIOSCIENCE IN OHIO BY SUBSECTOR

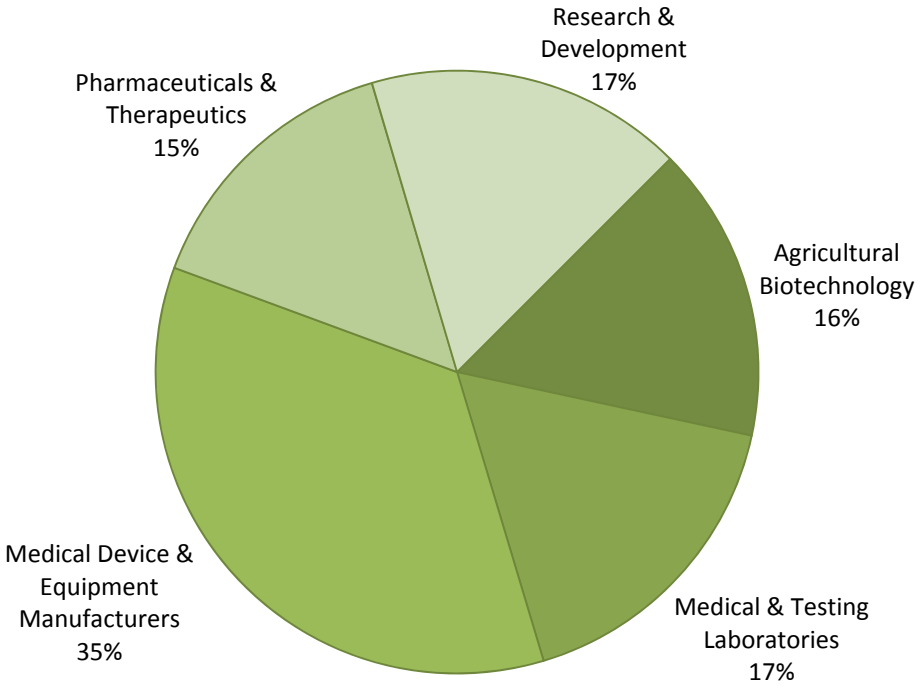
Employment

The bioscience subsector with the largest employment figure in 2009 was *Medical Device & Equipment Manufacturers* with 35% (22,047 employees) of the total bioscience employment. The next subsectors with the largest employment figures were *Research & Development* (10,668 employees) and *Medical & Testing Laboratories* (10,619 employees), each with 17% (Table 4 and Figure 4).

Table 4: Bioscience Employment in Ohio by Subsector, 2000-2009

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	9,837	9,857	9,820	9,881	9,788	9,189	9,372	9,520	10,029	9,933
Medical & Testing Laboratories	6,788	7,236	7,758	7,997	9,357	9,476	9,979	10,475	10,484	10,619
Medical Device & Equipment Manufacturers	21,282	21,893	22,082	21,338	21,414	21,732	21,685	21,712	22,011	22,047
Pharmaceuticals & Therapeutics	6,704	7,003	7,135	7,848	8,301	8,853	9,409	9,531	10,292	9,265
Research & Development	7,699	7,762	8,140	8,317	8,351	8,742	9,278	9,578	10,105	10,668
Total Bioscience in Ohio	52,311	53,750	54,935	55,381	57,211	57,992	59,723	60,816	62,921	62,533

Figure 4: Bioscience Sector Employment in Ohio by Subsector, 2009



The largest subsector, *Medical Device & Equipment Manufacturers*, gained 765 jobs between 2000 and 2009. Furthermore, despite the recession, the subsector gained 36 of those jobs between 2008 and 2009 (Table 5). Each subsector gained employment overall between 2000 and 2009 with the largest gains in *Medical & Testing Laboratories* (3,831 jobs). Two subsectors, *Agricultural Biotechnology* and *Pharmaceuticals & Therapeutics* lost employment between 2008 and 2009 (96 and 1,027 jobs, respectively). These losses were larger than the gains in the three other subsectors, resulting in a total employment loss of 388 jobs for the bioscience sector between 2008 and 2009.

Table 5: Employment Change by Subsector

	Change in Employment			Average Annual % Change in Employment		
Subsector	2000-2008	2008-2009	2000-2009	2000-2008	2008-2009	2000-2009
Agricultural Biotechnology	192	(96)	96	0.24	(0.96)	0.11
Medical & Testing Laboratories	3,696	135	3,831	5.58	1.29	5.10
Medical Device & Equipment Manufacturers	729	36	765	0.42	0.16	0.39
Pharmaceuticals & Therapeutics	3,587	(1,027)	2,561	5.50	(9.98)	3.66
Research & Development	2,406	564	2,970	3.46	5.58	3.69
Total Bioscience in Ohio	10,610	(388)	10,222	2.34	(0.62)	2.00

Payroll

The *Medical Device & Equipment Manufacturers* subsector had the largest payroll ($1.4 billion) in 2009 followed by the *Research & Development* and *Agricultural Biotechnology* subsectors with $865 million and $804 million, respectively. Overall, payroll increased every year after adjusting for inflation, except in 2004 and 2009. Payroll in the bioscience industry decreased in 2009 by $70 million. Declines occurred in two subsectors: *Agricultural Biotechnology* ($29 million) and *Pharmaceuticals & Therapeutics* ($158 million). The three other subsectors saw increases between 2008 and 2009: *Medical & Testing Laboratories* ($22 million), *Medical Device & Equipment Manufacturers* ($52 million), and *Research & Development* ($42 million). Between 2000 and 2009, payroll in the bioscience sector increased by 3.0% on average each year with the largest increase occurring in the *Research & Development* subsector (5.9% on average each year).

Average Wage

The *Research & Development* subsector paid the highest average wage ($81,105) in 2009. This subsector also saw the highest increase in average wages since 2000. *Agricultural Biotechnology* also had a high average wage of over $80,000. The *Medical & Testing Laboratories* subsector, the subsector with the largest number of employees, paid the lowest average wage of $46,742; however, this wage is still considerably higher than the average wage in Ohio ($41,053) when all industries are taken into account. Between 2000 and 2009, average wages in the *Research & Development* subsector grew at the fastest rate (2.1% on average per year) followed by the *Medical Device & Equipment Manufacturers* subsector (1.8% on average per year). Over the last year, however, average wages in the *Medical Device & Equipment Manufacturers* subsector improved the most, growing at a rate of 3.6%. The next highest growth was exhibited by *Medical & Testing Laboratories*, which grew at a rate of 3.3%. The *Research & Development* subsector saw a small decrease between 2008 and 2009 while the average wages in *Pharmaceuticals & Therapeutics* declined by 10.3%.

Establishments

Almost 70% of all bioscience establishments are included in two subsectors: *Medical & Testing Laboratories* (647) and *Medical Device & Equipment Manufacturers* (604). The total number of establishments increased in all subsectors between 2000 and 2009; the largest gain was in *Medical & Testing Laboratories,* which added 308 establishments. The number of establishments in the *Medical & Testing Laboratories* subsector nearly doubled between 2000 and 2009, which accounts for 60% of the increases in total bioscience establishments. The only subsector which saw a decrease over the last year was *Medical Device & Equipment Manufacturers,* which lost three establishments.

The employment, payroll, average wages, and number of bioscience establishments for Ohio's bioscience sector in 2009 are summarized in Table 6.

Table 6: Bioscience Employment, Payroll, Wages, and Establishments by Subsector, 2009

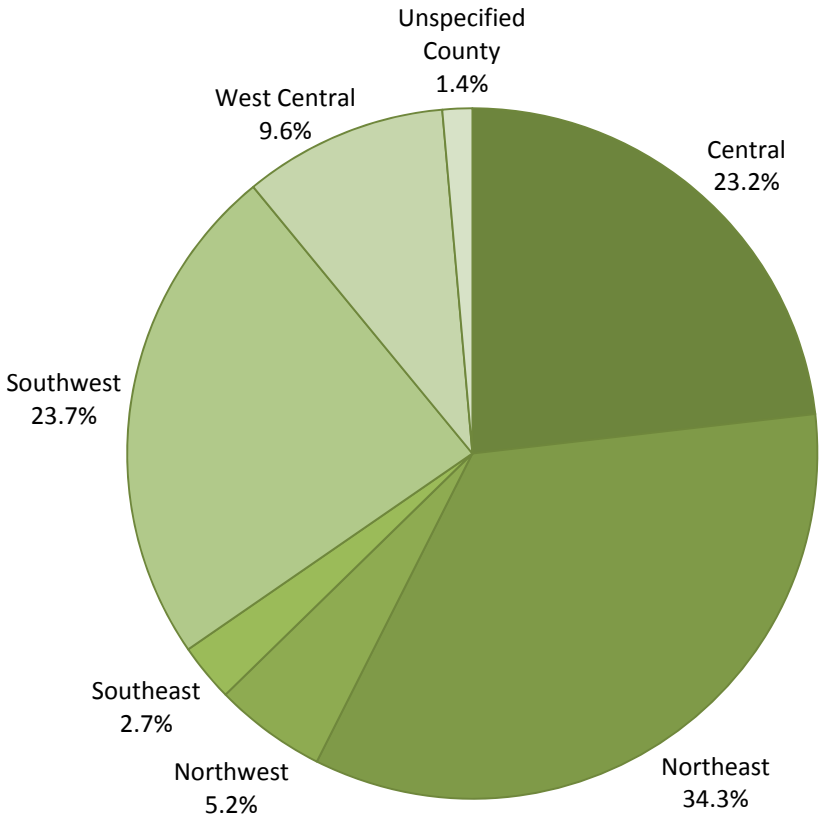
Subsector	Employment	Payroll ($)	Average Wages ($)	Number of Establishments
Agricultural Biotechnology	9,933	804,373,120	80,983	163
Medical & Testing Laboratories	10,619	496,369,148	46,742	647
Medical Device & Equipment Manufacturers	22,047	1,448,378,524	65,694	604
Pharmaceuticals & Therapeutics	9,265	661,886,492	71,439	94
Research & Development	10,668	865,268,476	81,105	292
Total Bioscience in Ohio	62,533	4,276,275,760	68,384	1,800

BIOSCIENCE IN OHIO'S SIX REGIONS

Employment

Of all six regions in Ohio, bioscience employment was highest in the Northeast, which accounted for over one third of the bioscience employment in Ohio. The Southwest and Central regions each accounted for almost a quarter of the bioscience employment in the state. The West Central, Northwest, and Southeast regions all represented less than 10% of the bioscience employment (Figure 5).

Figure 5: Bioscience Employment in Ohio by Region, 2009



All six regions grew in bioscience employment between 2000 and 2009. Between 2008 and 2009, the Southwest region added the most jobs (389) (Table 7). The Central, Northwest, and Northeast regions all experienced declines. The Central region alone lost more than 700 bioscience jobs over the last year, while the Northeast lost 271 and the Northwest lost 51. On average each year, employment in the bioscience industry in Ohio grew by 2.0% while total employment in Ohio decreased by 1.0%.

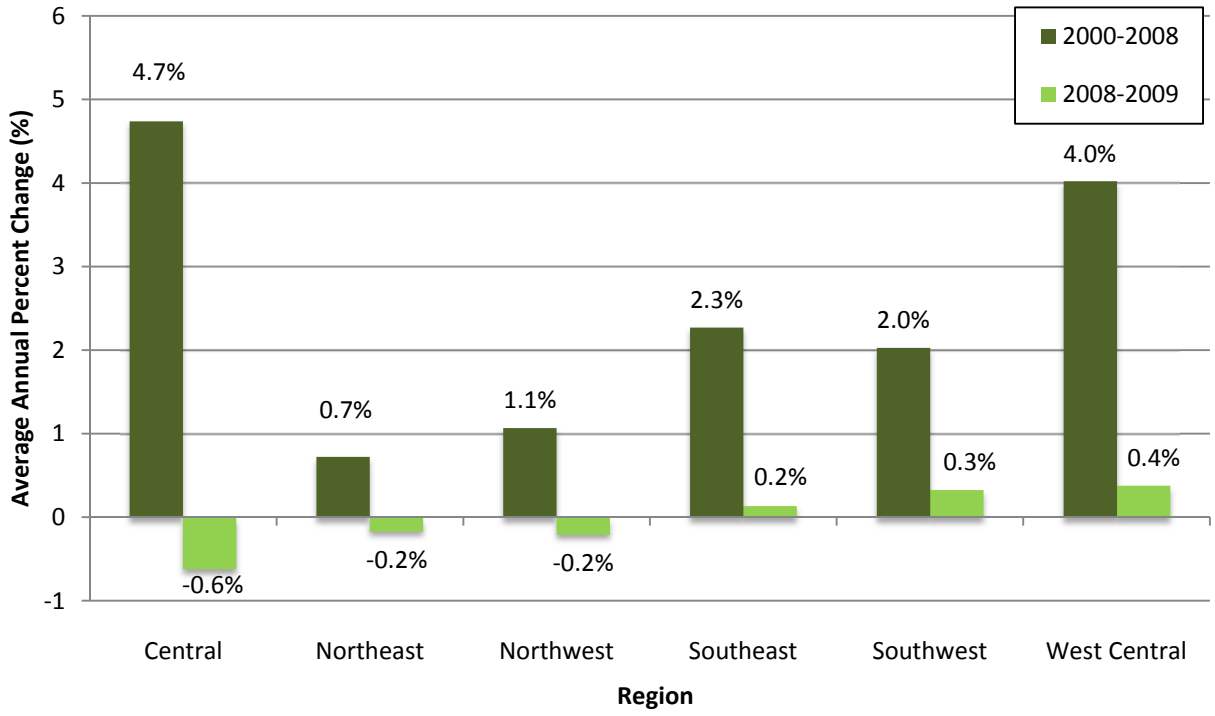
Table 7: Bioscience Employment in Ohio by Region, 2000-2009

Region	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Central	10,502	10,971	11,292	12,264	12,903	13,370	13,824	14,492	15,222	14,493
Northeast	20,466	20,899	21,563	20,760	21,107	21,380	21,509	21,268	21,699	21,427
Northwest	3,055	3,152	3,026	3,092	3,140	3,154	3,270	3,243	3,331	3,280
Southeast	1,398	1,332	1,328	1,286	1,257	1,248	1,349	1,536	1,675	1,695
Southwest	12,259	12,663	12,804	12,890	13,543	13,125	13,634	14,049	14,401	14,790
West Central	4,228	4,424	4,563	4,646	4,783	5,129	5,476	5,489	5,797	5,978
Unspecified County[9]	402	310	358	443	478	586	662	739	798	870
Total Bioscience in Ohio	52,311	53,750	54,935	55,381	57,211	57,992	59,723	60,816	62,921	62,533

[9] The "Unspecified County" designation refers to establishments that are statewide or could not be placed into one of the regions.

Figure 6 shows that the largest gains in employment on average each year between 2000 and 2008 were in the Central region (4.7%) followed by the West Central region (4.0%). Between 2008 and 2009, three regions lost employment and three regions gained with the West Central region gaining the most (0.4%).

Figure 6: Average Annual Percent Change in Bioscience Employment by Region



Medical Device & Equipment Manufacturers, which is the largest subsector in the state in terms of employment, also represents the largest subsector in all the regions except for the Central region. The largest subsector in the Central region is *Research & Development* which ranks second in the state. Almost 42% of the total *Research & Development* employment in Ohio is located in the Central region. A detailed look at the regional employment by subsector for 2009 can be found in Appendix Table B1.

Payroll

In 2009, the Northeast region led the state in annual payroll ($1.4 billion) followed by the Southwest region ($1.1 billion) (Table 8). The Central region also had a high annual payroll of $1.0 billion. On average, payroll in the Central region grew 5.0% annually since 2000 and the West Central region grew just shy of 5.0% annually (Appendix A). Payroll in the Northeast region has grown at the slowest rate on average since 2000 (1.4%). Between 2008 and 2009,

payroll decreased in all but two regions: West Central and Southeast. The Northwest region, which has the second smallest payroll among the regions, lost 12.4%.

Table 8: Bioscience by Region in Ohio, 2009

Region	Employment	Payroll ($)	Average Wages ($)	Number of Establishments
Central	14,493	1,036,421,540	71,510	291
Northeast	21,427	1,444,395,452	67,409	714
Northwest	3,280	145,351,208	44,316	145
Southeast	1,695	85,262,468	50,305	59
Southwest	14,790	1,142,986,008	77,283	294
West Central	5,978	333,986,436	55,866	205
Unspecified County	870	87,872,648	101,051	92
Total Bioscience in Ohio	62,533	4,276,275,760	68,384	1,800

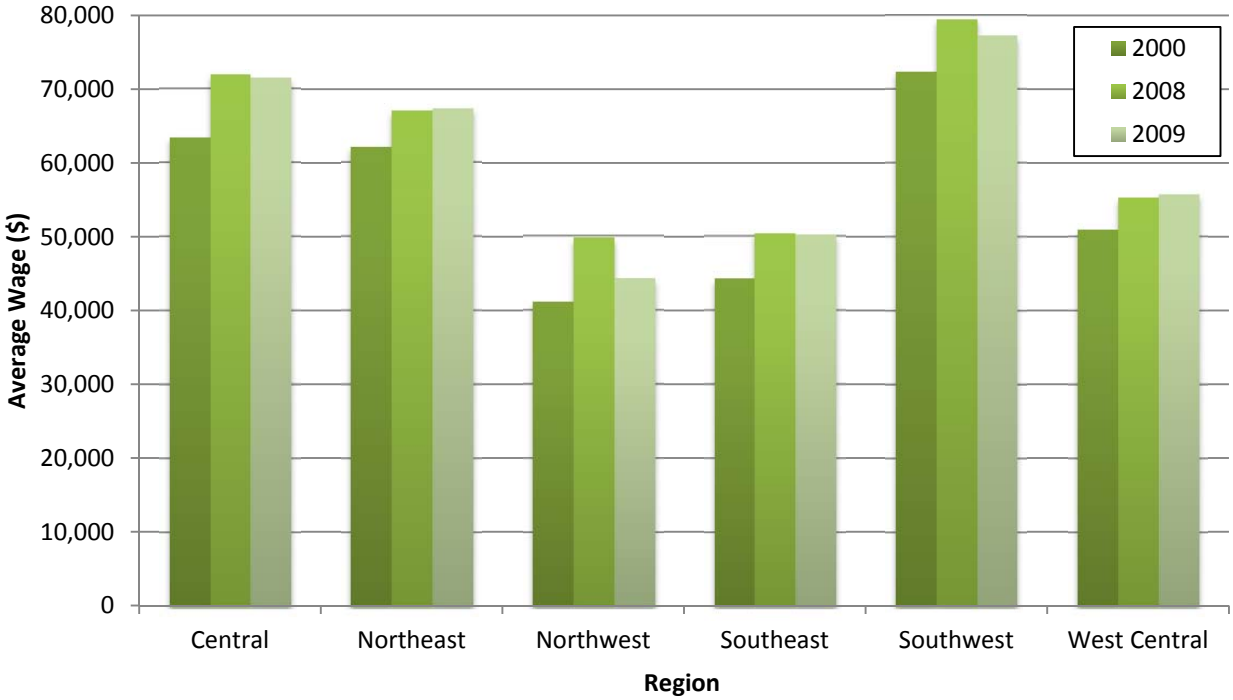
As with employment, the *Medical Device & Equipment Manufacturers* subsector is the largest subsector in Ohio in terms of payroll, and the largest in all regions except the Central region. The largest subsector in the Central region is once more, as with employment, *Research & Development.* A detailed look at the regional payroll by subsector for 2009 can be found in Appendix Table B2.

Average Wage

The average wage in bioscience in 2009 was highest in the Southwest region ($77,283), followed by the Central ($71,510) and Northeast regions ($67,409) (Figure 7). Between 2000 and 2009, average wages increased in all regions with the Southeast region leading (1.4% on average each year). Over the last year, however, average wages decreased in four regions, by as much as $5,518 (11.1%) in the Northwest. The West Central and the Northeast regions saw moderate increases over the last year.

The subsector with the highest average wage in Ohio is *Research & Development*. This subsector, which boasts the largest employment and payroll in the state, also has the highest average wage in the Central region. There is little other consistency across regions in terms of average wages. A detailed look at the average wages by region by subsector for 2009 can be found in Appendix Table B3.

Figure 7: Average Wage in the Bioscience Sector, 2000, 2008, & 2009



Establishments

The Northeast region led the state in number of bioscience establishments with 39.7% of the total in 2009. The Southwest and Central regions followed, each possessing about 16% of the bioscience establishments. Since 2000 all regions have grown in the total number of bioscience establishments. The Central region has grown at the fastest rate (4.3%) over the entire study period, but the West Central region grew at the fastest rate from 2008 to 2009 (6.2%).

The subsector with the largest number of establishments in the state, *Medical & Testing Laboratories*, is also the largest in all regions except the Northeast, where it ranks second to *Medical Device & Equipment Manufacturers*. The *Pharmaceuticals & Therapeutics* subsector consistently ranks near the bottom in terms of the number of establishments. A detailed look at the number of establishments by region by subsector for 2009 can be found in Appendix Table B4.

BIOSCIENCE SECTOR IN THE NORTHEAST REGION

General Trends

The Northeast region of Ohio consists of 21 counties: Ashland, Ashtabula, Carroll, Columbiana, Crawford, Cuyahoga, Erie, Geauga, Holmes, Huron, Lake, Lorain, Mahoning, Medina, Portage, Richland, Stark, Summit, Trumbull, Tuscarawas, and Wayne. Also encompassed in the Northeast region are six metropolitan statistical areas (MSAs) including the Akron MSA, Canton-Massillon MSA, Cleveland-Elyria-Mentor MSA, Mansfield MSA, Sandusky MSA, and Youngstown-Warren-Boardman MSA. While the majority of Northeast counties are a part of an MSA, eight counties are considered non-metro.

As was the case in 2008, the greatest portion of regional bioscience activity in 2009 existed in the Northeast region. In 2009, the region played host to 34.3% of the total bioscience employment, a 0.2 percentage point decrease from 2008; 33.8% of the total bioscience payroll, a 0.3 percentage point increase from 2008; and 39.7% of the total number of bioscience establishments, a 0.1 percentage point increase from 2008. A detailed summary of the bioscience sector in Northeast Ohio is located in Appendix Table A2.

From 2000 to 2009, the Northeast region has consistently possessed the highest bioscience employment, payroll, and number of establishments of any region in Ohio. In 2009, bioscience employment in the Northeast region was 21,427. Bioscience employment in the Northeast region declined 1.3% from 2008 to 2009, yet still increased on average 0.5% annually over the entire study period (Figure 8). The number of bioscience establishments in the Northeast region was 714 in 2009, which represents, on average, a 3.4% annual increase since 2000. The number of establishments grew by 23, or 3.3%, from 2008 to 2009. Finally, in 2009 bioscience payroll in the Northeast region was $1.4 billion. This is an increase, on average, of 1.4% per year since 2000, but a 0.7% decrease since 2008.

The average wage of the bioscience sector in Northeast Ohio was $67,409 in 2009, a 0.6% increase from 2008. The Northeast region possessed only the third largest average wage of any region in Ohio after the Southwest and Central regions. The Northeast and West Central regions were the only two regions that saw growth in bioscience average wage from 2008 to 2009. Over the length of the entire study period, the average wage in the Northeast region grew, on average, by 0.9% annually.

Figure 8: Average Annual Percentage Change in Employment, Payroll, Average Wages & Establishments for the Northeast Region

The Northeast region had the fourth highest growth rate among the six regions in terms of average wage and number of establishments from 2000 to 2009. The Northeast region only surpassed the Northwest and Southwest regions in terms of growth in average wages, and the Northwest and Southeast regions in terms of growth in number of establishments. In addition, the Northeast region possessed the lowest growth rate of any region in terms of bioscience employment and payroll. However, the Northeast region saw growth occur in all four measures since 2000, and it remained the highest ranking region of the state in terms of employment, payroll, and number of establishments.

Bioscience by Subsector

Like 2008, the *Medical Device & Equipment Manufacturers* subsector in the Northeast region represented the highest ranking subsector in 2009 in terms of both employment (9,742) and payroll ($575.9 million) (Table 9). The next highest subsectors in terms of employment were *Medical & Testing Laboratories* and *Agricultural Biotechnology* with 3,717 and 3,619 employees, respectively. *Agricultural Biotechnology* had the highest average wage in 2009 ($98,044), which was more than $23,000 higher than the subsectors with the next highest

average wages: *Pharmaceuticals & Therapeutics* ($74,889) and *Research & Development* ($73,707). *Medical Device & Equipment Manufacturers* represented the greatest number of establishments in 2009 with 291, followed closely by *Medical & Testing Laboratories* with 244 establishments. Finally, *Pharmaceuticals & Therapeutics* had the highest average number of employees per establishment (84), followed by *Agricultural Biotechnology* (61).

Table 9: Employment, Payroll, Average Wage, Establishments, & Average Employees per Establishment in the Northeast Region, 2009

	Employ-ment	Payroll ($)	Average Wages ($)	Establish-ments	Average Employees per Establishment
Agricultural Biotechnology	3,619	354,822,256	98,044	59	61
Medical & Testing Laboratories	3,717	190,293,628	51,201	244	15
Medical Device & Equipment Manufacturers	9,742	575,893,960	59,115	291	33
Pharmaceuticals & Therapeutics	2,351	176,064,968	74,889	28	84
Research & Development	1,999	147,320,640	73,707	92	22
Total Bioscience in Northeast Region	21,427	1,444,395,452	67,409	714	30

Employment and payroll in the *Pharmaceuticals & Therapeutics* subsector grew at the fastest rate from 2000 to 2009. It experienced an average annual increase of 7.8% in employment and 6.0% in payroll during the study period. The number of establishments in this subsector increased, on average, by 3.8% annually, but *Pharmaceuticals & Therapeutics* ranked only third in growth in the Northeast region in terms of establishments. *Medical & Testing Laboratories* saw the greatest growth in the number of establishments with an average increase of 7.7% annually between 2000 and 2009. The *Pharmaceuticals & Therapeutics* subsector was the only subsector in the Northeast region to decline in its average wage with a loss, on average, of 1.6% annually.

Three subsectors lost employment over the study period: *Agricultural Biotechnology* (-756); *Medical Device & Equipment Manufacturers* (-602); and *Research & Development* (-133). *Agricultural Biotechnology* was also the only subsector to sustain a loss in payroll between 2000 and 2009; the payroll in this subsector declined $18 million or, on average, 0.6% annually. Despite the onset of the recession, all subsectors increased in number of establishments during the study period.

BIOSCIENCE SECTOR IN THE CENTRAL REGION

General Trends

The Central region of Ohio encompasses the Columbus MSA and its surrounding counties. It is comprised of 15 counties: Delaware, Fairfield, Fayette, Franklin, Hocking, Knox, Licking, Logan, Madison, Morrow, Perry, Pickaway, Ross, and Union. Of these counties, eight are included as part of the Columbus MSA and the remaining seven are non-metro.

The third greatest portion of regional bioscience activity in 2009 existed in the Central region of Ohio, following only the Northeast and Southwest regions. In 2009, the Central region possessed 23.2% of the total bioscience employment, a decrease of 1.0 percentage point from 2008; 24.2% of the total bioscience payroll, a 1.0 percentage point decline from 2008; and 16.2% of the total bioscience establishments, a 0.2 percentage point decrease from 2008. A detailed summary of the bioscience sector in Central Ohio is located in Appendix Table A3.

Employment in the Central region in 2009 was 14,493. Bioscience employment in the Central region declined 4.8% from 2008 to 2009, yet still increased, on average, 3.6% annually over the entire study period (Figure 9). Payroll in the Central region was $1.0 billion in 2009. Bioscience payroll in the Central region declined 5.5% from 2008 to 2009, yet still increased, on average, 5.0% annually over the entire study period. The number of establishments in the Central region was 291 in 2009, which represents, on average, a 4.3% annual increase on average since 2000.

The Central region possessed the second-largest bioscience average wage of any region in Ohio after the Southwest region. The average wage of the bioscience sector in Central Ohio was $71,510 in 2009, a 0.8% decrease from 2008. Over the length of the entire study period, the average wage in the Central region grew, on average, by 1.3% annually.

Figure 9: Average Annual Percentage Change in Employment, Payroll, Average Wages & Establishments for the Central Region

The Central region had the highest growth rate of any region in terms of bioscience payroll and number of establishments on average each year between 2000 and 2009. In addition, the Central region possessed the second-highest growth rate of all regions in Ohio in terms of bioscience employment and average wage. Only the Southwest and Southeast regions surpassed the Central region in the growth rate of employment and average wage, respectively. Despite the effects of the recession, the Central region saw growth occur in all four measures being studied between 2000 and 2009.

Bioscience by Subsector

The *Research & Development* subsector possessed the largest bioscience employment in 2009 in the Central region with 4,469 employees (Table 10). The second-highest subsector in terms of employment was *Pharmaceuticals & Therapeutics* with 3,244 employees. Together, these two subsectors represented 53% of employment in the Central region's bioscience sector. The *Research & Development* and *Pharmaceuticals & Therapeutics* subsectors also had the two highest payrolls of any bioscience subsector in the Central region, although the payroll of the former far exceeded the latter. The payrolls of the *Research & Development* and *Pharmaceuticals & Therapeutics* subsectors were $389.3 million and $229.7 million, respectively. *Research & Development* had the highest average wage in 2009 ($87,122), followed by *Agricultural Biotechnology* ($85,694). *Medical & Testing Laboratories* represented the greatest number of establishments in 2009 with 107, followed by *Medical Device & Equipment Manufacturers* with 81 establishments. Finally, *Pharmaceuticals & Therapeutics* had

the highest average number of employees per establishment (171), followed by *Research & Development* (89).

Table 10: Employment, Payroll, Average Wage, Establishments, & Average Employees per Establishment in the Central Region, 2009

	Employ-ment	Payroll ($)	Average Wages ($)	Establish-ments	Average Employees per Establishment
Agricultural Biotechnology	2,066	177,014,556	85,694	35	59
Medical & Testing Laboratories	2,101	94,264,232	44,870	107	20
Medical Device & Equipment Manufacturers	2,614	146,092,876	55,882	81	32
Pharmaceuticals & Therapeutics	3,244	229,715,616	70,820	19	171
Research & Development	4,469	389,334,260	87,122	50	89
Total Bioscience in Central Region	14,493	1,036,421,540	71,510	291	50

Growth was seen in all subsectors in all measures being studied except for one; specifically, the *Medical Device & Equipment Manufacturers* subsector which sustained, on average, a loss of 0.4% annually in its number of establishments. *Medical Device & Equipment Manufacturers* subsector grew at the fastest rate in terms of employment and payroll from 2000 to 2009. It experienced an average annual increase of 6.1% in employment and 8.3% in payroll during the study period. The average wage in this subsector increased, on average, by 2.1% annually, but was only the second-highest growth rate; the *Agricultural Biotechnology* subsector grew, on average, by 2.6% annually. *Medical & Testing Laboratories* saw the highest growth in the number of establishments with an average increase of 8.6% annually between 2000 and 2009, followed by the *Agricultural Biotechnology* and *Research & Development* subsectors, each with an annual growth, on average, of 5.8%.

BIOSCIENCE SECTOR IN THE SOUTHWEST REGION

General Trends

The Southwest region of Ohio is comprised of seven counties: Brown, Butler, Clermont, Clinton, Hamilton, Highland, and Warren. Five counties are included as part of the Cincinnati-Middletown MSA and two are non-metro.

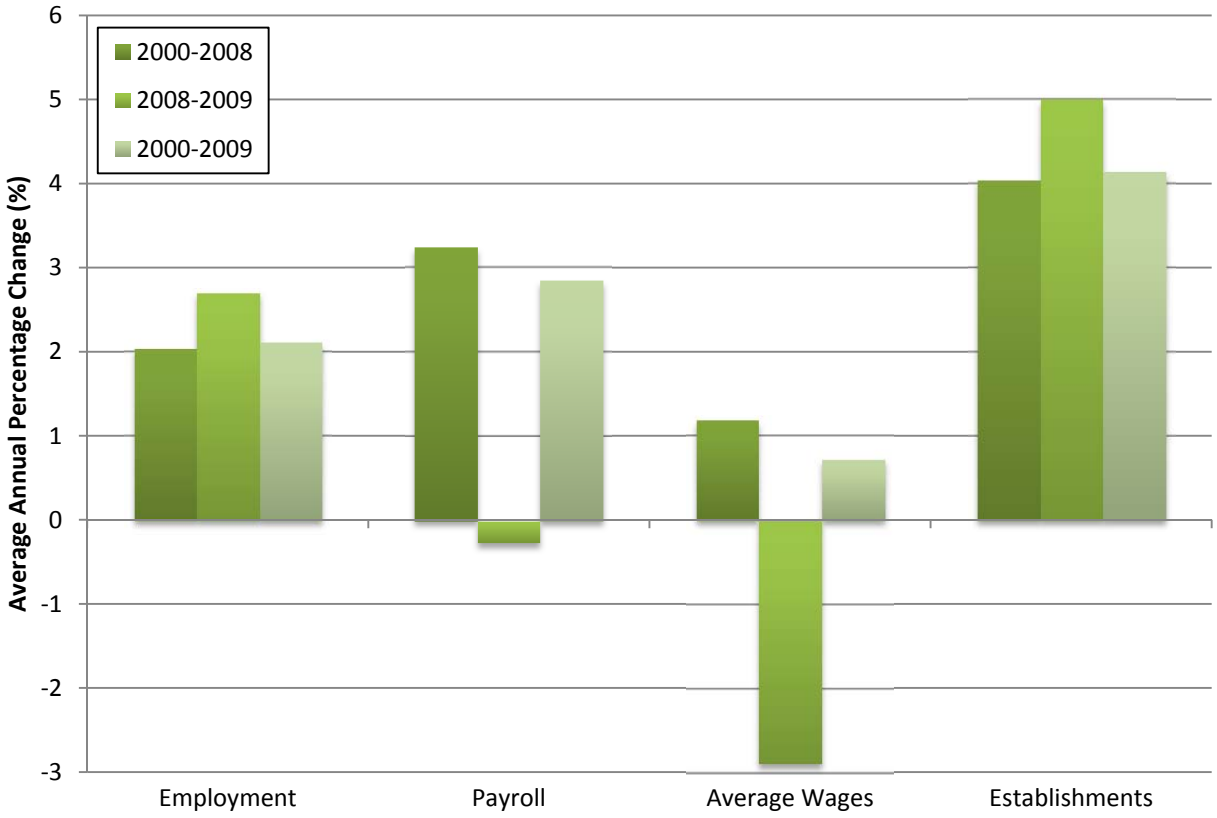
The state's second-greatest portion of regional bioscience activity in 2009 existed in the Southwest region of Ohio, following only the Northeast region. In 2009, the Southwest region accounted for 23.7% of the total bioscience employment, a 0.8 percentage point increase from 2008; 26.7% of the total bioscience payroll, a 0.4 percentage point increase from 2008; and

16.3% of the total bioscience establishments, a 0.2 percentage point increase from 2008. A detailed summary of the bioscience sector in the Southwest region is located in Appendix Table A4.

In 2009, the Southwest region possessed the second-largest figures for bioscience employment, payroll, and total number of establishments of any region in Ohio. Bioscience employment in the Southwest region in 2009 was 14,790. Bioscience employment in the Southwest region increased 2.7% from 2008 to 2009, and increased, on average, 2.1% annually over the entire study period (Figure 10). Bioscience payroll in the Southwest region was $1.14 million in 2009. Bioscience payroll in the Southwest region declined 0.3% from 2008 to 2009, yet still increased, on average, 2.8% annually over the entire study period. The number of bioscience establishments in the Southwest region was 294 in 2009, which represents a 5.0% increase since 2008 and, on average, a 4.1% annual increase since 2000.

The Southwest region had the largest average wage of in the bioscience sector any region in Ohio. The average wage of the bioscience sector in Southwest Ohio was $77,283 in 2009, a 2.9% decrease from 2008. Over the length of the entire study period, the average wage in the bioscience sector in the Southwest region grew, on average, by 0.7% annually.

Figure 10: Average Annual Percentage Change in Employment, Payroll, Average Wages & Establishments for the Southwest Region



The Southwest region had the fourth highest growth rate of any region in terms of employment and payroll from 2000 to 2009. In addition, the Southwest region possessed the second-highest growth rate of any region in Ohio in terms of number of establishments. Finally, the Southwest region had the smallest growth rate of all Ohio regions in terms of average wage. Despite the comparisons and the effects of the recession, the Southwest region grew from 2000 to 2009 in all four measures being studied.

Bioscience by Subsector

The *Medical Device & Equipment Manufacturers* subsector showed the largest bioscience employment in 2009 in the Southwest region with 4,903 bioscience employees (Table 11). The second-highest subsector in terms of employment was *Pharmaceuticals & Therapeutics* with 2,997 employees. Together, these two subsectors represented 53% of employment in the Southwest region's bioscience sector. The *Medical Device & Equipment Manufacturers* and *Pharmaceuticals & Therapeutics* subsectors also had the two highest payrolls of any bioscience subsector in the Southwest region, although the payroll of the former was more than twice the latter. The payrolls of the *Medical Device & Equipment Manufacturers* and *Pharmaceuticals & Therapeutics* subsectors were $467.4 million and $213.7 million, respectively. *Medical Device &*

Equipment Manufacturers had the highest average wage in 2009 ($95,341), followed by *Research & Development* ($83,546). *Medical & Testing Laboratories* represented the greatest number of establishments in 2009 with 108, followed by *Medical Device & Equipment Manufacturers* with 80 establishments. Finally, *Pharmaceuticals & Therapeutics* had the highest average number of employees per establishment (100), followed by *Agricultural Biotechnology* (84).

Table 11: Employment, Payroll, Average Wage, Establishments, & Average Employees per Establishment in the Southwest Region, 2009

	Employ-ment	Payroll ($)	Average Wages ($)	Establish-ments	Average Employees per Establishment
Agricultural Biotechnology	2,023	154,368,532	76,294	24	84
Medical & Testing Laboratories	2,359	97,981,492	41,534	108	22
Medical Device & Equipment Manufacturers	4,903	467,426,444	95,341	80	61
Pharmaceuticals & Therapeutics	2,997	213,691,252	71,310	30	100
Research & Development	2,508	209,518,288	83,546	52	48
Total Bioscience in Southwest Region	14,790	1,142,986,008	77,283	294	50

Despite recession-related losses incurred during the one-year period from 2008 to 2009, growth was seen from 2000 to 2009 in most subsectors. The fastest growth rates of any subsector in both employment and payroll belonged to the Southwest region's *Research & Development* subsector, which experienced an average annual increase of 8.3% in employment and 9.4% in payroll during the study period. The average wage in this subsector increased, on average, by 1.0% annually, but this was only the second-highest growth rate; the *Medical Device & Equipment Manufacturers* subsector grew, on average, by 3.5% annually. *Medical & Testing Laboratories* saw the highest growth in number of establishments with an average increase of 7.8% annually between 2000 and 2009, followed by the *Research & Development* subsector with an annual growth, on average, of 5.5%.

BIOSCIENCE SECTOR IN THE WEST CENTRAL REGION

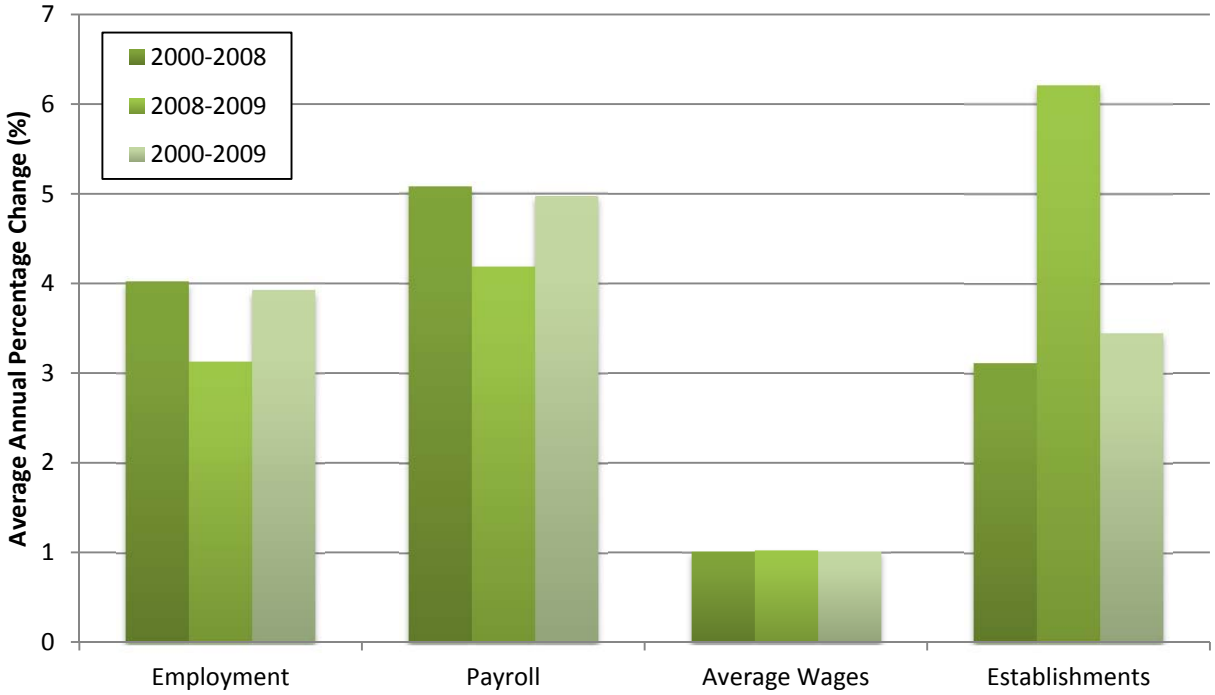
General Trends

The West Central region of Ohio is comprised of eight counties: Champaign, Clark, Darke, Greene, Miami, Montgomery, Preble, and Shelby. Of these counties, four are included as part of the Dayton MSA, one is included in the Springfield MSA, and the remaining three are non-metro. In addition, the West Central region includes the cities of Dayton, Springfield, Troy, and Xenia.

The fourth largest portion of regional bioscience activity in 2009 existed in the West Central region of Ohio, surpassing only the Northwest and Southeast regions. In 2009, the Central region possessed 9.6% of the total bioscience employment, a 0.4 percentage point increase from 2008; 7.8% of the total bioscience payroll, a 0.4 percentage point increase from 2008; and 11.4% of the total bioscience establishments, a 0.3 percentage point increase from 2008. A detailed look at the bioscience sector in the West Central region is located in Appendix Table A5.

In 2009, the West Central region possessed the fourth largest figures for bioscience employment, payroll, average wage, and total number of establishments of any region in Ohio. Employment in the West Central region in 2009 was 5,978. Bioscience employment in the West Central region increased 3.1% from 2008 to 2009, contributing to an annual increase, on average, of 3.9% over the entire study period (Figure 11). Payroll in the West Central region was $334.0 million in 2009. Bioscience payroll in the West Central region increased 4.2% from 2008 to 2009, contributing to an annual increase, on average, of 5.0% over the entire study period. The number of establishments in the West Central region was 205 in 2009, which represents a 6.2% increase from 2008 and an annual increase, on average, of 3.5% since 2000. Finally, the average wage of the bioscience sector in West Central Ohio was $55,866 in 2009, a 1.0% increase from 2008. Over the length of the entire study period, the average wage in the West Central region grew, on average, by 1.0% annually.

Figure 11: Average Annual Percentage Change in Employment, Payroll, Average Wages & Establishments for the West Central Region



The West Central region had the highest growth rate of all regions in terms of employment from 2000 to 2009. In addition, the West Central region possessed the second-highest growth rate of any region in Ohio in terms of payroll. Only the Central region surpassed the West Central region in the growth rate of payroll. Finally, the West Central region possessed the third highest growth rates of any region in terms of average wage and number of establishments. Overall, the West Central region saw growth occur from 2000 to 2009 in all four measures being studied.

Bioscience by Subsector

The *Medical Device & Equipment Manufacturers* subsector possessed the largest bioscience employment in 2009 in the West Central region with 2,624 bioscience employees (Table 12). The second-highest subsector in terms of employment was *Medical & Testing Laboratories* with 1,188 employees. Together, these two subsectors represented 64% of employment in the West Central region's bioscience sector; the *Medical Device & Equipment Manufacturers* subsector alone represented 44% of total employment. The *Medical Device & Equipment Manufacturers* subsector also had the highest bioscience payroll of any subsector in the West Central region. The payroll of the *Medical Device & Equipment Manufacturers* subsector was $145.9 million. The *Research & Development* subsector possessed the second-highest payroll. The two subsectors with the greatest average wages were the *Pharmaceuticals & Therapeutics* and *Research & Development* subsectors which are suppressed due to confidentiality restrictions. *Medical Device & Equipment Manufacturers* represented the greatest number of establishments in 2009 with 73 establishments, followed by *Medical & Testing Laboratories* with 69 establishments. Finally, the *Agricultural Biotechnology* subsector had the highest average number of employees per establishment (69), followed by *Medical Device & Equipment Manufacturers* (38).

Table 12: Employment, Payroll, Average Wage, Establishments, & Average Employees per Establishment in the West Central Region, 2009

	Employ-ment	Payroll ($)	Average Wages ($)	Establish-ments	Average Employees per Establishment
Agricultural Biotechnology	965	52,126,024	54,017	14	69
Medical & Testing Laboratories	1,188	49,057,644	41,297	73	16
Medical Device & Equipment Manufacturers	2,624	145,907,100	55,605	69	38
Pharmaceuticals & Therapeutics	NA[10]	NA	NA	NA	NA
Research & Development	NA	NA	NA	NA	NA
Total Bioscience in West Central Region	5,978	333,986,436	55,866	205	29

[10] NA indicates that data in these subsectors is suppressed due to confidentiality restrictions. Data cannot be reported if there are less than three companies in any one area or if one company has 80% or more of the total employment.

Despite recession-related losses incurred during the period from 2008 to 2009, growth was seen in all subsectors in the West Central region in all measures being studied except for one; specifically, the *Agricultural Biotechnology* subsector sustained, on average, a loss of 2.1% annually in average wage. Despite this loss, however, the *Agricultural Biotechnology* subsector grew at the fastest rate in terms of employment and number of establishments from 2000 to 2009. It experienced an average annual increase of 5.0% in employment and 6.4% in number of establishments during the study period.

The highest growth rate in terms of both payroll and average wage belonged to the *Pharmaceuticals & Therapeutics* subsector. The payroll in this subsector increased, on average, by 7.8% annually from 2000 to 2009, despite sustaining a 17.0% loss from 2008 to 2009. Likewise, the number of establishments in the *Pharmaceuticals & Therapeutics* subsector increased, on average, by 5.0% annually between 2000 and 2009, even after suffering a 26.5% decline in establishments from 2008 to 2009. Please note that, although the aforementioned percentage losses are large, the *Pharmaceuticals & Therapeutics* subsector in the West Central region is relatively small; in fact, this subsector represents the smallest segment of the West Central region's entire bioscience sector. As a result, small changes in employment, payroll, and other measures can result in substantial percent changes.

BIOSCIENCE SECTOR IN THE NORTHWEST REGION

General Trends

The Northwest region of Ohio is comprised of 18 counties: Allen, Auglaize, Defiance, Fulton, Hancock, Hardin, Henry, Lucas, Mercer, Ottawa, Paulding, Putnam, Sandusky, Seneca, Van Wert, Williams, Wood, and Wyandot. Of these counties, four are included as part of the Toledo MSA, one is included in the Lima MSA, and the remaining 13 are non-metro. In addition, the Northwest region includes the cities of Toledo, Lima, Bowling Green, and Findlay.

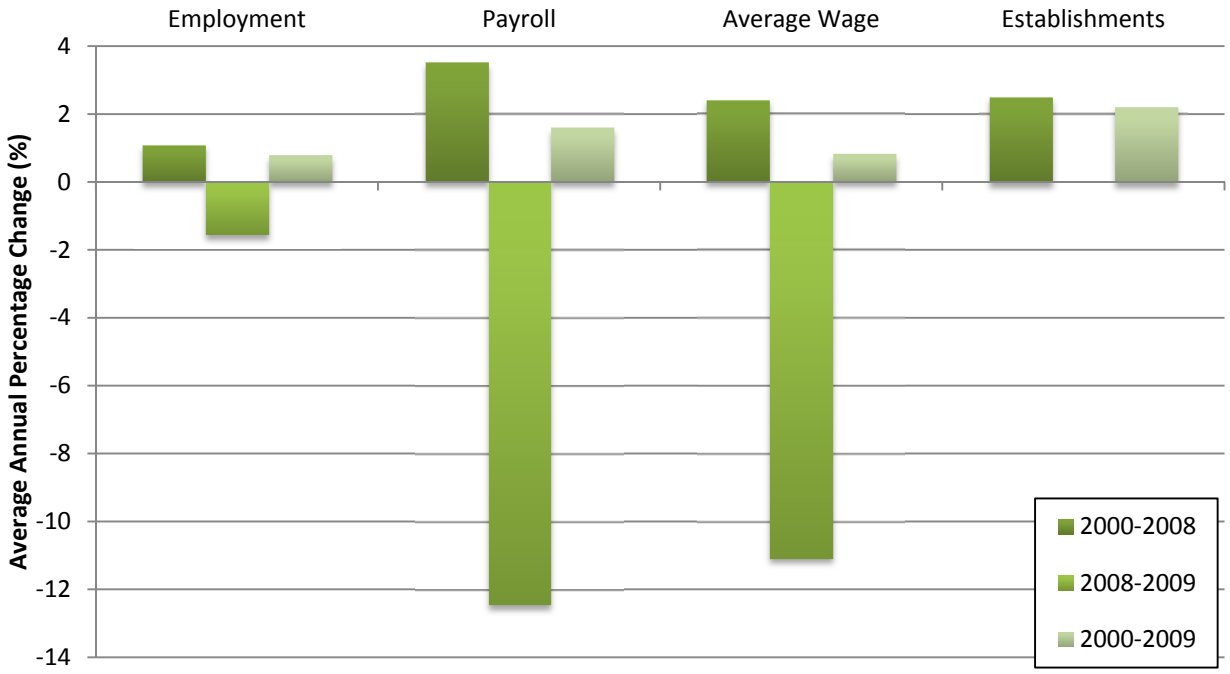
The portion of regional bioscience activity in 2009 that existed in the Northwest region of Ohio was small and surpassed only the Southeast region. In 2009, the Northwest region possessed 5.2% of the total bioscience employment, a decrease of 0.1 percentage point from 2008; 3.4% of the total bioscience payroll, a 0.4 percentage point decrease from 2008; and 8.1% of the total bioscience establishments, a 0.2 percentage point decrease from 2008. A detailed summary of the bioscience sector in Northwest Ohio is located in Appendix Table A6.

In 2009, the Northwest region possessed the second-smallest figures for bioscience employment, payroll, and total number of establishments of any region of Ohio. Employment in the Northwest region in 2009 was 3,280. Bioscience employment in the Northwest region decreased 1.5% from 2008 to 2009, yet still increased, on average, by 0.8% annually over the entire study period (Figure 12). Payroll in the Northwest region was $145.4 million in 2009. Bioscience payroll in the Northwest region declined by about $20 million or 12.4% from 2008 to

2009, yet still increased annually, on average, by 1.6% over the entire study period. The number of establishments in the Northwest region was 145 in 2009, which represents no change in establishments from 2008 and an annual increase, on average, of 2.2% since 2000.

The Northwest region possessed the smallest average wage of any Ohio region in 2009. The average wage of the bioscience sector in the Northwest region was $44,316 in 2009, an 11.1% decrease from 2008. Over the length of the entire study period, the average wage in the Northwest region grew, on average, by 0.8% annually.

Figure 12: Average Annual Percentage Change in Employment, Payroll, Average Wages & Establishments for the Northwest Region



The Northwest region had the second-smallest growth rate of any region in terms of all measures from 2000 to 2009. In terms of employment and payroll, the Northwest region's growth rate surpassed only the Northeast region. In terms of average wage, the Northwest region's growth rate surpassed only the Southwest region. Finally, in terms of number of establishments, the Northwest region's growth rate surpassed only the Southeast region. Overall, however, the Northwest region grew from 2000 to 2009 in all four measures being studied.

Bioscience by Subsector

The *Medical Device & Equipment Manufacturers* subsector possessed the largest bioscience employment in 2009 in the Northwest region with 1,176 bioscience employees (Table 13). This subsector alone represented over one third of total bioscience employment in the Northwest region. The second-highest ranking subsector in terms of employment was *Medical & Testing Laboratories* with 830 employees. The *Medical Device & Equipment Manufacturers* and *Medical & Testing Laboratories* subsectors also had the two highest payrolls of any bioscience subsector in the Northwest region. The payrolls of the *Medical Device & Equipment Manufacturers* and *Medical & Testing Laboratories* subsectors were $45.2 million and $38.7 million, respectively. The two subsectors with the highest average wages were the *Pharmaceuticals & Therapeutics* ($55,212) and *Research & Development* ($53,786) subsectors. The *Medical & Testing Laboratories* subsector represented the greatest number of establishments in 2009 with 61 establishments, followed by the *Medical Device & Equipment Manufacturers* subsector with 50 establishments. Finally, the *Agricultural Biotechnology* subsector had the greatest average number of employees per establishment (44), followed by *Research & Development* (33).

Table 13: Employment, Payroll, Average Wage, Establishments, & Average Employees per Establishment in the Northwest Region, 2009

	Employ-ment	Payroll ($)	Average Wages ($)	Establish-ments	Average Employees per Establishment
Agricultural Biotechnology	788	35,240,092	44,740	18	44
Medical & Testing Laboratories	830	38,689,936	46,616	61	14
Medical Device & Equipment Manufacturers	1,176	45,158,964	38,390	50	24
Pharmaceuticals & Therapeutics	89	4,932,124	55,212	4	22
Research & Development	397	21,330,092	53,786	12	33
Total Bioscience in Northwest Region	3,280	145,351,208	44,316	145	23

The *Research & Development* and *Pharmaceuticals & Therapeutics* subsectors grew at the fastest rates in terms of employment, payroll, and average wages from 2000 to 2009. In terms of employment, the *Research & Development* and *Pharmaceuticals & Therapeutics* subsectors grew annually, on average, by 8.2% and 3.6%, respectively. In terms of payroll, the *Research & Development* and *Pharmaceuticals & Therapeutics* subsectors grew annually, on average, by 11.7% and 7.0%, respectively. Finally, in terms of average wages, the *Pharmaceuticals & Therapeutics* subsector exhibited a higher growth rate than the *Research & Development* subsector. The *Pharmaceuticals & Therapeutics* and *Research & Development* subsectors grew annually, on average, by 3.3% and 3.2%, respectively. These two subsectors managed to

sustain positive growth in payroll and average wages from 2000 to 2009 despite declines between 2008 and 2009.

Finally, the largest growth rate in number of establishments belonged to the *Medical & Testing Laboratories* subsector. The number of establishments in the *Medical & Testing Laboratories* subsector increased, on average, by 4.8% annually between 2000 and 2009, even after suffering a 3.2% decline in establishments from 2008 to 2009. The *Pharmaceuticals & Therapeutics* subsector possessed the second largest growth rate in number of establishments with an annual growth, on average, of 3.3%.

BIOSCIENCE SECTOR IN THE SOUTHEAST REGION

General Trends

The Southeast region of Ohio is comprised of 19 counties: Adams, Athens, Belmont, Coshocton, Gallia, Guernsey, Harrison, Jackson, Jefferson, Lawrence, Meigs, Monroe, Morgan, Muskingum, Noble, Pike, Scioto, Vinton, and Washington. Of these counties, one is included as part of the Weirton-Steubenville MSA, three are included in West Virginia MSAs, and the remaining 15 are non-metro. In addition, the Southwest region includes the cities of Marietta, Athens, Portsmouth, and Zanesville.

The smallest portion of regional bioscience activity in 2009 existed in the Southeast region of Ohio. In 2009, the Southeast region possessed 2.7% of the total bioscience employment, which represents no change from 2008; 2.0% of the total bioscience payroll, a 0.1 percentage point increase from 2008; and 3.3% of the total bioscience establishments, which represents no change from 2008. A detailed look at the bioscience sector in the Southeast region is located in Appendix Table A7.

In 2009, the Southeast region possessed the smallest figures for bioscience employment, payroll, and total number of establishments of any region in Ohio. Employment in the Southeast region in 2009 was 1,695. Bioscience employment in the Southeast region increased 1.2% from 2008 to 2009, and increased, on average, by 2.2% annually over the entire study period (Figure 13). Payroll in the Southeast region was $85.3 million in 2009. Bioscience payroll in the Southeast region grew by 0.8% from 2008 to 2009, and increased annually, on average, by 3.6% over the entire study period. The number of establishments in the Southeast region was 59 in 2009, which represents a growth of 1.7% since 2008 and an annual increase, on average, of 2.1% since 2000.

The Southeast region possessed the second-smallest average wage of any Ohio region in 2009, surpassing only the Northwest region. The average wage of the bioscience sector in the Southeast region was $50,305 in 2009, a 0.4% decrease from 2008. Over the length of the

entire study period, the average wage in the Southeast region grew, on average, by 1.4% annually.

Figure 13: Average Annual Percentage Change in Employment, Payroll, Average Wages & Establishments for the Southeast Region

The Southeast region had the third largest growth rate of all regions in terms of employment and payroll from 2000 to 2009. The Southeast region was surmounted only by the Central and West Central regions. In terms of average wage, the Southeast region's growth rate was the largest, surpassing all other regions. Conversely, in terms of number of establishments, the Southeast region's growth rate was the smallest. Overall, however, the Southeast region saw growth occur from 2000 to 2009 in all four measures being studied.

Bioscience by Subsector

The *Medical Device & Equipment Manufacturers* subsector possessed the largest bioscience employment in 2009 in the Southeast region with 740 bioscience employees (Table 14). This subsector alone represented over 44% of total bioscience employment in the Southeast region. The second-highest subsector in terms of employment was *Agricultural Biotechnology* with 401 employees. The *Medical Device & Equipment Manufacturers* and *Agricultural Biotechnology* subsectors also had the two highest payrolls of any bioscience subsector in the Southeast region. The payrolls of the *Medical Device & Equipment Manufacturers* and *Agricultural*

Biotechnology subsectors were $36.0 million and $25.6 million, respectively. The two subsectors with the greatest average wages were also the *Agricultural Biotechnology* ($63,870) and *Medical Device & Equipment Manufacturers* ($48,695) subsectors. The *Medical & Testing Laboratories* subsector possessed the greatest number of establishments in 2009 with 25 establishments, followed by the *Medical Device & Equipment Manufacturers* subsector with 18 establishments. Finally, the *Pharmaceuticals & Therapeutics* and *Agricultural Biotechnology* subsectors had the two highest average numbers of employees per establishment.

Table 14: Employment, Payroll, Average Wage, Establishments, & Average Employees per Establishment in the Southeast Region, 2009

	Employ-ment	Payroll ($)	Average Wages ($)	Establish-ments	Average Employees per Establishment
Agricultural Biotechnology	401	25,611,756	63,870	8	50
Medical & Testing Laboratories	217	7,728,772	35,621	25	9
Medical Device & Equipment Manufacturers	740	36,034,084	48,695	18	41
Pharmaceuticals & Therapeutics	NA[11]	NA	NA	NA	NA
Research & Development	NA	NA	NA	NA	NA
Total Bioscience in Southeast Region	1,695	85,262,468	50,305	59	29

The *Medical & Testing Laboratories* subsector grew at the fastest rate in terms of employment, payroll, and average wages from 2000 to 2009. In terms of employment, the subsector grew, on average, by 14.9% annually. In terms of payroll, the *Medical & Testing Laboratories* subsector grew, on average, by 17.6% annually. Finally, in terms of number of establishments, the *Medical & Testing Laboratories* subsector grew annually, on average, by 7.5%.

The *Agricultural Biotechnology* subsector possessed the second-highest growth rate in employment from 2000 to 2009. This subsector grew annually, on average, by 8.4%. The *Pharmaceuticals & Therapeutics* subsector possessed the second-highest growth rate in payroll from 2000 to 2009. This subsector grew annually, on average, by 15.7%. Finally, the *Research & Development* subsector possessed the second-highest growth rate in number of establishments from 2000 to 2009. This subsector grew annually, on average, by 6.4%.

The *Pharmaceuticals & Therapeutics* subsector also had the highest growth rate in average wages from 2000 to 2009 growing, on average, 7.2% annually. The *Medical & Testing Laboratories* subsector, with the highest growth rate in all others measures, also possessed the second-highest growth rate in average wages. This subsector grew, on average, 2.3% annually.

[11] NA indicates that data in these subsectors is suppressed due to confidentiality restrictions. Data cannot be reported if there are less than three companies in any one area or if one company has 80% or more of the total employment.

ECONOMIC IMPACT OF THE BIOSCIENCE SECTOR IN OHIO

INTRODUCTION

The bioscience sector in Ohio is linked to other industries through buy-sell relationships. In order to produce goods and services, companies in this sector buy intermediary goods and services from other companies both inside and outside the bioscience sector. The buy-sell relationships that occur within the state of Ohio contribute to the economic impact of the sector.

Five measures of impact are analyzed here: employment, output, value added, labor income, and taxes. *Employment* measures the number of jobs that are present because of the existence of the bioscience sector. *Output* measures the total value of goods and services produced in the state as a result of the activities of the bioscience sector. *Value added* measures the value of goods and services less the intermediary goods and represents a portion of output. *Labor income* is payroll paid to employees plus proprietors' income. *Taxes* include federal, state, and local tax revenues.

Each of the impacts, except for taxes, is a summation of direct impact, indirect impact, and induced impact. *Direct impact* is the initial value of goods and services the sector purchases in the state. *Indirect impact* measures the jobs and production needed to manufacture goods and services required by the sector. *Induced impact* is the increase in spending of local households because of income received through their work in the bioscience sector and with its suppliers.

ECONOMIC IMPACT OF BIOSCIENCE

Employment Impact

The bioscience sector in Ohio accounted for 195,835 jobs in 2009. Of these, 62,533 jobs or 32% were the direct impact of the sector, representing primarily the jobs that exist in bioscience industries. An additional 87,906 (45%) employees worked for industries that sell goods and services to the bioscience industry and its suppliers. Finally, 45,396 employees work for industries that sell goods and services to Ohio households associated with the bioscience industry and its suppliers. Table 15 shows the economic impact of the bioscience sector and presents estimates for these direct, indirect, and induced effects. A detailed look at the impact of the bioscience sector in Ohio is located in Appendix Table C1.

Table 15: Economic Impact of Bioscience in Ohio (by Direct, Indirect, and Induced Impacts), 2009

Type of Impact	Employment	Output	Value Added	Labor Income
Direct	62,533	$40,180.3	$4,339.1	$1,069.1
Indirect	87,906	$16,173.6	$7,837.5	$4,945.2
Induced	45,396	$5,288.0	$3,030.9	$1,677.2
Total Bioscience	195,835	$61,641.9	$15,207.6	$7,691.5

Note: Output, Value Added, and Labor Income in millions of dollars.

Output and Value Added Impacts

The estimated output impact of the bioscience industry is $61.6 billion. This is the value of goods and services that were produced in Ohio through the buy-sell relationships affiliated with the bioscience sector. Of the total output, 65% was associated with direct impact, 26% with indirect impact, and 9% with induced impact. Excluding all the intermediate goods and services, the value added to the goods and services produced in Ohio in association with bioscience was $15.2 billion in 2009. Of that, 29% was due to the direct impact, 52% to indirect impact, and 20% to induced impact.

Household Income and Tax Impacts

Nearly $7.7 billion of household income was associated with the bioscience sector in Ohio. Almost 14% of this is due to the direct impact, 64% due to the indirect impact, and 22% due to the induced impact. Finally, $3.2 billion in tax revenues are associated with the bioscience sector in Ohio. Federal tax revenues ($1.7 billion) represent 52% of the total tax revenues, and state and local tax revenues ($1.6 billion) represent 48%.

To summarize, the economic impact of the bioscience sector in Ohio in 2009 was:

- Employment impact 195,835 jobs
- Output impact $61.642 billion
- Value-added impact $15.208 billion
- Labor income impact $7.691 billion
- Tax revenues $3.242 billion

Economic Impact of Bioscience Subsectors

Table 16 summarizes the total economic impact of the five subsectors in Ohio's bioscience industry using the five impact measures. *Agricultural Biotechnology* is the subsector with the largest impact; its employment impact is 65,197 jobs, its output is $30.2 billion, its value-added

impact is $5.6 billion, its labor income is $2.8 billion, and its tax impact is $1.3 billion.[12] *Agricultural Biotechnology* accounts for 33% of the bioscience sector's employment impact, 49% of output, 37% of both value added and labor income, and 40% of tax revenues. According to most impact measures, the subsector with the second-largest impact is *Pharmaceuticals & Therapeutics,* followed very closely by *Medical Device & Equipment Manufacturers.* The *Research & Development* and *Medical & Testing Laboratories* subsectors both accounted for less than 10% of the total impact of each measure. Figure 14 shows the percentages of the bioscience impact each of the five subsectors represents.

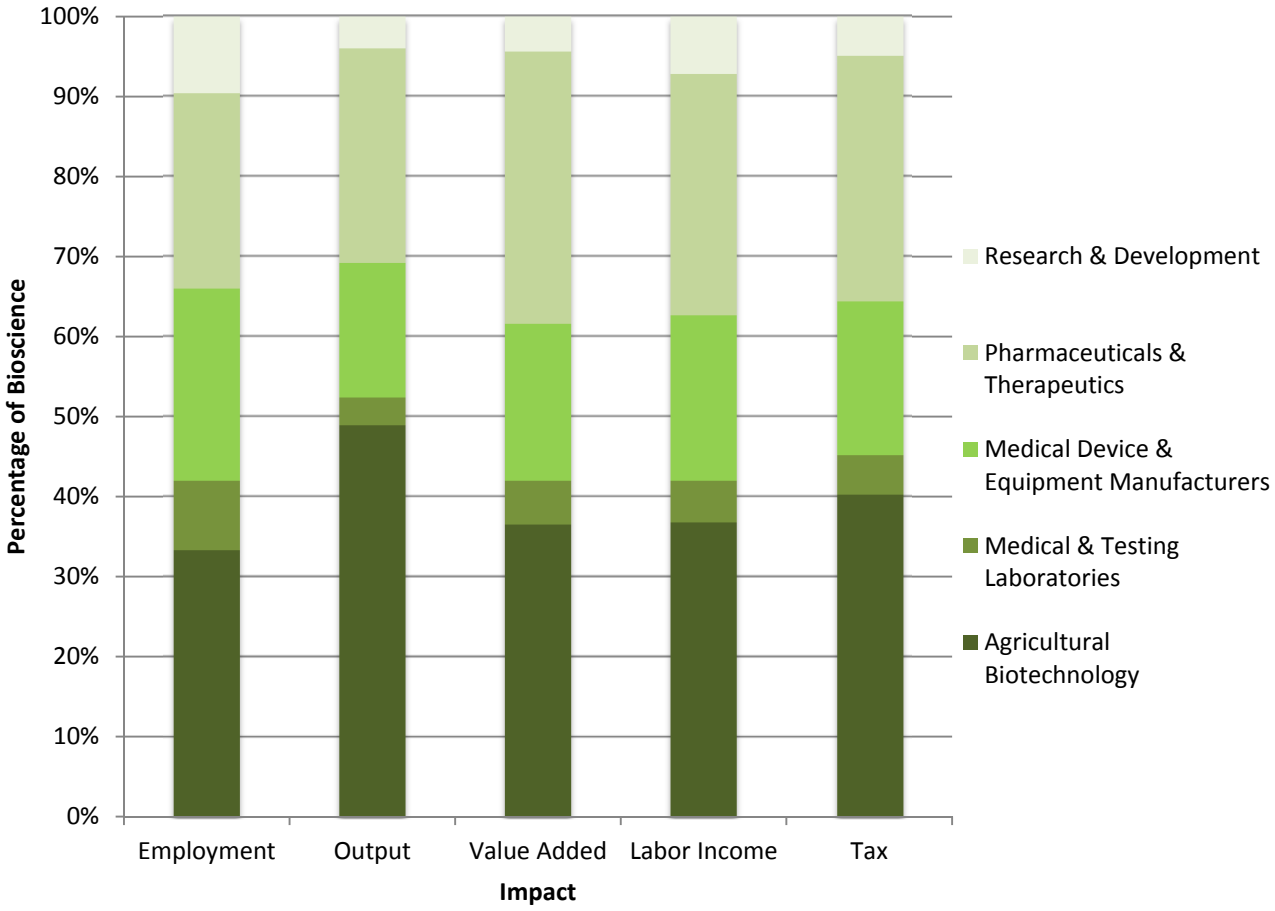
Table 16: Economic Impact of Bioscience by Subsector, 2009

Subsector	Employment	Output	Value Added	Labor Income	Tax
Agricultural Biotechnology	65,197	$30,178.1	$5,555.3	$2,834.1	$1,307.0
Medical & Testing Laboratories	17,112	$2,150.9	$841.4	$393.4	$157.2
Medical Device & Equipment Manufacturers	47,038	$10,343.1	$2,961.6	$1,588.1	$621.7
Pharmaceuticals & Therapeutics	47,710	$16,491.6	$5,181.6	$2,322.1	$995.0
Research & Development	18,777	$2,478.1	$667.7	$553.8	$161.1
Total Bioscience	195,835	$61,641.9	$15,207.6	$7,691.5	$3,242.0

Note: Output, Value Added, Labor Income, and Tax in millions of dollars.

[12] Although *Agricultural Biotechnology* has the largest economic impact, the largest subsector in terms of direct employment is, as outlined in the previous section, *Medical Device & Equipment Manufacturers*. The *Agricultural Biotechnology* subsector has the largest economic impact because the industries included in this subsector have relatively large multipliers, especially in the indirect portion.

Figure 14: Percentage of Economic Impact by Bioscience Subsector in Ohio, 2009



ECONOMIC IMPACT OF BIOSCIENCE IN OHIO'S SIX REGIONS

Although all of Ohio's six regions participate in the bioscience sector, data show three regions account for the majority of the industry: Northeast, Southwest, and Central (Table 17). These three regions encompass the three largest metropolitan areas in Ohio: Cleveland, Cincinnati, and Columbus.

Table 17: Economic Impact of Bioscience by Region, 2009

	Employment	Output	Value Added	Labor Income	Tax
Central	42,176	$12,936.2	$3,530.2	$1,739.1	$727.7
Northeast	64,313	$20,723.9	$4,762.2	$2,459.7	$1,049.1
Northwest	7,074	$2,464.8	$413.0	$192.9	$85.7
Southeast	3,248	$1,479.3	$217.5	$90.0	$45.3
Southwest	43,189	$14,521.5	$3,692.8	$1,859.6	$796.5
West Central	13,347	$3,990.0	$902.9	$442.4	$191.5
Total Bioscience	195,835	$61,641.9	$15,207.6	$7,691.5	$3,242.0

Notes: Output, Value Added, Labor Income, and Tax in millions of dollars.

Regions do not add up to total for Ohio because some establishments are statewide or could not be classified into one region.

Economic Impact of Bioscience in Northeast Ohio

In Northeast Ohio, the bioscience sector yielded 64,313 jobs, $20.7 billion in the production of goods and services, $4.8 billion in value-added production, and $2.5 billion in labor income. Of the employment impact, 33% was attributed to direct impact, 44% to indirect impact, and 23% to induced impact (Table 18). Of the labor income impact of bioscience in Northeast Ohio, 15% was attributed to direct impact, 63% to indirect impact, and 22% to induced impact. Tax revenues in Northeast Ohio amounted to over $1 billion, 51% of which went to the federal government ($537 million) and 49% ($512 million) went to Ohio and local governments. A detailed summary of the impact of the bioscience sector in Northeast Ohio is located in Appendix Table C2.

Table 18: Economic Impact of Bioscience in the Northeast Region (by Direct, Indirect, and Induced Impacts), 2009

	Employment	Output	Value Added	Labor Income
Direct	21,427	$14,069.7	$1,342.3	$361.1
Indirect	27,977	$4,978.1	$2,448.9	$1,558.6
Induced	14,909	$1,676.0	$971.0	$540.0
Total Bioscience	64,313	$20,723.9	$4,762.2	$2,459.7

Note: Output, Value Added, and Labor Income in millions of dollars.

The bioscience subsector with the highest impact in Northeast Ohio was *Agricultural Biotechnology*. Its employment impact is only slightly larger than *Medical Device & Equipment Manufacturers* (Table 19). *Agricultural Biotechnology* accounts for 34% of the bioscience employment impact in Northeast Ohio, 52% of the output impact, 39% of value added, 39% of labor income, and 43% of tax revenues. The *Medical Device & Equipment Manufacturers* subsector accounts for 33% of the bioscience employment impact, 24% of the output impact, 29% of both value added and labor income, and 28% of tax revenues.

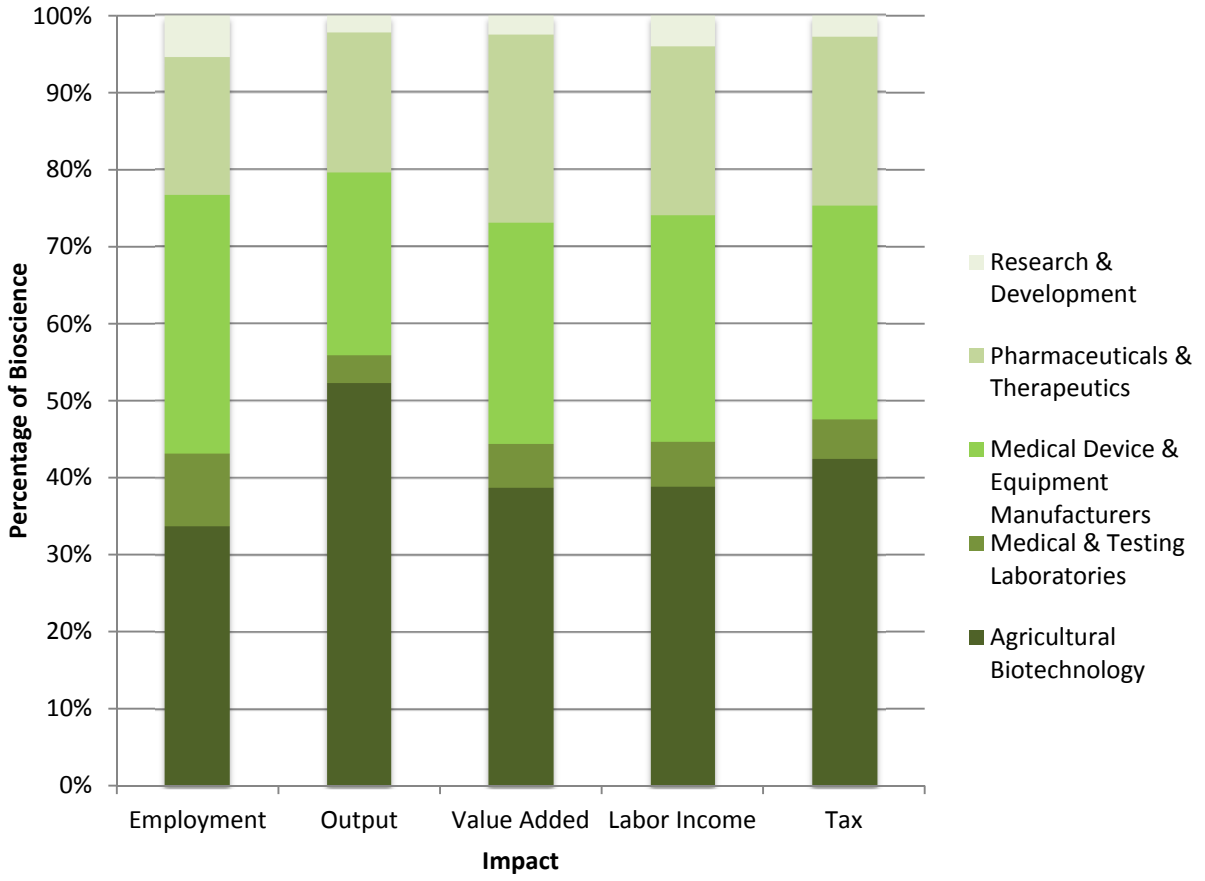
Table 19: Economic Impact of Bioscience by Subsector in the Northeast Region, 2009

	Employment	Output	Value Added	Labor Income	Tax
Agricultural Biotechnology	21,719	$10,846.1	$1,843.7	$956.2	$446.4
Medical & Testing Laboratories	6,102	$739.9	$276.2	$145.0	$54.2
Medical Device & Equipment Manufacturers	21,531	$4,916.7	$1,360.8	$722.8	$289.3
Pharmaceuticals & Therapeutics	11,485	$3,775.0	$1,164.4	$538.1	$230.6
Research & Development	3,475	$446.1	$117.0	$97.7	$28.6
Total Bioscience	64,313	$20,723.9	$4,762.2	$2,459.7	$1,049.1

Note: Output, Value Added, Labor Income, and Tax in millions of dollars.

Pharmaceuticals & Therapeutics is the subsector with the third-largest impact. It accounts for 18% of the employment and output impacts, 24% of value added, and 22% of both labor income and tax revenues. The other two subsectors, *Medical & Testing Laboratories* and *Research & Development,* together account for 15% of the total employment impact and less than 10% of the other impact measures (Figure 15).

Figure 15: Percentage of Economic Impact by Bioscience Subsector in the Northeast Region, 2009



Economic Impact of Bioscience in Central Ohio

The economic impact of bioscience in Central Ohio in 2009 was 42,176 jobs, $12.9 billion in output, $3.5 billion in value added, and $1.7 billion in labor income (Table 20). Of the employment impact, 34% was attributed to direct impact, 43% to indirect impact, and 22% to induced impact. Of the value-added impact of bioscience in Central Ohio, 34% was attributed to direct impact, 47% to the indirect impact, and 19% to the induced impact. A detailed look at the impact of the bioscience sector in the Central region is located in Appendix Table C3.

Table 20: Economic Impact of Bioscience in the Central Region (by Direct, Indirect, and Induced Impacts), 2009

	Employment	Output	Value Added	Labor Income
Direct	14,493	$8,814.2	$1,202.2	$259.1
Indirect	18,199	$2,995.3	$1,659.8	$1,117.6
Induced	9,484	$1,126.8	$668.3	$362.4
Total Bioscience	42,176	$12,936.2	$3,530.2	$1,739.1

Note: Output, Value Added, and Labor Income in millions of dollars.

Tax revenues in Central Ohio amounted to $728 million. Of that amount, 53% ($383 million) went to the federal government and 47% ($345 million) went to Ohio and local governments.

The bioscience subsector with the highest impact in Central Ohio was *Pharmaceuticals & Therapeutics* (Table 21). Among the five subsectors in Central Ohio, *Pharmaceuticals & Therapeutics* had the second-highest number of direct employees and the highest employment multiplier, a combination that yielded the high overall impact of this subsector. This is different from the Northeast, Northwest, Southeast, and West Central regions, and the state of Ohio as a whole, where the *Agricultural Biotechnology* subsector had the greatest impact.

The employment impact in the *Pharmaceuticals & Therapeutics* subsector was 17,112 jobs, which accounts for 41% of the bioscience employment impact in Central Ohio (Figure 16). *Agricultural Biotechnology* ranked second (9,101 jobs) followed by *Research & Development* (7,732 jobs).

Table 21: Economic Impact of Bioscience by Subsector in the Central Region, 2009

	Employment	Output	Value Added	Labor Income	Tax
Agricultural Biotechnology	9,101	$4,287.1	$778.6	$409.1	$187.1
Medical & Testing Laboratories	3,276	$423.0	$176.1	$73.7	$32.0
Medical Device & Equipment Manufacturers	4,955	$1,040.4	$285.3	$153.6	$61.1
Pharmaceuticals & Therapeutics	17,112	$6,135.0	$2,007.8	$865.6	$378.3
Research & Development	7,732	$1,050.6	$282.4	$237.1	$69.3
Total Bioscience	42,176	$12,936.2	$3,530.2	$1,739.1	$727.7

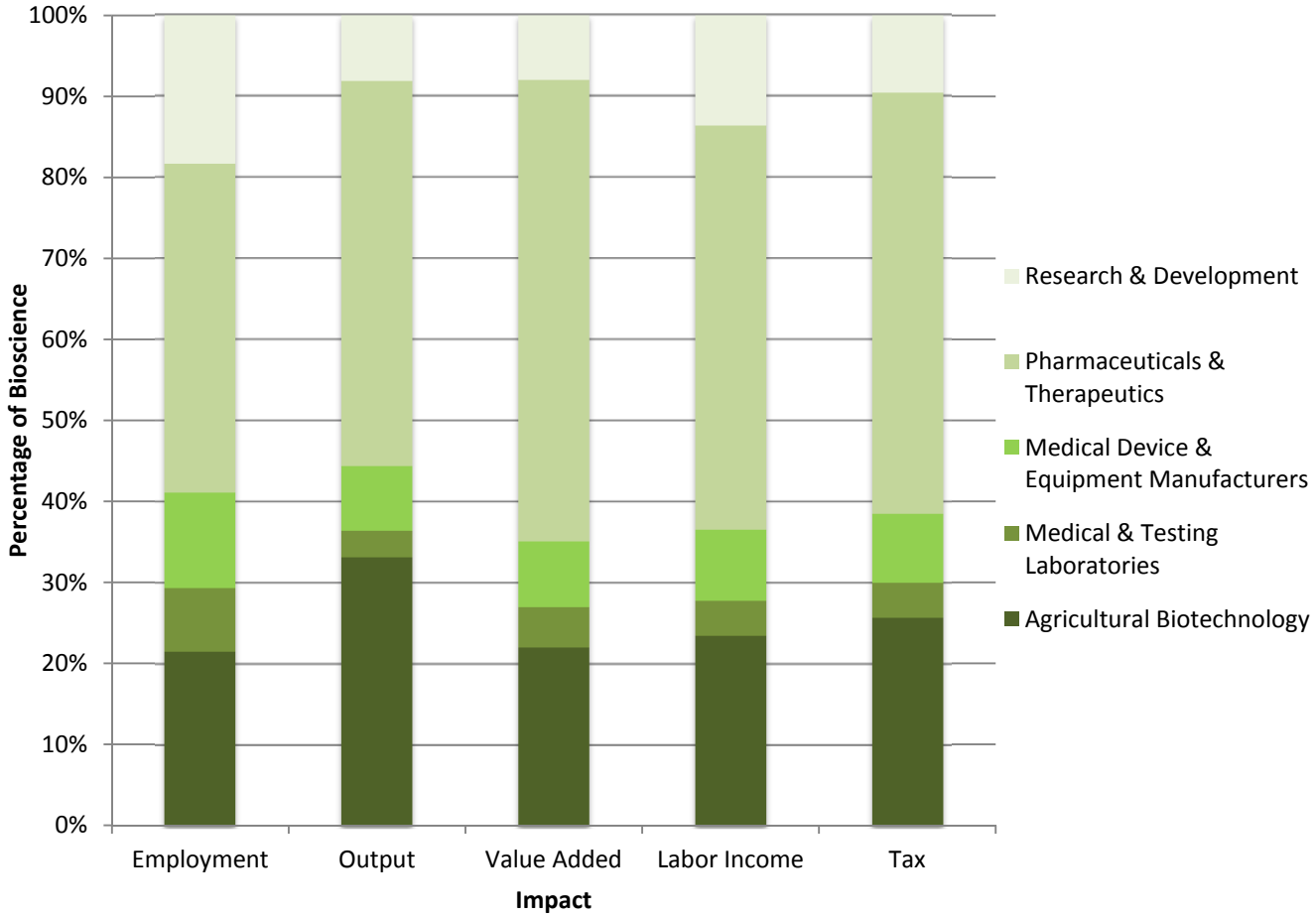
Note: Output, Value Added, Labor Income, and Tax in millions of dollars.

The *Pharmaceuticals & Therapeutics* subsector had the greatest impact not only on employment, but also on output, value added, labor income, and tax revenues.

Unique to Central Ohio is the *Research & Development* subsector, which is ranked third in terms of bioscience impact in the region. This subsector ranks fourth and fifth in all other regions. *Research & Development* accounts for 18% of the employment impact in Central Ohio, but accounts for only 10% of the employment impact statewide.

The *Medical Device & Equipment Manufacturers* and *Medical & Testing Laboratories* subsectors had the smallest impact on the Central region in all measures of economic impact. Combined, the two subsectors accounted for only 20% of the employment impact, 11% of the output impact, and 13% of value-added, labor income, and tax impacts.

Figure 16: Percentage of Economic Impact by Bioscience Subsector in the Central Region, 2009



Economic Impact of Bioscience in Southwest Ohio

The economic impact of bioscience in Southwest Ohio in 2009 was 43,189 jobs, $14.5 billion in output, $3.7 billion in value added, and $1.9 billion in labor income (Table 22). Of the employment impact, 34% was attributed to direct impact, 43% to indirect impact, and 23% to induced impact. Of the value-added impact of bioscience in Central Ohio, 33% was attributed to direct impact, 49% to indirect impact, and 19% to induced impact. A detailed look at the impact of the bioscience sector in the Southwest region is located in Appendix Table C4.

Table 22: Economic Impact of Bioscience in the Southwest Region (by Direct, Indirect, and Induced Impacts), 2009

	Employment	Output	Value Added	Labor Income
Direct	14,790	$9,923.4	$1,202.1	$285.7
Indirect	18,663	$3,423.7	$1,801.0	$1,194.3
Induced	9,737	$1,174.3	$689.7	$379.5
Total Bioscience	43,189	$14,521.5	$3,692.8	$1,859.6

Note: Output, Value Added, and Labor Income in millions of dollars.

Tax revenues in Southwest Ohio amounted to $796 million. Of that amount, 53% ($422 million) went to the federal government and 47% ($374 million) went to the state of Ohio and local governments.

Like the Central region, the *Pharmaceuticals & Therapeutics* subsector had the greatest impact on Southwest Ohio in terms of employment, value added, labor income, and tax impacts (Table 23). The second-largest impact in the Southwest region was *Agricultural Biotechnology,* which represented 24% of the total employment impact with 10,515 jobs.

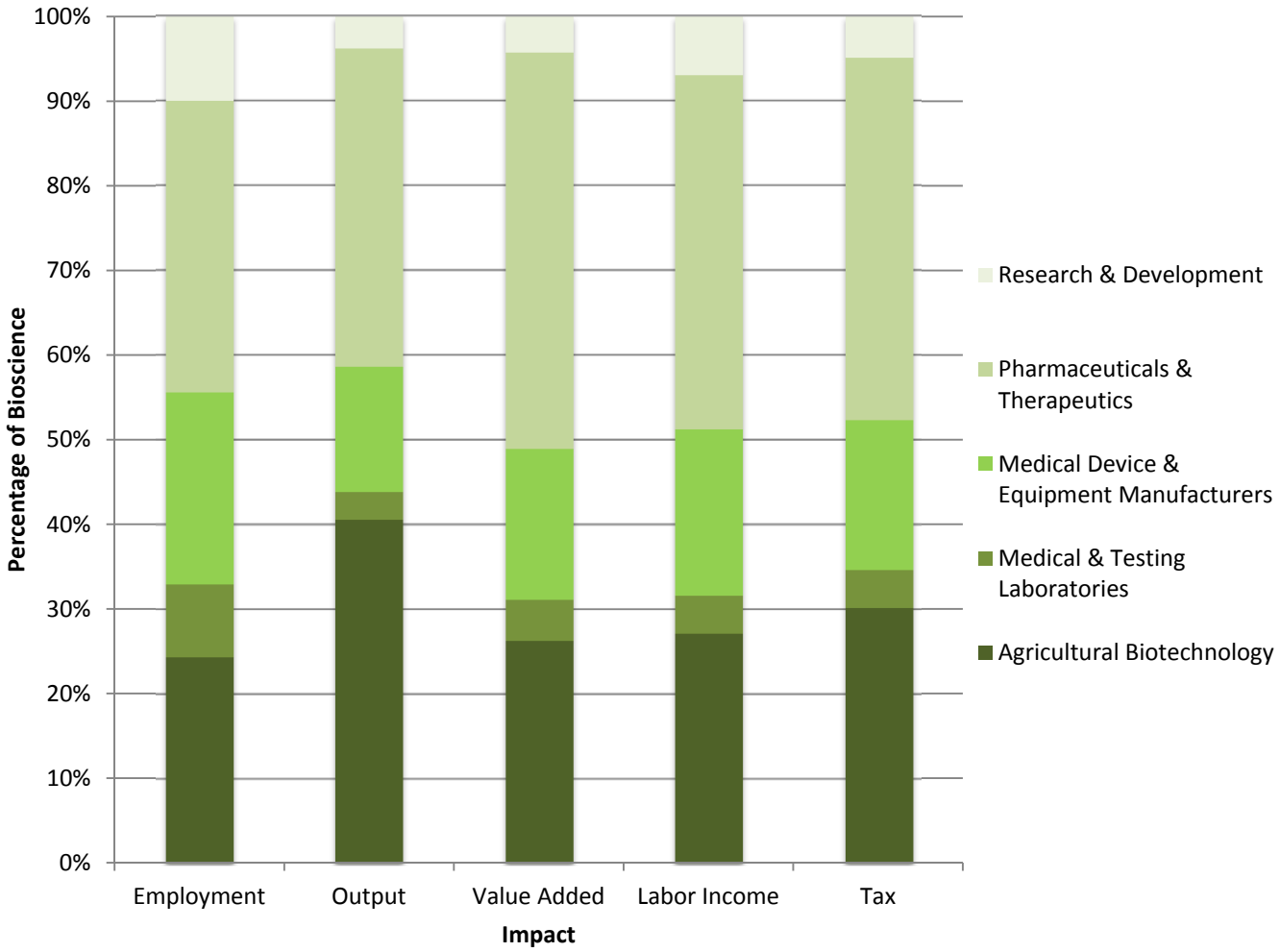
Table 23: Economic Impact of Bioscience by Subsector in the Southwest Region, 2009

	Employment	Output	Value Added	Labor Income	Tax
Agricultural Biotechnology	10,515	$5,893.8	$970.3	$504.4	$241.0
Medical & Testing Laboratories	3,751	$482.0	$181.9	$84.6	$34.8
Medical Device & Equipment Manufacturers	9,773	$2,137.8	$655.3	$363.7	$141.3
Pharmaceuticals & Therapeutics	14,834	$5,452.9	$1,727.8	$777.0	$340.9
Research & Development	4,316	$554.8	$157.5	$129.9	$38.6
Total Bioscience	43,189	$14,521.5	$3,692.8	$1,859.6	$796.5

Note: Output, Value Added, Labor Income, and Tax in millions of dollars.

The *Pharmaceuticals & Therapeutics* subsector represented 34% of the employment impact, 38% of the output impact, 47% of the value-added impact, 42% of the labor income impact, and 43% of the tax impact (Figure 17). *Agricultural Biotechnology* and *Medical Device & Equipment Manufacturers* were the next largest subsectors in the Southwest region.

Figure 17: Percentage of Economic Impact by Bioscience Subsector in the Southwest Region, 2009



Economic Impact of Bioscience in the West Central, Northwest, and Southeast Regions

The three remaining regions account for a small piece of Ohio's bioscience sector. Ranked by the size of their bioscience sector, the remaining regions are ordered as follows: West Central, Northwest, and Southeast. A detailed look at the impact of the bioscience sector in these three regions is located in Appendix Table C5, Appendix Table C6, and Appendix Table C7.

Similar to the state of Ohio as a whole, the *Agricultural Biotechnology* subsector had the greatest impact in all three of the aforementioned regions. In addition, the *Medical Device & Equipment Manufacturers* subsector was ranked second in terms of total regional economic impact. This contrasts with the state of Ohio as a whole where the *Pharmaceuticals & Therapeutics* subsector was ranked second.

Tables 24 through 26 show the total economic impact of the bioscience sector and its subsectors on the West Central, Northwest, and Southeast regions.

Table 24: Economic Impact of Bioscience by Subsector in the West Central Region, 2009

	Employment	Output	Value Added	Labor Income	Tax
Agricultural Biotechnology	4,989	$2,389.9	$443.7	$218.4	$103.9
Medical & Testing Laboratories	1,738	$224.7	$88.1	$34.1	$14.9
Medical Device & Equipment Manufacturers	4,253	$841.5	$224.6	$111.8	$44.3
Pharmaceuticals & Therapeutics	781	$328.4	$101.2	$36.9	$17.4
Research & Development	1,587	$205.4	$45.4	$41.1	$11.0
Total Bioscience	13,347	$3,990.0	$902.9	$442.4	$191.5

Note: Output, Value Added, Labor Income, and Tax in millions of dollars.

Table 25: Economic Impact of Bioscience by Subsector in the Northwest Region, 2009

	Employment	Output	Value Added	Labor Income	Tax
Agricultural Biotechnology	3,249	$1,819.8	$243.3	$113.0	$54.0
Medical & Testing Laboratories	1,196	$150.9	$60.5	$22.6	$9.9
Medical Device & Equipment Manufacturers	1,758	$316.9	$72.6	$34.6	$14.2
Pharmaceuticals & Therapeutics	271	$103.9	$23.0	$10.1	$4.3
Research & Development	600	$73.3	$13.6	$12.5	$3.3
Total Bioscience	7,074	$2,464.8	$413.0	$192.9	$85.7

Note: Output, Value Added, Labor Income, and Tax in millions of dollars.

Table 26: Economic Impact of Bioscience by Subsector in the Southeast Region, 2009

	Employment	Output	Value Added	Labor Income	Tax
Agricultural Biotechnology	1,362	$1,014.1	$118.9	$52.0	$28.3
Medical & Testing Laboratories	275	$31.1	$9.3	$3.9	$1.6
Medical Device & Equipment Manufacturers	1,003	$192.8	$47.0	$18.7	$8.0
Pharmaceuticals & Therapeutics	567	$236.5	$41.8	$14.9	$7.3
Research & Development	41	$4.9	$0.6	$0.6	$0.2
Total Bioscience	3,248	$1,479.3	$217.5	$90.0	$45.3

Note: Output, Value Added, Labor Income, and Tax in millions of dollars.

CONCLUDING COMMENTS

The bioscience sector in Ohio and the United States may represent a small percentage of the total employment in Ohio, but it is growing. The bioscience sector represents firms in manufacturing, professional, scientific, and technical services, and health care and social assistance. Bioscience sector firms range in function from *Biological Product Manufacturing* to *Testing Laboratories* to *Research & Development in Biotechnology*. They make products that assist in, among other things, wound management, crop production and pharmaceuticals, and services including DNA sequencing, and product and drug testing.

Bioscience firms are attractive in the global marketplace and are being targeted by many places. *Business Facilities* magazine cites over 40 regions in the United States alone that are targeting biotechnology companies.[13] They are attractive because biotechnology companies generally pay higher average wages and employ highly skilled individuals. Although Ohio may not be commonly associated with the bioscience industry, the shares of bioscience employment, payroll, and establishments in Ohio are larger than those of the United States as a whole. In fact, Ohio ranks fourth in the number of *Agricultural Feedstock & Chemicals* employees and establishments in the country after Texas, Illinois, and Iowa.[14] Ohio ranks seventh in the number of clinical trials[15], seventh in the number of bioscience higher education degrees, ninth overall in terms of academic bioscience research and development expenditures, and tenth in terms of National Institute of Health funding and bioscience occupational employment.[16]

Despite the recent recession, there are still signs of growth in the biosciences. According to the *Battelle/BIO State Bioscience Initiatives 2010* report, the U.S. Bureau of Labor Statistics projects that the bioscience sector will grow at an annual rate of 1.5% between 2008 and 2018. This would make it one of the fastest growing industry sectors in the United States.[17] Ernst & Young's *Beyond borders: global biotechnology report 2010* states that the biotechnology industry weathered the economic downturn and performed well in 2009. The report notes, however, the increasing difficulty in accessing research and development capital. Ernst & Young reports that the total capital raised by the industry in the United States increased in 2009 to $18 billion and the amount of venture capital raised increased to $4.6 billion.[18]

[13] http://businessfacilities.com/articles/outside-the-biotechnology-clusters.php?searched=biotechnology+strength&advsearch=oneword&highlight=ajaxSearch_highlight+ajaxSearch_highlight1+ajaxSearch_highlight2
[14] http://www.bio.org/local/battelle2010/Battelle_Report_2010.pdf
[15] BioOhio 2011
[16] http://www.bio.org/local/battelle2010/Battelle_Report_2010.pdf
[17] http://www.bio.org/local/battelle2010/Battelle_Report_2010.pdf
[18] http://www.ey.com/FR/fr/Newsroom/News-releases/Communique-de-presse---Beyond-Borders-Global-Biotechnology-Report-2010

One of the strongest programs in Ohio is the recently renewed Third Frontier. This $700 million program extension supports "existing industries that are transforming themselves with new globally competitive products and fostering the formation and attraction of new companies in emerging industry sectors."[19] This program funds many technology-based industries, including those in the biosciences. Also, programs like the Biomedical Research and Technology Transfer Trust Fund and the Thomas Edison Program Centers help set Ohio apart from the competition. In 2010, Ohio became the first state to establish a bioproducts preferred purchasing program.[20] Regionally, work is being done by BioEnterprise in Cleveland, BioStart in Cincinnati, the Biotechnology Research & Development Facility housed in the Innovation Center in Athens, TechColumbus, and the Akron Global Business Accelerator to advance the bioscience industry.

In Ohio in 2009, the bioscience sector employed 62,533 people, with a payroll of $4.3 billion and an average wage of $68,384, in 1,800 establishments. Despite some losses in 2009, Ohio's bioscience sector has seen growth. Employment has grown 2.0%, on average, each year between 2000 and 2009, payroll has grown 3.0%, on average, each year, average wages have grown 1.0%, on average, each year, and the number of establishments has increased, on average, 3.7% each year.

In short, the bioscience industry not only helps to discover solutions to the biological and environmental issues that face the world, but it is good for the economy of Ohio.

[19] http://thirdfrontier.com/ThirdFrontierCalendar/default.aspx
[20] http://www.bio.org/local/battelle2010/Battelle_Report_2010.pdf

APPENDIX

APPENDIX A: EMPLOYMENT, PAYROLL, AVERAGE WAGES & NUMBER OF ESTABLISHMENTS IN OHIO & SIX REGIONS, 2000-2009

Tables A1 – A7

Appendix Table A1: Employment, Payroll, Average Wage & Establishments in Ohio, 2000-2009

Table 1: Employment by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	9,837	9,857	9,820	9,881	9,788	9,189	9,372	9,520	10,029	9,933
Medical & Testing Laboratories	6,788	7,236	7,758	7,997	9,357	9,476	9,979	10,475	10,484	10,619
Medical Device & Equipment Manufacturers	21,282	21,893	22,082	21,338	21,414	21,732	21,685	21,712	22,011	22,047
Pharmaceuticals & Therapeutics	6,704	7,003	7,135	7,848	8,301	8,853	9,409	9,531	10,292	9,265
Research & Development	7,699	7,762	8,140	8,317	8,351	8,742	9,278	9,578	10,105	10,668
All Bioscience in Ohio	52,311	53,750	54,935	55,381	57,211	57,992	59,723	60,816	62,921	62,533

Table 2: Payroll by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007
Agricultural Biotechnology	$751,666,680	$749,004,431	$742,878,162	$797,587,165	$772,855,396	$772,679,079	$768,554,461	$835,702,814
Medical & Testing Laboratories	$297,544,998	$328,896,967	$348,638,749	$358,529,826	$398,814,533	$421,457,417	$455,130,085	$488,622,379
Medical Device & Equipment Manufacturers	$1,189,028,865	$1,213,379,190	$1,233,783,964	$1,272,274,559	$1,291,832,563	$1,263,218,178	$1,383,946,988	$1,347,273,935
Pharmaceuticals & Therapeutics	$510,545,563	$535,857,210	$608,341,204	$718,630,970	$650,906,829	$673,934,895	$811,978,810	$759,289,894
Research & Development	$516,764,058	$512,574,734	$577,487,562	$611,721,089	$623,959,832	$645,370,051	$737,510,288	$769,268,648
All Bioscience in Ohio	$3,265,550,169	$3,339,712,532	$3,511,129,640	$3,758,743,610	$3,738,369,154	$3,776,659,620	$4,157,120,631	$4,200,157,670

Subsector	2008	2009
Agricultural Biotechnology	$832,975,293	$804,373,120
Medical & Testing Laboratories	$474,453,381	$496,369,148
Medical Device & Equipment Manufacturers	$1,396,480,724	$1,448,378,524
Pharmaceuticals & Therapeutics	$819,500,316	$661,886,492
Research & Development	$823,227,656	$865,268,476
All Bioscience in Ohio	$4,346,637,370	$4,276,275,760

Appendix Table A1, Continued

Table 3: Average Wages by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	$76,412	$75,990	$75,652	$80,722	$78,962	$84,084	$82,008	$87,781	$83,057	$80,983
Medical & Testing Laboratories	$43,833	$45,456	$44,937	$44,830	$42,621	$44,476	$45,607	$46,646	$45,254	$46,742
Medical Device & Equipment Manufacturers	$55,869	$55,423	$55,872	$59,624	$60,327	$58,128	$63,821	$62,053	$63,444	$65,694
Pharmaceuticals & Therapeutics	$76,152	$76,515	$85,265	$91,573	$78,416	$76,125	$86,295	$79,663	$79,628	$71,439
Research & Development	$67,122	$66,040	$70,945	$73,548	$74,717	$73,826	$79,490	$80,317	$81,471	$81,105
All Bioscience in Ohio	$62,426	$62,134	$63,915	$67,870	$65,344	$65,124	$69,606	$69,063	$69,081	$68,384

Table 4: Establishments by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	117	121	121	123	124	126	128	134	140	163
Medical & Testing Laboratories	339	350	430	453	478	508	564	590	622	647
Medical Device & Equipment Manufacturers	589	609	609	615	616	626	627	624	607	604
Pharmaceuticals & Therapeutics	68	67	66	71	74	78	82	85	91	94
Research & Development	177	197	203	195	206	222	244	270	278	292
All Bioscience in Ohio	1,290	1,344	1,429	1,457	1,498	1,560	1,645	1,703	1,738	1,800

Notes:

All payroll and average wage figures have been inflated to 2009 dollars.

NA indicates data suppressed due to confidentiality restrictions.

The total is not equal to the summation of the regions because some companies were not able to be geocoded.

Source:

Quarterly Census of Employee Wages (QCEW)

Appendix Table A2: Employment, Payroll, Average Wage & Establishments in the Northeast Region, 2000-2009

Table 1: Employment by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	4,375	4,480	4,286	4,400	4,292	4,100	4,052	3,876	3,920	3,619
Medical & Testing Laboratories	2,419	2,592	3,096	3,073	3,273	3,344	3,476	3,632	3,712	3,717
Medical Device & Equipment Manufacturers	10,344	10,516	10,536	9,660	10,025	10,193	9,960	9,839	9,818	9,742
Pharmaceuticals & Therapeutics	1,196	1,309	1,488	1,627	1,672	1,945	2,178	1,982	2,279	2,351
Research & Development	2,132	2,001	2,157	2,000	1,845	1,798	1,842	1,940	1,969	1,999
All Bioscience in Northeast	20,466	20,899	21,563	20,760	21,107	21,380	21,509	21,268	21,699	21,427

Table 2: Payroll by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007
Agricultural Biotechnology	$373,009,959	$346,682,609	$354,541,297	$399,082,997	$380,810,905	$401,610,319	$384,273,351	$440,786,321
Medical & Testing Laboratories	$121,536,518	$129,233,284	$146,695,514	$145,594,498	$155,904,098	$171,489,361	$170,165,636	$188,450,241
Medical Device & Equipment Manufacturers	$555,776,275	$562,493,217	$539,238,821	$507,321,307	$578,725,375	$545,489,378	$522,775,089	$537,638,417
Pharmaceuticals & Therapeutics	$103,953,361	$99,442,882	$111,570,236	$133,789,888	$126,403,892	$136,978,042	$159,155,786	$156,413,140
Research & Development	$118,240,240	$104,500,877	$115,044,790	$126,079,951	$117,341,915	$103,689,370	$132,396,984	$123,654,202
All Bioscience in Northeast	$1,272,516,353	$1,242,352,869	$1,267,090,653	$1,311,868,641	$1,359,186,181	$1,359,256,475	$1,368,766,846	$1,446,942,321

Subsector	2008	2009
Agricultural Biotechnology	$405,761,366	$354,822,256
Medical & Testing Laboratories	$184,525,859	$190,293,628
Medical Device & Equipment Manufacturers	$554,858,477	$575,893,960
Pharmaceuticals & Therapeutics	$176,502,553	$176,064,968
Research & Development	$132,850,952	$147,320,640
All Bioscience in Northeast	$1,454,499,207	$1,444,395,452

Appendix Table A2, Continued

Table 3: Average Wages by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	$85,253	$77,390	$82,714	$90,694	$88,726	$97,946	$94,828	$113,722	$103,519	$98,044
Medical & Testing Laboratories	$50,239	$49,857	$47,376	$47,373	$47,630	$51,289	$48,950	$51,893	$49,710	$51,201
Medical Device & Equipment Manufacturers	$53,727	$53,488	$51,183	$52,518	$57,731	$53,515	$52,486	$54,644	$56,513	$59,115
Pharmaceuticals & Therapeutics	$86,942	$75,949	$74,997	$82,248	$75,585	$70,426	$73,085	$78,930	$77,436	$74,889
Research & Development	$55,470	$52,216	$53,336	$63,045	$63,610	$57,676	$71,876	$63,731	$67,463	$73,707
All Bioscience in Northeast	$62,177	$59,446	$58,762	$63,192	$64,396	$63,576	$63,638	$68,033	$67,032	$67,409

Table 4: Establishments by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	44	45	46	46	48	50	53	50	48	59
Medical & Testing Laboratories	125	126	166	171	177	185	212	223	229	244
Medical Device & Equipment Manufacturers	279	287	298	298	295	301	303	302	295	291
Pharmaceuticals & Therapeutics	20	20	19	20	22	22	24	29	31	28
Research & Development	61	71	72	69	69	76	78	88	88	92
All Bioscience in Northeast	529	549	601	605	611	634	670	692	691	714

Notes:

All payroll and average wage figures have been inflated to 2009 dollars.

NA indicates data suppressed due to confidentiality restrictions.

The total is not equal to the summation of the regions because some companies were not able to be geocoded.

Source:

Quarterly Census of Employee Wages (QCEW)

Appendix Table A3: Employment, Payroll, Average Wage & Establishments in the Central Region, 2000-2009

Table 1: Employment by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	1,793	1,700	1,791	1,659	1,675	1,612	1,667	1,683	1,869	2,066
Medical & Testing Laboratories	1,383	1,535	1,403	1,562	1,856	1,943	2,028	2,131	2,053	2,101
Medical Device & Equipment Manufacturers	1,536	1,538	1,955	2,199	2,284	2,457	2,418	2,494	2,611	02,614
Pharmaceuticals & Therapeutics	2,571	2,646	2,576	3,185	3,342	3,428	3,516	3,985	4,350	3,244
Research & Development	3,219	3,552	3,567	3,659	3,746	3,929	4,195	4,199	4,338	4,469
All Bioscience in Central	10,502	10,971	11,292	12,264	12,903	13,370	13,824	14,492	15,222	14,493

Table 2: Payroll by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007
Agricultural Biotechnology	$122,332,367	$157,716,559	$140,238,292	$148,200,499	$157,184,988	$126,497,102	$149,844,208	$143,407,692
Medical & Testing Laboratories	$58,090,291	$70,911,930	$71,789,610	$75,439,515	$86,628,787	$85,868,991	$92,964,221	$98,154,591
Medical Device & Equipment Manufacturers	$71,165,187	$75,879,482	$96,380,029	$122,770,202	$117,758,398	$140,801,720	$132,451,694	$131,419,822
Pharmaceuticals & Therapeutics	$179,149,005	$207,582,704	$232,857,309	$344,788,906	$275,011,018	$273,694,236	$361,235,401	$330,032,924
Research & Development	$236,369,728	$260,976,563	$283,933,304	$290,660,205	$303,103,181	$310,463,879	$335,548,859	$364,932,235
All Bioscience in Central	$667,106,579	$773,067,238	$825,198,540	$981,859,326	$939,686,373	$937,325,933	$1,072,044,387	$1,067,947,263

Subsector	2008	2009
Agricultural Biotechnology	$142,074,735	$177,014,556
Medical & Testing Laboratories	$89,285,736	$94,264,232
Medical Device & Equipment Manufacturers	$137,659,959	$146,092,876
Pharmaceuticals & Therapeutics	$367,428,270	$229,715,616
Research & Development	$360,263,179	$389,334,260
All Bioscience in Central	$1,096,711,879	$1,036,421,540

Appendix Table A3, Continued

Table 3: Average Wages by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	$68,228	$92,792	$78,302	$89,349	$93,823	$78,472	$89,906	$85,226	$76,003	$85,694
Medical & Testing Laboratories	$42,004	$46,185	$51,179	$48,285	$46,663	$44,185	$45,851	$46,058	$43,492	$44,870
Medical Device & Equipment Manufacturers	$46,332	$49,347	$49,291	$55,822	$51,565	$57,299	$54,770	$52,694	$52,716	$55,882
Pharmaceuticals & Therapeutics	$69,681	$78,461	$90,383	$108,243	$82,281	$79,833	$102,740	$82,819	$84,466	$70,820
Research & Development	$73,420	$73,469	$79,600	$79,442	$80,923	$79,029	$79,982	$86,902	$83,049	$87,122
All Bioscience in Central	$63,519	$70,467	$73,076	$80,057	$72,825	$70,109	$77,551	$73,692	$72,050	$71,510

Table 4: Establishments by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	21	21	22	23	24	25	24	26	27	35
Medical & Testing Laboratories	51	52	69	74	80	90	104	108	108	107
Medical Device & Equipment Manufacturers	84	87	87	88	89	93	86	87	84	81
Pharmaceuticals & Therapeutics	13	12	9	12	15	15	16	16	19	19
Research & Development	30	33	36	37	39	46	50	50	47	50
All Bioscience in Central	200	205	223	234	247	269	280	287	285	291

Notes:

All payroll and average wage figures have been inflated to 2009 dollars.

NA indicates data suppressed due to confidentiality restrictions.

The total is not equal to the summation of the regions because some companies were not able to be geocoded.

Source:

Quarterly Census of Employee Wages (QCEW)

Appendix Table A4: Employment, Payroll, Average Wage & Establishments in the Southwest Region, 2000-2009

Table 1: Employment by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	1,993	2,004	1,997	1,952	1,891	1,580	1,702	1,858	1,926	2,023
Medical & Testing Laboratories	1,165	1,189	1,303	1,217	2,072	1,941	2,187	2,382	2,356	2,359
Medical Device & Equipment Manufacturers	5,350	5,665	5,587	5,712	5,267	4,939	4,866	4,893	4,900	4,903
Pharmaceuticals & Therapeutics	2,526	2,682	2,622	2,552	2,769	2,991	3,163	3,004	3,066	2,997
Research & Development	1,224	1,124	1,294	1,457	1,544	1,675	1,716	1,910	2,152	2,508
All Bioscience in Southwest	12,259	12,663	12,804	12,890	13,543	13,125	13,634	14,049	14,401	14,790

Table 2: Payroll by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007
Agricultural Biotechnology	$164,289,099	$157,724,598	$155,206,027	$150,288,381	$134,684,259	$134,082,269	$126,702,401	$141,748,985
Medical & Testing Laboratories	$50,032,333	$49,531,133	$54,787,034	$52,595,971	$74,451,392	$76,010,617	$89,827,031	$95,046,214
Medical Device & Equipment Manufacturers	$373,912,899	$377,376,354	$404,674,903	$453,574,430	$409,899,760	$386,618,569	$495,472,856	$457,486,484
Pharmaceuticals & Therapeutics	$206,353,304	$208,569,519	$238,057,553	$213,015,989	$222,245,461	$235,348,602	$256,816,843	$239,039,372
Research & Development	$93,430,081	$80,025,562	$107,443,833	$117,446,617	$123,009,805	$141,110,128	$166,117,052	$173,779,861
All Bioscience in Southwest	$888,017,716	$873,227,170	$960,169,349	$986,921,390	$964,290,681	$973,170,186	$1,134,936,184	$1,107,100,916

Subsector	2008	2009
Agricultural Biotechnology	$143,340,865	$154,368,532
Medical & Testing Laboratories	$91,984,181	$97,981,492
Medical Device & Equipment Manufacturers	$459,875,053	$467,426,444
Pharmaceuticals & Therapeutics	$234,487,512	$213,691,252
Research & Development	$216,323,919	$209,518,288
All Bioscience in Southwest	$1,146,011,530	$1,142,986,008

Appendix Table A4, Continued

Table 3: Average Wages by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	$82,433	$78,718	$77,707	$76,992	$71,224	$84,862	$74,443	$76,278	$74,411	$76,294
Medical & Testing Laboratories	$42,946	$41,654	$42,052	$43,216	$35,934	$39,169	$41,070	$39,896	$39,035	$41,534
Medical Device & Equipment Manufacturers	$69,890	$66,619	$72,427	$79,403	$77,819	$78,284	$101,830	$93,498	$93,852	$95,341
Pharmaceuticals & Therapeutics	$81,681	$77,766	$90,781	$83,470	$80,272	$78,686	$81,194	$79,565	$76,488	$71,310
Research & Development	$76,321	$71,220	$83,046	$80,612	$79,685	$84,266	$96,821	$90,962	$100,513	$83,546
All Bioscience in Southwest	$72,441	$68,959	$74,992	$76,563	$71,204	$74,147	$83,246	$78,806	$79,581	$77,283

Table 4: Establishments by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	19	22	20	22	21	18	18	22	22	24
Medical & Testing Laboratories	55	57	62	63	68	74	79	91	96	108
Medical Device & Equipment Manufacturers	79	83	77	79	77	79	83	82	80	80
Pharmaceuticals & Therapeutics	19	20	22	23	24	27	27	26	30	30
Research & Development	32	34	34	32	35	34	40	43	52	52
All Bioscience in Southwest	204	216	216	219	225	231	247	264	280	294

Notes:

All payroll and average wage figures have been inflated to 2009 dollars.

NA indicates data suppressed due to confidentiality restrictions.

The total is not equal to the summation of the regions because some companies were not able to be geocoded.

Source:

Quarterly Census of Employee Wages (QCEW)

Appendix Table A5: Employment, Payroll, Average Wage & Establishments in the West Central Region, 2000-2009

Table 1: Employment by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	623	716	798	878	914	958	983	942	980	965
Medical & Testing Laboratories	1,004	1,034	1,074	1,087	1,085	1,139	1,123	1,125	1,178	1,188
Medical Device & Equipment Manufacturers	1,704	1,787	1,765	1,703	1,798	2,012	2,311	2,328	2,525	2,624
Pharmaceuticals & Therapeutics	NA	NA	167	NA	185	164	158	178	NA	NA
Research & Development	NA	NA	760	NA	801	855	902	917	NA	NA
All Bioscience in West Central	4,228	4,424	4,563	4,646	4,783	5,129	5,476	5,489	5,797	5,978

Table 2: Payroll by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007
Agricultural Biotechnology	$40,841,773	$41,523,034	$45,983,093	$49,967,837	$51,971,220	$55,399,780	$48,468,383	$46,185,695
Medical & Testing Laboratories	$34,119,406	$35,904,220	$38,991,915	$42,801,998	$38,626,389	$43,021,749	$47,332,633	$47,104,289
Medical Device & Equipment Manufacturers	$83,468,308	$87,869,015	$81,704,500	$85,098,826	$86,219,697	$92,197,708	$125,311,672	$115,958,961
Pharmaceuticals & Therapeutics	NA	NA	$9,978,093	NA	$9,982,544	$8,784,242	$10,314,252	$12,476,271
Research & Development	NA	NA	$51,332,346	NA	$54,344,207	$59,225,643	$64,197,311	$66,023,682
All Bioscience in West Central	$215,636,887	$223,087,850	$227,989,948	$242,220,459	$241,144,057	$258,629,126	$295,624,250	$287,748,902

Subsector	2008	2009
Agricultural Biotechnology	$53,134,777	$52,126,024
Medical & Testing Laboratories	$48,171,839	$49,057,644
Medical Device & Equipment Manufacturers	$136,227,715	$145,907,100
Pharmaceuticals & Therapeutics	NA	NA
Research & Development	NA	NA
All Bioscience in West Central	$320,544,937	$333,986,436

Appendix Table A5, Continued

Table 3: Average Wages by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	$65,591	$57,993	$57,647	$56,890	$56,861	$57,809	$49,290	$49,029	$54,219	$54,017
Medical & Testing Laboratories	$33,984	$34,727	$36,301	$39,383	$35,598	$37,770	$42,165	$41,859	$40,895	$41,297
Medical Device & Equipment Manufacturers	$48,993	$49,171	$46,300	$49,960	$47,953	$45,824	$54,232	$49,818	$53,959	$55,605
Pharmaceuticals & Therapeutics	NA	NA	$59,631	NA	$53,864	$53,562	$65,280	$70,222	NA	NA
Research & Development	NA	NA	$67,574	NA	$67,869	$69,245	$71,205	$72,036	NA	NA
All Bioscience in West Central	$51,005	$50,429	$49,960	$52,137	$50,416	$50,428	$53,984	$52,421	$55,296	$55,866

Table 4: Establishments by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	8	9	10	10	10	10	10	9	13	14
Medical & Testing Laboratories	46	47	52	55	56	60	65	66	69	73
Medical Device & Equipment Manufacturers	64	68	63	66	69	69	71	71	68	69
Pharmaceuticals & Therapeutics	NA	NA	5	NA	4	4	4	4	NA	NA
Research & Development	NA	NA	30	NA	29	31	37	40	NA	NA
All Bioscience in West Central	151	161	160	167	168	174	187	189	193	205

Notes:

All payroll and average wage figures have been inflated to 2009 dollars.

NA indicates data suppressed due to confidentiality restrictions.

The total is not equal to the summation of the regions because some companies were not able to be geocoded.

Source:

Quarterly Census of Employee Wages (QCEW)

Appendix Table A6: Employment, Payroll, Average Wage & Establishments in the Northwest Region, 2000-2009

Table 1: Employment by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	764	773	746	798	815	741	744	737	840	788
Medical & Testing Laboratories	727	776	739	851	847	852	902	884	834	830
Medical Device & Equipment Manufacturers	1,304	1,343	1,255	1,120	1,156	1,222	1,211	1,186	1,185	1,176
Pharmaceuticals & Therapeutics	NA	NA	69	NA	65	56	73	77	79	89
Research & Development	NA	NA	216	NA	257	283	339	358	392	397
All Bioscience in Northwest	3,055	3,152	3,026	3,092	3,140	3,154	3,270	3,243	3,331	3,280

Table 2: Payroll by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007
Agricultural Biotechnology	$34,707,498	$34,006,210	$34,997,635	$37,185,987	$36,763,368	$43,148,531	$45,974,166	$37,378,250
Medical & Testing Laboratories	$30,188,340	$38,979,963	$30,179,136	$32,553,994	$31,721,046	$32,564,335	$40,243,473	$42,322,243
Medical Device & Equipment Manufacturers	$50,381,512	$53,325,239	$53,605,231	$47,177,444	$46,306,280	$47,423,004	$49,781,682	$46,505,089
Pharmaceuticals & Therapeutics	NA	NA	$2,894,225	NA	$3,196,568	$3,072,154	$4,234,198	$4,369,744
Research & Development	NA	NA	$10,383,564	NA	$12,415,666	$13,064,877	$20,189,374	$19,393,189
All Bioscience in Northwest	$125,868,656	$137,176,949	$132,059,791	$133,820,688	$130,402,928	$139,272,901	$160,422,894	$149,968,520

Subsector	2008	2009
Agricultural Biotechnology	$55,890,140	$35,240,092
Medical & Testing Laboratories	$37,358,954	$38,689,936
Medical Device & Equipment Manufacturers	$45,146,381	$45,158,964
Pharmaceuticals & Therapeutics	$5,035,508	$4,932,124
Research & Development	$22,561,066	$21,330,092
All Bioscience in Northwest	$165,992,050	$145,351,208

Appendix Table A6, Continued

Table 3: Average Wages by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	$45,448	$44,011	$46,893	$46,599	$45,108	$58,230	$61,793	$50,717	$66,562	$44,740
Medical & Testing Laboratories	$41,503	$50,241	$40,813	$38,233	$37,460	$38,213	$44,596	$47,858	$44,770	$46,616
Medical Device & Equipment Manufacturers	$38,626	$39,696	$42,702	$42,110	$40,046	$38,818	$41,097	$39,201	$38,088	$38,390
Pharmaceuticals & Therapeutics	NA	NA	$41,746	NA	$49,429	$54,539	$57,742	$56,508	$63,475	$55,212
Research & Development	NA	NA	$48,105	NA	$48,314	$46,203	$59,631	$54,166	$57,542	$53,786
All Bioscience in Northwest	$41,197	$43,527	$43,637	$43,282	$41,533	$44,158	$49,064	$46,243	$49,834	$44,316

Table 4: Establishments by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	14	14	13	13	13	15	15	16	17	18
Medical & Testing Laboratories	40	42	50	52	50	53	61	54	63	61
Medical Device & Equipment Manufacturers	51	50	49	51	52	51	51	49	49	50
Pharmaceuticals & Therapeutics	NA	NA	4	NA	4	4	5	4	4	4
Research & Development	NA	NA	11	NA	10	11	12	10	12	12
All Bioscience in Northwest	119	121	127	130	129	134	145	133	145	145

Notes:

All payroll and average wage figures have been inflated to 2009 dollars.

NA indicates data suppressed due to confidentiality restrictions.

The total is not equal to the summation of the regions because some companies were not able to be geocoded.

Source:

Quarterly Census of Employee Wages (QCEW)

Appendix Table A7: Employment, Payroll, Average Wage & Establishments in the Southeast Region, 2000-2009

Table 1: Employment by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	193	166	176	165	178	167	191	389	457	401
Medical & Testing Laboratories	62	82	98	100	112	130	140	157	165	217
Medical Device & Equipment Manufacturers	949	912	853	798	730	713	702	707	723	740
Pharmaceuticals & Therapeutics	153	123	144	170	202	195	213	229	NA	NA
Research & Development	41	49	57	53	36	43	103	54	NA	NA
All Bioscience in Southeast	1,398	1,332	1,328	1,286	1,257	1,248	1,349	1,536	1,675	1,695

Table 2: Payroll by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007
Agricultural Biotechnology	$10,201,622	$10,016,057	$9,763,285	$9,823,322	$9,088,208	$8,611,557	$11,147,543	$23,576,285
Medical & Testing Laboratories	$1,796,366	$2,332,662	$2,880,911	$3,280,388	$3,504,433	$4,100,926	$5,071,312	$5,385,247
Medical Device & Equipment Manufacturers	$44,639,927	$45,507,389	$46,504,911	$39,089,287	$35,221,177	$31,729,426	$36,137,224	$34,594,608
Pharmaceuticals & Therapeutics	$3,997,175	$3,187,689	$4,252,112	$5,464,260	$6,786,837	$7,397,446	$9,204,814	$9,546,040
Research & Development	$1,356,680	$1,583,691	$1,897,624	$1,751,308	$1,704,642	$1,644,931	$3,720,328	$2,137,913
All Bioscience in Southeast	$61,991,769	$62,627,493	$65,298,843	$59,408,560	$56,305,296	$53,484,285	$65,281,221	$75,240,093

Subsector	2008	2009
Agricultural Biotechnology	$29,628,351	$25,611,756
Medical & Testing Laboratories	$5,919,429	$7,728,772
Medical Device & Equipment Manufacturers	$35,146,261	$36,034,084
Pharmaceuticals & Therapeutics	NA	NA
Research & Development	NA	NA
All Bioscience in Southeast	$84,557,580	$85,262,468

Appendix Table A7, Continued

Table 3: Average Wages by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	$52,768	$60,218	$55,473	$59,416	$51,152	$51,465	$58,263	$60,607	$64,832	$63,870
Medical & Testing Laboratories	$29,049	$28,378	$29,289	$32,696	$31,278	$31,601	$36,283	$34,273	$35,960	$35,621
Medical Device & Equipment Manufacturers	$47,039	$49,898	$54,519	$49,004	$48,270	$44,522	$51,502	$48,909	$48,634	$48,695
Pharmaceuticals & Therapeutics	$26,069	$25,916	$29,596	$32,205	$33,653	$37,872	$43,148	$41,686	NA	NA
Research & Development	$33,358	$32,479	$33,198	$33,257	$47,129	$37,954	$36,001	$39,872	NA	NA
All Bioscience in Southeast	$44,337	$47,007	$49,164	$46,209	$44,786	$42,841	$48,377	$48,982	$50,497	$50,305

Table 4: Establishments by Subsector

Subsector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agricultural Biotechnology	6	5	5	5	4	4	4	6	8	8
Medical & Testing Laboratories	13	15	14	17	21	22	21	24	25	25
Medical Device & Equipment Manufacturers	22	21	22	22	22	21	20	19	18	18
Pharmaceuticals & Therapeutics	5	4	4	4	4	4	3	3	NA	NA
Research & Development	4	5	5	5	5	5	6	7	NA	NA
All Bioscience in Southeast	49	49	49	52	56	56	54	58	58	59

Notes:

All payroll and average wage figures have been inflated to 2009 dollars.

NA indicates data suppressed due to confidentiality restrictions.

The total is not equal to the summation of the regions because some companies were not able to be geocoded.

Source:

Quarterly Census of Employee Wages (QCEW)

APPENDIX B: SUMMARY OF EMPLOYMENT, PAYROLL, AVERAGE WAGES & NUMBER OF ESTABLISHMENTS BY SUBSECTOR AND REGION, 2009

Tables B1 – B4

Appendix Table B1: Employment by Subsector and Region, 2009

Subsector	Northeast	Central	Southwest	West Central	Northwest	Southeast	Unspecified County[21]	State of Ohio
Agricultural Biotechnology	3,619	2,066	2,023	965	788	401	71	9,933
Medical & Testing Laboratories	3,717	2,101	2,359	1,188	830	217	208	10,619
Medical Device & Equipment Manufacturers	9,742	2,614	4,903	2,624	1,176	740	248	22,047
Pharmaceuticals & Therapeutics	2,351	3,244	2,997	NA[22]	89	NA	93	9,265
Research & Development	1,999	4,469	2,508	NA	397	NA	249	10,668
All BIO in Ohio	21,427	14,493	14,790	5,978	3,280	1,695	870	62,533

Appendix Table B2: Payroll by Subsector and Region, 2009

Subsector	Northeast	Central	Southwest	West Central	Northwest	Southeast	Unspecified County	State of Ohio
Agricultural Biotechnology	354,822,256	177,014,556	154,368,532	52,126,024	35,240,092	25,611,756	5,189,904	804,373,120
Medical & Testing Laboratories	190,293,628	94,264,232	97,981,492	49,057,644	38,689,936	7,728,772	18,353,448	496,369,148
Medical Device & Equipment Manufacturers	575,893,960	146,092,876	467,426,444	145,907,100	45,158,964	36,034,084	31,865,096	1,448,378,524
Pharmaceuticals & Therapeutics	176,064,968	229,715,616	213,691,252	NA	4,932,124	NA	8,511,360	661,886,492
Research & Development	147,320,640	389,334,260	209,518,288	NA	21,330,092	NA	23,952,840	865,268,476
All BIO in Ohio	1,444,395,452	1,036,421,540	1,142,986,008	333,986,436	145,351,208	85,262,468	87,872,648	4,276,275,760

[21] The "Unspecified County" designation refers to establishments that are statewide or could not be placed into one of the regions.
[22] NA indicates suppressed data

Appendix Table B3: Average Wage by Subsector and Region, 2009

Subsector	Northeast	Central	Southwest	West Central	Northwest	Southeast	Unspecified County[23]	State of Ohio
Agricultural Biotechnology	98,044	85,694	76,294	54,017	44,740	63,870	73,097	80,983
Medical & Testing Laboratories	51,201	44,870	41,534	41,297	46,616	35,621	88,217	46,742
Medical Device & Equipment Manufacturers	59,115	55,882	95,341	55,605	38,390	48,695	128,488	65,694
Pharmaceuticals & Therapeutics	74,889	70,820	71,310	NA[24]	55,212	NA	91,196	71,439
Research & Development	73,707	87,122	83,546	NA	53,786	NA	96,115	81,105
All BIO in Ohio	67,409	71,510	77,283	55,866	44,316	50,305	101,051	68,384

Appendix Table B4: Establishments by Subsector and Region, 2009

Subsector	Northeast	Central	Southwest	West Central	Northwest	Southeast	Unspecified County	State of Ohio
Agricultural Biotechnology	59	35	24	14	18	8	5	163
Medical & Testing Laboratories	244	107	108	73	61	25	29	647
Medical Device & Equipment Manufacturers	291	81	80	69	50	18	15	604
Pharmaceuticals & Therapeutics	28	19	30	NA	4	NA	5	94
Research & Development	92	50	52	NA	12	NA	36	292
All BIO in Ohio	714	291	294	205	145	59	92	1,800

[23] The "Unspecified County" designation refers to establishments that are statewide or could not be placed into one of the regions.
[24] NA indicates suppressed data

APPENDIX C: ECONOMIC IMPACT OF BIOSCIENCE IN OHIO & SIX REGIONS, 2009

Tables C1 – C7

Appendix Table C1: Economic Impact of Bioscience in Ohio, 2009

	Employment				Output			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	9,933	38,504	16,760	65,197	$20,070,149,115	$8,156,057,930	$1,951,900,725	$30,178,107,769
Medical & Testing Laboratories	10,619	4,174	2,319	17,112	$1,386,600,993	$494,125,234	$270,176,662	$2,150,902,889
Medical Device & Equipment Manufacturers	22,047	15,635	9,356	47,038	$6,654,389,442	$2,598,671,328	$1,090,050,097	$10,343,110,868
Pharmaceuticals & Therapeutics	9,265	24,745	13,700	47,710	$10,580,071,124	$4,315,695,550	$1,595,862,205	$16,491,628,879
Research & Development	10,668	4,847	3,262	18,777	$1,489,040,893	$609,078,108	$380,030,467	$2,478,149,467
Total Bioscience	62,533	87,906	45,396	195,835	$40,180,251,568	$16,173,628,099	$5,288,019,867	$61,641,899,533

	Value Added				Labor Income			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	$957,845,089	$3,478,666,744	$1,118,773,017	$5,555,284,851	$201,093,282	$2,013,992,504	$618,995,961	$2,834,081,747
Medical & Testing Laboratories	$400,248,008	$286,286,737	$154,853,036	$841,387,780	$124,092,286	$183,621,854	$85,698,432	$393,412,572
Medical Device & Equipment Manufacturers	$964,240,585	$1,372,562,141	$624,763,426	$2,961,566,151	$362,094,628	$880,270,075	$345,774,240	$1,588,138,942
Pharmaceuticals & Therapeutics	$1,902,947,341	$2,363,974,718	$914,682,778	$5,181,604,836	$165,471,617	$1,650,413,855	$506,169,137	$2,322,054,609
Research & Development	$113,854,982	$336,059,159	$217,814,646	$667,728,787	$216,317,122	$216,918,631	$120,550,277	$553,786,030
Total Bioscience	$4,339,136,005	$7,837,549,569	$3,030,886,719	$15,207,572,293	$1,069,068,935	$4,945,216,926	$1,677,187,973	$7,691,473,834

	Tax		
	Federal Government Non Defense	State/Local Government Non Education	Total
Agricultural Biotechnology	$622,869,037	$684,114,014	$1,306,983,051
Medical & Testing Laboratories	$87,700,314	$69,532,354	$157,232,668
Medical Device & Equipment Manufacturers	$335,773,493	$285,944,213	$621,717,706
Pharmaceuticals & Therapeutics	$531,132,778	$463,851,628	$994,984,406
Research & Development	$97,963,287	$63,106,469	$161,069,756
Total Bioscience	$1,675,438,856	$1,566,548,647	$3,241,987,503

Appendix Table C2: Economic Impact of Bioscience in the Northeast Region, 2009

	Employment				Output			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	3,619	12,297	5,803	21,719	$7,699,006,250	$2,494,893,500	$652,249,532	$10,846,149,282
Medical & Testing Laboratories	3,717	1,508	878	6,102	$468,874,078	$172,325,769	$98,690,383	$739,890,230
Medical Device & Equipment Manufacturers	9,742	7,413	4,376	21,531	$3,193,944,788	$1,230,753,987	$491,993,988	$4,916,692,763
Pharmaceuticals & Therapeutics	2,351	5,873	3,261	11,485	$2,435,639,275	$972,758,623	$366,584,909	$3,774,982,807
Research & Development	1,999	886	591	3,475	$272,280,128	$107,405,167	$66,455,428	$446,140,723
Total Bioscience	21,427	7,977	14,909	64,313	$14,069,744,519	$4,978,136,946	$1,675,974,111	$20,723,855,576

	Value Added				Labor Income			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	$372,037,954	$1,093,768,477	$377,885,700	$1,843,692,130	$88,705,565	$657,343,964	$210,121,286	$956,170,815
Medical & Testing Laboratories	$118,997,498	$100,073,291	$57,177,725	$276,248,513	$47,573,409	$65,583,526	$31,798,928	$144,955,863
Medical Device & Equipment Manufacturers	$425,592,240	$650,158,514	$285,044,469	$1,360,795,222	$143,973,487	$420,287,050	$158,529,227	$722,789,765
Pharmaceuticals & Therapeutics	$407,067,898	$544,935,453	$212,385,511	$1,164,388,863	$44,016,241	$375,977,485	$118,109,798	$538,103,524
Research & Development	$18,569,267	$59,976,000	$38,502,072	$117,047,338	$36,830,160	$39,421,583	$21,413,736	$97,665,478
Total Bioscience	$1,342,264,856	$2,448,911,709	$970,995,401	$4,762,171,966	$361,098,861	$1,558,613,596	$539,972,935	$2,459,685,392

	Tax		
	Federal Government Non Defense	State/Local Government Non Education	Total
Agricultural Biotechnology	$210,950,001	$235,463,888	$446,413,889
Medical & Testing Laboratories	$30,896,346	$23,254,452	$54,150,798
Medical Device & Equipment Manufacturers	$154,946,662	$134,378,209	$289,324,871
Pharmaceuticals & Therapeutics	$122,492,136	$108,081,504	$230,573,640
Research & Development	$17,431,558	$11,214,212	$28,645,770
Total Bioscience	$536,716,685	$512,392,253	$1,049,108,938

Appendix Table C3: Economic Impact of Bioscience in the Central Region, 2009

	Employment				Output			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	2,066	4,803	2,232	9,101	$3,105,149,284	$916,807,840	$265,191,301	$4,287,148,425
Medical & Testing Laboratories	2,101	773	402	3,276	$283,089,041	$92,198,816	$47,728,812	$423,016,669
Medical Device & Equipment Manufacturers	2,614	1,504	837	4,955	$710,324,719	$230,639,568	$99,406,882	$1,040,371,169
Pharmaceuticals & Therapeutics	3,244	9,146	4,722	17,112	$4,062,339,511	$1,511,664,491	$561,029,375	$6,135,033,377
Research & Development	4,469	1,972	1,291	7,732	$653,289,464	$243,950,900	$153,407,578	$1,050,647,942
Total Bioscience	14,493	8,199	9,484	42,176	$8,814,192,019	$2,995,261,641	$1,126,763,759	$12,936,217,420

	Value Added				Labor Income			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	$167,017,606	$454,263,536	$157,284,254	$778,565,395	$44,253,637	$279,526,898	$85,288,426	$409,068,962
Medical & Testing Laboratories	$91,944,244	$55,801,056	$28,308,150	$176,053,450	$23,566,059	$34,815,622	$15,351,746	$73,733,427
Medical Device & Equipment Manufacturers	$93,491,960	$132,882,043	$58,958,723	$285,332,726	$36,523,220	$85,105,595	$31,974,285	$153,603,100
Pharmaceuticals & Therapeutics	$798,726,032	$876,373,987	$332,745,537	$2,007,845,556	$57,428,904	$627,723,470	$180,435,826	$865,588,200
Research & Development	$51,019,355	$140,431,181	$90,987,051	$282,437,588	$97,333,570	$90,450,575	$49,344,892	$237,129,037
Total Bioscience	$1,202,199,198	$1,659,751,795	$668,283,605	$3,530,234,597	$259,105,390	$1,117,622,156	$362,395,116	$1,739,122,662

	Tax		
	Federal Government Non Defense	State/Local Government Non Education	Total
Agricultural Biotechnology	$89,361,302	$97,724,219	$187,085,521
Medical & Testing Laboratories	$17,374,395	$14,611,753	$31,986,148
Medical Device & Equipment Manufacturers	$32,512,783	$28,596,985	$61,109,768
Pharmaceuticals & Therapeutics	$201,567,759	$176,709,494	$378,277,253
Research & Development	$41,712,913	$27,575,830	$69,288,743
Total Bioscience	$382,529,150	$345,218,267	$727,747,417

Appendix Table C4: Economic Impact of Bioscience in the Southwest Region, 2009

	Employment				Output			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	2,023	5,847	2,644	10,515	$4,335,495,013	$1,239,444,810	$318,891,400	$5,893,831,223
Medical & Testing Laboratories	2,359	948	443	3,751	$315,745,060	$112,823,440	$53,464,627	$482,033,128
Medical Device & Equipment Manufacturers	4,903	2,969	1,901	9,773	$1,423,584,170	$484,912,761	$229,321,504	$2,137,818,435
Pharmaceuticals & Therapeutics	2,997	7,770	4,068	14,834	$3,515,368,276	$1,446,908,445	$490,655,717	$5,452,932,438
Research & Development	2,508	1,129	680	4,316	$333,216,363	$139,640,901	$81,987,887	$554,845,150
Total Bioscience	14,790	18,663	9,737	43,189	$9,923,408,882	$3,423,730,359	$1,174,321,290	$14,521,460,530

	Value Added				Labor Income			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	$207,735,549	$575,227,154	$187,294,323	$970,257,026	$38,592,135	$362,733,845	$103,032,943	$504,358,923
Medical & Testing Laboratories	$83,697,491	$66,833,552	$31,401,595	$181,932,638	$24,495,372	$42,840,731	$17,275,659	$84,611,762
Medical Device & Equipment Manufacturers	$248,669,966	$271,950,526	$134,691,865	$655,312,356	$116,856,610	$172,694,649	$74,119,282	$363,670,541
Pharmaceuticals & Therapeutics	$631,940,574	$807,711,143	$288,181,266	$1,727,832,982	$53,422,812	$565,047,179	$158,556,280	$777,026,271
Research & Development	$30,091,173	$79,250,516	$48,154,920	$157,496,609	$52,379,570	$51,014,219	$26,495,860	$129,889,649
Total Bioscience	$1,202,134,752	$1,800,972,915	$689,724,061	$3,692,831,728	$285,746,499	$1,194,330,640	$379,480,077	$1,859,557,216

	Tax		
	Federal Government Non Defense	State/Local Government Non Education	Total
Agricultural Biotechnology	$115,112,270	$125,889,704	$241,001,974
Medical & Testing Laboratories	$19,600,454	$15,168,942	$34,769,396
Medical Device & Equipment Manufacturers	$78,918,283	$62,350,022	$141,268,305
Pharmaceuticals & Therapeutics	$184,432,134	$156,424,214	$340,856,348
Research & Development	$24,043,502	$14,542,429	$38,585,931
Total Bioscience	$422,106,652	$374,375,326	$796,481,978

Appendix Table C5: Economic Impact of Bioscience in the West Central Region, 2009

	Employment				Output			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	965	2,911	1,113	4,989	$1,761,051,647	$506,250,261	$122,636,286	$2,389,938,193
Medical & Testing Laboratories	1,188	378	172	1,738	$164,097,069	$41,654,295	$18,956,503	$224,707,867
Medical Device & Equipment Manufacturers	2,624	1,066	563	4,253	$623,228,194	$156,231,557	$62,038,786	$841,498,537
Pharmaceuticals & Therapeutics	185	410	186	781	$239,482,955	$68,391,731	$20,508,964	$328,383,650
Research & Development	1,016	364	207	1,587	$140,841,344	$41,808,927	$22,793,856	$205,444,127
Total Bioscience	5,978	5,128	2,241	13,347	$2,928,701,209	$814,336,736	$246,934,374	$3,989,972,319

	Value Added				Labor Income			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	$83,314,171	$288,161,710	$72,252,763	$443,728,645	$13,031,506	$165,786,375	$39,583,242	$218,401,123
Medical & Testing Laboratories	$52,210,611	$24,732,003	$11,167,978	$88,110,592	$12,264,411	$15,753,838	$6,123,220	$34,141,468
Medical Device & Equipment Manufacturers	$100,689,133	$87,313,269	$36,549,204	$224,551,607	$36,476,775	$55,328,829	$20,040,770	$111,846,373
Pharmaceuticals & Therapeutics	$50,534,274	$38,554,239	$12,082,616	$101,171,129	$3,526,723	$26,767,127	$6,624,454	$36,918,303
Research & Development	$8,354,565	$23,578,174	$13,428,631	$45,361,370	$18,197,194	$15,549,820	$7,363,441	$41,110,454
Total Bioscience	$295,102,755	$462,339,389	$145,481,180	$902,923,324	$83,496,608	$279,185,977	$79,735,120	$442,417,705

	Tax		
	Federal Government Non Defense	State/Local Government Non Education	Total
Agricultural Biotechnology	$46,889,954	$56,960,992	$103,850,946
Medical & Testing Laboratories	$8,070,365	$6,854,205	$14,924,570
Medical Device & Equipment Manufacturers	$23,473,928	$20,806,684	$44,280,612
Pharmaceuticals & Therapeutics	$9,054,435	$8,385,924	$17,440,359
Research & Development	$6,737,154	$4,250,510	$10,987,664
Total Bioscience	$94,225,833	$97,258,313	$191,484,146

Appendix Table C6: Economic Impact of Bioscience in the Northwest Region, 2009

	Employment				Output			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	788	1,892	569	3,249	$1,349,646,121	$412,079,894	$58,108,932	$1,819,834,948
Medical & Testing Laboratories	830	254	113	1,196	$114,148,771	$25,235,810	$11,507,045	$150,891,626
Medical Device & Equipment Manufacturers	1,176	408	173	1,758	$245,727,129	$53,515,215	$17,670,316	$316,912,660
Pharmaceuticals & Therapeutics	89	131	51	271	$79,367,014	$19,321,686	$5,181,139	$103,869,839
Research & Development	397	141	63	600	$51,952,214	$14,985,767	$6,391,229	$73,329,210
Total Bioscience	3,280	2,826	968	7,074	$1,840,841,250	$525,138,385	$98,858,660	$2,464,838,295

	Value Added				Labor Income			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	$53,501,036	$156,409,104	$33,349,508	$243,259,649	$8,810,023	$85,979,143	$18,250,285	$113,039,451
Medical & Testing Laboratories	$39,463,938	$14,469,718	$6,603,033	$60,536,689	$9,672,484	$9,275,276	$3,616,103	$22,563,863
Medical Device & Equipment Manufacturers	$33,620,285	$28,856,673	$10,139,783	$72,616,741	$11,289,741	$17,787,530	$5,552,695	$34,629,966
Pharmaceuticals & Therapeutics	$9,700,102	$10,370,775	$2,973,252	$23,044,128	$1,233,031	$7,266,519	$1,627,805	$10,127,355
Research & Development	$1,976,639	$7,923,257	$3,667,574	$13,567,470	$5,332,523	$5,169,584	$2,008,195	$12,510,302
Total Bioscience	$138,261,999	$218,029,526	$56,733,151	$413,024,675	$36,337,802	$125,478,049	$31,055,082	$192,870,934

	Tax		
	Federal Government Non Defense	State/Local Government Non Education	Total
Agricultural Biotechnology	$25,048,118	$28,970,601	$54,018,719
Medical & Testing Laboratories	$5,442,163	$4,483,085	$9,925,248
Medical Device & Equipment Manufacturers	$7,448,876	$6,735,713	$14,184,589
Pharmaceuticals & Therapeutics	$2,259,805	$2,028,924	$4,288,729
Research & Development	$2,044,025	$1,270,860	$3,314,885
Total Bioscience	$42,242,982	$43,489,185	$85,732,167

Appendix Table C7: Economic Impact of Bioscience in the Southeast Region, 2009

	Employment				Output			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	401	715	246	1,362	$727,571,543	$262,606,541	$23,913,594	$1,014,091,678
Medical & Testing Laboratories	217	40	18	275	$25,269,194	$4,025,784	$1,786,721	$31,081,699
Medical Device & Equipment Manufacturers	740	175	88	1,003	$159,640,470	$24,572,658	$8,580,078	$192,793,206
Pharmaceuticals & Therapeutics	306	191	70	567	$201,917,221	$27,696,809	$6,840,431	$236,454,460
Research & Development	31	7	3	41	$3,885,878	$735,056	$272,119	$4,893,053
Total Bioscience	1,695	1,127	425	3,248	$1,118,284,306	$319,636,839	$41,392,940	$1,479,314,085

	Value Added				Labor Income			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agricultural Biotechnology	$30,894,382	$74,152,995	$13,812,478	$118,859,855	$6,402,939	$38,338,219	$7,226,422	$51,967,580
Medical & Testing Laboratories	$6,037,192	$2,214,929	$1,031,725	$9,283,845	$1,932,193	$1,422,035	$540,317	$3,894,545
Medical Device & Equipment Manufacturers	$30,445,371	$11,592,794	$4,954,297	$46,992,461	$9,008,521	$7,105,900	$2,594,928	$18,709,349
Pharmaceuticals & Therapeutics	$23,906,661	$13,984,291	$3,950,737	$41,841,690	$3,716,070	$9,093,692	$2,067,501	$14,877,263
Research & Development	$18,434	$385,026	$157,142	$560,602	$255,894	$254,580	$82,278	$592,752
Total Bioscience	$91,302,040	$102,330,032	$23,906,377	$217,538,450	$21,315,617	$56,214,425	$12,511,444	$90,041,486

	Tax		
	Federal Government Non Defense	State/Local Government Non Education	Total
Agricultural Biotechnology	$11,738,432	$16,550,336	$28,288,768
Medical & Testing Laboratories	$863,319	$720,328	$1,583,647
Medical Device & Equipment Manufacturers	$4,270,617	$3,695,662	$7,966,279
Pharmaceuticals & Therapeutics	$3,636,807	$3,633,430	$7,270,237
Research & Development	$90,225	$62,556	$152,781
Total Bioscience	$20,599,400	$24,662,313	$45,261,713