

Case Study: Regional Skilled Training Indicators for Central Ohio and Licking County, Ohio

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Executive Summary

- (A) **As announced by the International Business Machines (IBM) Corporation and reported in the *Columbus Dispatch* Newspaper, IBM will “locate its Client Center for Advanced Analytics at its existing campus in the Tuttle Crossing area,” in the Columbus Metropolitan Statistical Area (MSA), which includes Licking County. As stated in the *Dispatch* article, “The expansion will add \$45.8 million in annual payroll.” The article goes on to explain the reasons why this economic development project is so important to the future of computer science technology in central Ohio. “IBM’s center is meant to capitalize on the big push by companies to capture, analyze and make sense of the billions of bits of data produced every minute by computer users. It is also expected to position Columbus as a national and even international center for such work.”**
- (B) **When asked to explain the reasons IBM chose central Ohio for the location of its cutting edge, advanced center for analytics, the IBM manager of public partnerships, Terry Hansen, gave the following explanation - “Why Ohio? It comes down to a single question: skills. Ohio has skills.” Some of these skilled workers needed by IBM in the field of computer analytics will be developed by computer science training from the The Ohio State University (OSU) main and branch campuses in the Columbus MSA (including the OSU/Newark branch in Licking County).**
- (C) **The skills, which IBM emphasized in its explication of the reasons why it chose to expand and develop the analytics center in central Ohio, largely**

resulted from the careful construction of the educational infrastructure in central Ohio, which was designed to a significant degree to meet the workforce needs of employers. For the Columbus MSA and Licking County, this educational infrastructure provides pre-employment and structured training at the 1-year training level through the Licking County Career-Technology Education Centers (C-TEC); at the Associate Degree level through the Central Ohio Technical College (COTC), the Columbus State Community College (CSCC), and The Ohio State University/Newark branch campus; at the baccalaureate training level via The Ohio State University branch and main campuses and Denison University; and with advanced, graduate degree training at the Ohio State University main campus. Hence, this educational and training infrastructure is organized to meet the long-term, workforce skill training needs for all educational levels in the entire staffing patterns of businesses and industries.

- (D) As part of its economic review, the IHS Global Insight econometric forecasting firm regularly tracks the wages and employment levels of the four skilled trades of boilermakers, electricians, pipefitters, and welders through the Occupational Employment Statistics (OES) surveys of the U.S. Bureau of Labor Statistics (BLS). These four skilled trades represent critical labor inputs into the productions functions of manufacturing, utilities, construction, and mining firms. **Based on the OES data, the IHS Global Insight forecasters estimate a manageable U.S. supply/demand ratio for the aforementioned, skilled trades workers. When compared with the pre-recession, peak employment levels, Global Insight reported that nationally “15% of boilermakers and 21% of electricians, pipefitters, and welders were unemployed in 2011.” While the Global Insight forecast anticipates “a skilled labor squeeze occurring over the next five years, a shortage that would risk double-digit wage increases is not likely.”**
- (E) **The housing crash in real residential spending is reflected in decreases in the median home prices from the pre-recession peak, which represent substantial relocation costs and limit the mobility of skilled workers. In the case of the Midwest, including Ohio, these effects result in higher unemployment rates for skilled labor and lower wage growth, which also represent lower skilled labor costs to employers and greater availability in the Midwest of skilled labor.**
- (F) **The educational infrastructure in central Ohio and Licking County is well rationalized with the skilled labor requirements of businesses and industries.** In the case of the critical skilled trades of boilermakers, electricians, pipefitters, and welders, the output of graduates from structured training programs in the Columbus MSA (including Licking County) provide for the

skilled workforce needs of central Ohio businesses, as indicated by the completion data reported by the U.S. Department of Education.

- (G) **The Career and Technology Education Centers (C-TEC) of Licking County and the Eastland-Fairfield Career and Technical Schools developed the multi-craft maintenance technician programs in response to the skilled trades needs of central Ohio employers. The multi-craft maintenance technicians receive training opportunities in blueprint reading and precision measuring, welding and fabrication, programmable logic controllers (PLC's), facility maintenance, plumbing, manual machining for maintenance, electrical control systems, electrical wiring, hydraulics, pneumatics, industrial mechanics, and heating, ventilation, and air conditioning.**
- (H) **The Columbus State Community College (CSCC) and C-TEC implemented welding training programs in part to address the rising demand for welders from the expanding Ohio oil and gas extraction industry.**
- (I) **These structured training programs are supplemented by Ohio Bureau of Apprenticeship and Training programs in the Columbus MSA for electricians, maintenance electricians, plumbers, pipefitters, welderfitters, and combination welders.**
- (J) **The local wage rates for the skilled occupations of boilermakers, electricians, pipefitters, and welders in the Columbus Metropolitan Statistical Area (including Licking County) are lower than the wages for these same, skilled occupations at the state and national levels**

Recent Economic Development Success Underscores the Skilled Training Advantage of Central Ohio

As announced by the International Business Machines (IBM) Corporation and reported in the *Columbus Dispatch* Newspaper, IBM will “locate its Client Center for Advanced Analytics at its existing campus in the Tuttle Crossing area,” in the Columbus Metropolitan Statistical Area (MSA), which includes Licking County.¹ As stated in the *Dispatch* article, “The expansion will add \$45.8 million in annual payroll.”² The article goes on to explain the reasons why this economic development project is so important to the future of computer science technology in central Ohio. **“IBM’s center is meant to capitalize on the big push by companies to capture, analyze and make sense of the billions of bits of data**

1. Williams, Mark, The *Columbus Dispatch* Newspaper, “Ohio tax credits to help companies add 900 area jobs,” Dec. 11, 2012. The Columbus Metropolitan Statistical Area (MSA) includes the counties of Delaware, Fairfield, Franklin, **Licking**, Madison, Morrow, Pickaway and Union counties.

2. *Ibid.*

3. *Ibid.*

4. *Ibid.*

produced every minute by computer users. It is also expected to position Columbus as a national and even international center for such work.”³

When asked to explain the reasons IBM chose central Ohio for the location of its cutting edge, advanced center for analytics, the IBM manager of public partnerships, Terry Hansen, gave the following explanation - “Why Ohio? It comes down to a single question: skills. Ohio has skills.”⁴ Some of these skilled workers needed by IBM in the field of computer analytics will be developed by computer science training from the The Ohio State University (OSU) main and branch campuses in the Columbus MSA (including the OSU/Newark branch in Licking County).

The skills, which IBM emphasized in its explication of the reasons why it chose to expand and develop the analytics center in central Ohio, largely resulted from the careful construction of the educational infrastructure in central Ohio, which was designed to a significant degree to meet the workforce needs of employers. For the Columbus MSA and Licking County, this educational infrastructure provides pre-employment and structured training at the 1-year training level through the Licking County Career-Technology Education Centers (C-TEC); at the Associate Degree level through the Central Ohio Technical College (COTC), the Columbus State Community College (CSCC), and The Ohio State University/Newark branch campus; at the baccalaureate training level via The Ohio State University branch and main campuses and Denison University; and with advanced, graduate degree training at the Ohio State University main campus. Hence, this educational and training infrastructure is organized to meet the long-term, workforce skill training needs for all educational levels in the entire staffing patterns of businesses and industries.

Skilled Trades, National Surveys, and the Midwest Advantage (including Ohio)

As part of its economic review, the IHS Global Insight econometric forecasting firm regularly tracks the wages and employment levels of the four skilled trades of boilermakers, electricians, pipefitters, and welders through the Occupational Employment Statistics (OES) surveys of the U.S. Bureau of Labor Statistics (BLS).⁵ These four skilled trades represent critical labor inputs into the productions functions of manufacturing, utilities, construction, and mining firms. Based on the OES data, the IHS Global Insight forecasters estimate a manageable U.S. supply/demand ratio for the aforementioned, skilled trades workers. When compared with the pre-recession, peak employment levels, Global Insight reported that nationally “15% of

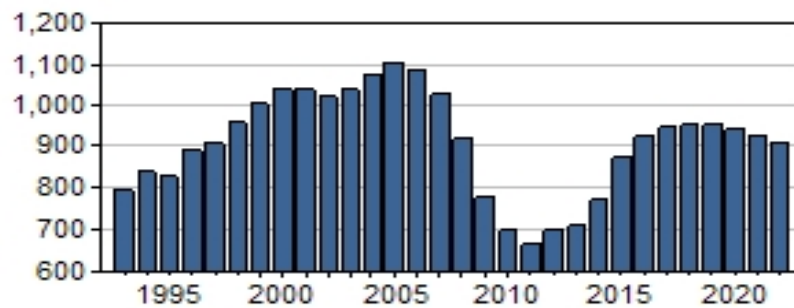
⁵ Crowley, Emily, “US Labor Skills Shortage: Fact or Fiction?,” *Perspectives, Country & Industry Forecasting*, IHS Global Insight, 9/19/12, p. 1.

boilermakers and 21% of electricians, pipefitters, and welders were unemployed in 2011.”⁶ While the Global Insight forecast anticipates “a skilled labor squeeze occurring over the next five years, a shortage that would risk double-digit wage increases is not likely.”⁷

The Midwest (including Ohio) advantage in retaining skilled labor developed in part from the relative lack of mobility of this skilled labor, as a result of U.S. construction spending during the recovery falling short of pre-recession peak levels.⁸

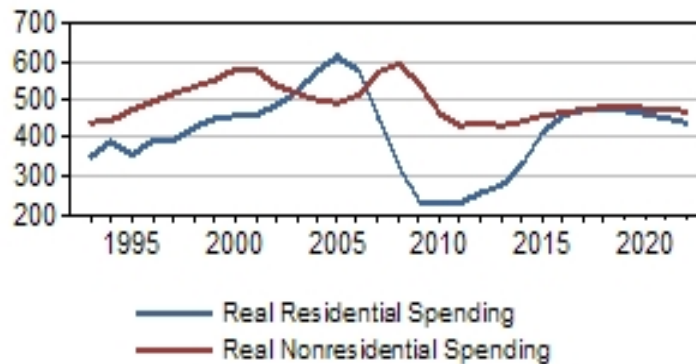
Real US Construction Spending Recovery Falls Short of Peak

(US construction spending, billions of 2005 dollars)



Nonresidential Spending Spared the Worst in Recession

(US construction spending, billions of 2005 dollars)



(Source: Crowley, Emily, “US Labor Skills Shortage: Fact or Fiction?,” *Perspectives, Country & Industry Forecasting*, IHS Global Insight, 9/19/2012, p. 1.)

⁶ *Ibid.*

⁷ *Ibid.*

⁸ *Ibid.*

As shown in the preceding graphs and following commentary from IHS Global Insight analyst Emily Crowley, “The U.S. construction industry remains in the doldrums – real total construction spending in 2012 will come in more than 40% lower than prerecession peaks.”⁹ **The housing crash in real residential spending is reflected in decreases in the median home prices from the pre-recession peak, which represent substantial relocation costs and limit the mobility of skilled workers. In the case of the Midwest, including Ohio, these effects result in higher unemployment rates for skilled labor and lower wage growth, which also represent lower skilled labor costs to employers and greater availability in the Midwest of skilled labor.**¹⁰

| Housing Crash Limits Mobility | | |
|-------------------------------|---|---|
| Region | Decrease in Median Home Price from Peak (Percent) | Estimated Skilled Unemployment Rate (Percent) |
| Gulf Coast | 5.7 | 10.9 |
| West North Central | 6.3 | 15.2 |
| Mountain | 7.7 | 20.6 |
| Middle Atlantic | 11.1 | 12.6 |
| New York & New Jersey | 11.8 | 17.1 |
| New England | 13.3 | 10.2 |
| Southeast | 15.9 | 21.8 |
| United States | 16.0 | 18.9 |
| Midwest | 16.3 | 17.1 |
| Pacific Northwest | 19.7 | 26.0 |
| West Coast | 41.2 | 33.6 |

(Source: Crowley, Emily, “US Labor Skills Shortage: Fact or Fiction?,” *Perspectives, Country & Industry Forecasting*, IHS Global Insight, 9/19/2012, p. 1.)

⁹ *Ibid.*

¹⁰ *Ibid.*, pp. 2-3.

| Region | 2012 Construction Spending (Percent of 10-year average) | Average Skilled Wage Growth 2013–16 |
|-----------------------|---|-------------------------------------|
| Gulf Coast | 98.4 | 4.8 |
| Mountain | 85.1 | 4.4 |
| Mid Atlantic | 84.6 | 4.3 |
| New York & New Jersey | 81.7 | 4.4 |
| West North-Central | 80.2 | 4.5 |
| New England | 77.6 | 4.5 |
| Pacific Northwest | 74.5 | 4.4 |
| United States | 73.5 | 4.4 |
| Midwest | 70.1 | 4.2 |
| South | 66.3 | 4.0 |
| West Coast | 55.5 | 4.2 |

(Source: Crowley, Emily, “US Labor Skills Shortage: Fact or Fiction?,” *Perspectives, Country & Industry Forecasting*, IHS Global Insight, 9/19/2012, pp. 2-3.)

Skilled Trades and the Central Ohio (including Licking County) Advantage

The educational infrastructure in central Ohio and Licking County is well rationalized with the skilled labor requirements of businesses and industries. In the case of the critical skilled trades of boilermakers, electricians, pipefitters, and welders, the output of graduates from structured training programs in the Columbus MSA (including Licking County) provide for the skilled workforce needs of central Ohio businesses, as indicated by the following completion data reported by the U.S. Department of Education.¹¹

¹¹ Integrated Postsecondary Education Data System (IPEDS) completions data, National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), as reported in the Economic Development and Employer Planning System (EDEPS) at www.edeps.org.

COMPLETERS OF PROGRAMS OF STUDY FOR BOILERMAKING/BOILERMAKER¹²

| | | Columbus MSA (including Licking County) Program Completers | | | | | | | | | | | | | | |
|---|--|--|----------|----------|----------|----------|----------|-----------|----------|-----------|-----------|----------|-----------|-----------|----------|-----------|
| | | 2006-07 | | | 2007-08 | | | 2008-09 | | | 2009-10 | | | 2010-11 | | |
| Institution | | M | W | Total | M | W | Total | M | W | Total | M | W | Total | M | W | Total |
| Award of less than 1 academic year | | | | | | | | | | | | | | | | |
| 1 | Adult and Community Education-Hudson, Col. MSA | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 7 | 4 | 0 | 4 | 6 | 0 | 6 |
| 2 | Columbus State Community College, Columbus MSA | 1 | 0 | 1 | 2 | 0 | 2 | 14 | 0 | 14 | 6 | 0 | 6 | 12 | 0 | 12 |
| Program Completer Total | | 1 | 0 | 1 | 2 | 0 | 2 | 21 | 0 | 21 | 10 | 0 | 10 | 18 | 0 | 18 |

COMPLETERS OF PROGRAMS OF STUDY FOR ELECTRICAL AND ELECTRONIC ENGINEERING TECHNOLOGIES/TECHNICIANS, OTHER¹³

| | | Columbus MSA (including Licking County) Program Completers | | | | | | | | | | | | | | |
|--|--|--|----------|----------|-----------|----------|-----------|-----------|----------|-----------|-----------|----------|-----------|-----------|----------|-----------|
| | | 2006-07 | | | 2007-08 | | | 2008-09 | | | 2009-10 | | | 2010-11 | | |
| Institution | | M | W | Total | M | W | Total | M | W | Total | M | W | Total | M | W | Total |
| Award of less than 1 academic year | | | | | | | | | | | | | | | | |
| 1 | Columbus State Community College, Columbus MSA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 9 | 2 | 11 |
| Award at least 1 but less than 2 academic years | | | | | | | | | | | | | | | | |
| 2 | Columbus State Community College, Columbus MSA | 0 | 0 | 0 | 14 | 0 | 14 | 5 | 0 | 5 | 30 | 0 | 30 | 29 | 0 | 29 |
| Associate's degree | | | | | | | | | | | | | | | | |
| 3 | Columbus State Community College, Columbus MSA | 1 | 1 | 2 | 3 | 1 | 4 | 8 | 0 | 8 | 14 | 1 | 15 | 2 | 1 | 3 |
| Program Completer Total | | 1 | 1 | 2 | 17 | 1 | 18 | 13 | 0 | 13 | 46 | 1 | 47 | 40 | 3 | 43 |

¹² *Ibid.*

¹³ *Ibid.*

COMPLETERS OF PROGRAMS OF STUDY FOR ELECTRICAL AND POWER TRANSMISSION
INSTALLATION/INSTALLER, GENERAL¹⁴

| | | Columbus MSA (including Licking County) Program Completers | | | | | | | | | | | | | | |
|--|---|--|----------|----------|----------|----------|----------|-----------|----------|-----------|-----------|----------|-----------|-----------|----------|-----------|
| | | 2006-07 | | | 2007-08 | | | 2008-09 | | | 2009-10 | | | 2010-11 | | |
| Institution | | M | W | Total | M | W | Total | M | W | Total | M | W | Total | M | W | Total |
| Award at least 1 but less than 2 academic years | | | | | | | | | | | | | | | | |
| 1 | Career and Technology Education Centers of Licking County, Columbus MSA | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 15 | 13 | 0 | 13 | 10 | 0 | 10 |
| 2 | Delaware Area Career Center, Columbus MSA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 7 |
| Program Completer Total | | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 15 | 13 | 0 | 13 | 17 | 0 | 17 |

¹⁴ *Ibid.*

**COMPLETERS OF PROGRAMS OF STUDY FOR ELECTRICAL, ELECTRONIC AND COMMUNICATIONS
ENGINEERING TECHNOLOGY/TECHNICIAN¹⁵**

| | | Columbus MSA (including Licking County) Program Completers | | | | | | | | | | | | | | |
|--------------------------------|--|---|-----------|--------------|----------------|----------|--------------|----------------|----------|--------------|----------------|----------|--------------|----------------|----------|--------------|
| | | 2006-07 | | | 2007-08 | | | 2008-09 | | | 2009-10 | | | 2010-11 | | |
| Institution | | M | W | Total | M | W | Total | M | W | Total | M | W | Total | M | W | Total |
| Associate's degree | | | | | | | | | | | | | | | | |
| 1 | Central Ohio Technical College, Columbus MSA | 11 | 1 | 12 | 5 | 0 | 5 | 11 | 0 | 11 | 13 | 0 | 13 | 12 | 0 | 12 |
| 2 | Columbus State Community College, Columbus MSA | 5 | 2 | 7 | 13 | 0 | 13 | 14 | 1 | 15 | 10 | 0 | 10 | 10 | 1 | 11 |
| 3 | DeVry University-Ohio, Columbus MSA | 46 | 6 | 52 | 19 | 6 | 25 | 27 | 1 | 28 | 28 | 4 | 32 | 20 | 1 | 21 |
| 4 | ITT Technical Institute-Columbus, Columbus MSA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 2 | 14 |
| 5 | ITT Technical Institute-Hilliard, Columbus MSA | 27 | 0 | 27 | 15 | 0 | 15 | 17 | 0 | 17 | 15 | 2 | 17 | 19 | 0 | 19 |
| Subtotal | | 89 | 9 | 98 | 52 | 6 | 58 | 69 | 2 | 71 | 66 | 6 | 72 | 73 | 4 | 77 |
| Bachelor's degree | | | | | | | | | | | | | | | | |
| 7 | DeVry University-Ohio, Columbus MSA | 42 | 7 | 49 | 27 | 1 | 28 | 23 | 6 | 29 | 15 | 3 | 18 | 16 | 0 | 16 |
| Subtotal | | 42 | 7 | 49 | 27 | 1 | 28 | 23 | 6 | 29 | 15 | 3 | 18 | 16 | 0 | 16 |
| Program Completer Total | | 131 | 16 | 147 | 79 | 7 | 86 | 92 | 8 | 100 | 81 | 9 | 90 | 89 | 4 | 93 |

In addition to the skilled training programs noted above, **the Career and Technology Education Centers (C-TEC) of Licking County and the Eastland-Fairfield Career and Technical Schools developed the multi-craft maintenance technician programs in response to the skilled trades needs of central Ohio employers.¹⁶ The multi-craft maintenance**

¹⁵ *Ibid.*

¹⁶ *Ibid.*

technicians receive training opportunities in blueprint reading and precision measuring, welding and fabrication, programmable logic controllers (PLC's), facility maintenance, plumbing, manual machining for maintenance, electrical control systems, electrical wiring, hydraulics, pneumatics, industrial mechanics, and heating, ventilation, and air conditioning.¹⁷

| COMPLETERS OF PROGRAMS OF STUDY FOR INDUSTRIAL MECHANICS AND MAINTENANCE TECHNOLOGY ¹⁸ | | | | | | | | | | | | | | | | |
|---|---|----------|----------|----------|-----------|----------|-----------|-----------|----------|-----------|-----------|----------|-----------|-----------|----------|-----------|
| Columbus MSA (including Licking County) Program Completers | | | | | | | | | | | | | | | | |
| | | 2006-07 | | | 2007-08 | | | 2008-09 | | | 2009-10 | | | 2010-11 | | |
| Institution | | M | W | Total | M | W | Total | M | W | Total | M | W | Total | M | W | Total |
| Award of less than 1 academic year | | | | | | | | | | | | | | | | |
| 1 | Career and Technology Education Centers of Licking County, Columbus MSA | 0 | 0 | 0 | 10 | 1 | 11 | 16 | 1 | 17 | 22 | 0 | 22 | 21 | 0 | 21 |
| 2 | Eastland-Fairfield Career and Technical Schools, Columbus MSA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 0 | 30 |
| Program Completer Total | | 0 | 0 | 0 | 10 | 1 | 11 | 16 | 1 | 17 | 22 | 0 | 22 | 51 | 0 | 51 |

Also, the Columbus State Community College (CSCC) and C-TEC implemented welding training programs in part to address the rising demand for welders from the expanding Ohio oil and gas extraction industry.¹⁹ These structured training programs are supplemented by Ohio Bureau of Apprenticeship and Training programs in the Columbus MSA for electricians, maintenance electricians, plumbers, pipefitters, welderfitters, and combination welders.²⁰

¹⁷ C-TEC Adult Education Course Catalogue, *Education That Works*, January-June, 2013, pp. 2-3.

¹⁸ Integrated Postsecondary Education Data System (IPEDS) completions data, National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), as reported in the Economic Development and Employer Planning System (EDEPS) at www.edeps.org.

¹⁹ *Ibid.*, and C-TEC Adult Education Course Catalogue, *Education That Works*, January-June, 2013, p. 3.

²⁰ Ohio Bureau of Apprenticeship and Training, programs by county, at www.jfs.ohio.gov/apprenticeship/index.stm.

COMPLETERS OF PROGRAMS OF STUDY FOR WELDING TECHNOLOGY/WELDER²¹

| | | Columbus MSA (including Licking County) Program Completers | | | | | | | | | | | | | | | |
|---|--|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| | | 2006-07 | | | 2007-08 | | | 2008-09 | | | 2009-10 | | | 2010-11 | | | |
| Institution | | M | W | Total | M | W | Total | M | W | Total | M | W | Total | M | W | Total | |
| Award of less than 1 academic year | | | | | | | | | | | | | | | | | |
| 1 | Columbus State Community College, Columbus MSA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 8 | 14 |
| Program Completer Total | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 8 | 14 |

Furthermore, the local wage rates for the skilled occupations of boilermakers, electricians, pipefitters, and welders in the Columbus Metropolitan Statistical Area (including Licking County) are lower than the wages for these same, skilled occupations at the state and national levels, as shown in the following tables.²²

Wage Trends (Mean) National

| SOC Code | Occupation | Mean Annual Wage | | | | | Change 2007 to 2011 | Relative Standard Error of the Mean Annual Wage | | | | |
|----------|--------------|------------------|----------|----------|----------|----------|------------------------|---|------|------|------|------|
| | | 2007 | 2008 | 2009 | 2010 | 2011 | | 2007 | 2008 | 2009 | 2010 | 2011 |
| 47-2011 | Boilermakers | \$51,420 | \$53,100 | \$56,680 | \$55,750 | \$56,650 | +10.2% | 1.1% | 1.6% | 1.9% | 2.2% | 2.1% |

Wage Trends (Mean) Ohio

| SOC Code | Occupation | Mean Annual Wage | | | | | Change 2007 to 2011 | Relative Standard Error of the Mean Annual Wage | | | | |
|----------|--------------|------------------|----------|----------|----------|----------|------------------------|---|------|------|------|------|
| | | 2007 | 2008 | 2009 | 2010 | 2011 | | 2007 | 2008 | 2009 | 2010 | 2011 |
| 47-2011 | Boilermakers | \$58,160 | \$61,100 | \$62,690 | \$54,120 | \$57,390 | -1.3% | 4.7% | 3.7% | 3.9% | 3.4% | 4.4% |

Wage Trends (Mean) Columbus, Ohio, Metropolitan Statistical Area (MSA)

| SOC Code | Occupation | Mean Annual Wage | | | | | Change 2006 to 2010 | Relative Standard Error of the Mean Annual Wage | | | | |
|----------|--------------|------------------|----------|----------|----------|------|------------------------|---|------|------|-------|------|
| | | 2007 | 2008 | 2009 | 2010 | 2011 | | 2007 | 2008 | 2009 | 2010 | 2011 |
| 47-2011 | Boilermakers | NA | \$52,440 | \$52,920 | \$45,330 | NA | NA | NA | 9.4% | 9.3% | 11.4% | NA |

NA=Not Available

Source: Occupational Employment Statistics (OES) Program, U.S. Bureau of Labor Statistics (BLS), at www.stats.bls.gov/oes/. As noted by the BLS analysts, the relative standard error (RSE) is a measure of the reliability of a statistic; the smaller the relative standard error, the more precise the estimate.

²¹ *Ibid.*

²² Occupational Employment Statistics (OES) Program, U.S. Bureau of Labor Statistics (BLS), at www.stats.bls.gov/oes/.

| Wage Trends (Mean) National | | | | | | | | | | | | |
|-----------------------------|--------------|------------------|----------|----------|----------|----------|------------------------|---|------|------|------|------|
| SOC Code | Occupation | Mean Annual Wage | | | | | Change 2007 to 2011 | Relative Standard Error of the Mean Annual Wage | | | | |
| | | 2007 | 2008 | 2009 | 2010 | 2011 | | 2007 | 2008 | 2009 | 2010 | 2011 |
| 47-2111 | Electricians | \$48,100 | \$49,890 | \$50,850 | \$51,810 | \$52,910 | +10.0% | 0.4% | 0.4% | 0.5% | 0.5% | 0.5% |

| Wage Trends (Mean) Ohio | | | | | | | | | | | | |
|-------------------------|--------------|------------------|----------|----------|----------|----------|------------------------|---|------|------|------|------|
| SOC Code | Occupation | Mean Annual Wage | | | | | Change 2007 to 2011 | Relative Standard Error of the Mean Annual Wage | | | | |
| | | 2007 | 2008 | 2009 | 2010 | 2011 | | 2007 | 2008 | 2009 | 2010 | 2011 |
| 47-2111 | Electricians | \$47,440 | \$48,420 | \$48,180 | \$48,900 | \$49,530 | +4.4% | 1.3% | 1.3% | 1.2% | 1.2% | 1.1% |

| Wage Trends (Mean) Columbus, Ohio, Metropolitan Statistical Area (MSA) | | | | | | | | | | | | |
|--|--------------|------------------|----------|----------|----------|----------|------------------------|---|------|------|------|------|
| SOC Code | Occupation | Mean Annual Wage | | | | | Change 2007 to 2011 | Relative Standard Error of the Mean Annual Wage | | | | |
| | | 2007 | 2008 | 2009 | 2010 | 2011 | | 2007 | 2008 | 2009 | 2010 | 2011 |
| 47-2111 | Electricians | \$45,250 | \$45,210 | \$43,960 | \$44,300 | \$44,890 | -0.8% | 3.1% | 3.7% | 3.1% | 2.7% | 2.2% |

Source: Occupational Employment Statistics (OES) Program, U.S. Bureau of Labor Statistics (BLS), at www.stats.bls.gov/oes/. As noted by the BLS analysts, the relative standard error (RSE) is a measure of the reliability of a statistic; the smaller the relative standard error, the more precise the estimate.

| Wage Trends (Mean) National | | | | | | | | | | | | |
|-----------------------------|---|------------------|----------|----------|----------|----------|------------------------|---|------|------|------|------|
| SOC Code | Occupation | Mean Annual Wage | | | | | Change 2007 to 2011 | Relative Standard Error of the Mean Annual Wage | | | | |
| | | 2007 | 2008 | 2009 | 2010 | 2011 | | 2007 | 2008 | 2009 | 2010 | 2011 |
| 47-2152 | Plumbers, Pipefitters, and Steamfitters | \$47,350 | \$49,200 | \$49,870 | \$50,360 | \$51,830 | +9.5% | 0.4% | 0.5% | 0.5% | 0.5% | 0.5% |

| Wage Trends (Mean) Ohio | | | | | | | | | | | | |
|-------------------------|---|------------------|----------|----------|----------|----------|------------------------|---|------|------|------|------|
| SOC Code | Occupation | Mean Annual Wage | | | | | Change 2007 to 2011 | Relative Standard Error of the Mean Annual Wage | | | | |
| | | 2007 | 2008 | 2009 | 2010 | 2011 | | 2007 | 2008 | 2009 | 2010 | 2011 |
| 47-2152 | Plumbers, Pipefitters, and Steamfitters | \$47,930 | \$48,980 | \$48,900 | \$46,520 | \$47,340 | -1.2% | 1.6% | 1.7% | 1.8% | 2.5% | 2.4% |

| Wage Trends (Mean) Columbus, Ohio, Metropolitan Statistical Area (MSA) | | | | | | | | | | | | |
|--|---|------------------|----------|----------|----------|----------|------------------------|---|------|------|------|------|
| SOC Code | Occupation | Mean Annual Wage | | | | | Change 2007 to 2011 | Relative Standard Error of the Mean Annual Wage | | | | |
| | | 2007 | 2008 | 2009 | 2010 | 2011 | | 2007 | 2008 | 2009 | 2010 | 2011 |
| 47-2152 | Plumbers, Pipefitters, and Steamfitters | \$45,400 | \$46,140 | \$44,170 | \$43,550 | \$44,600 | -1.8% | 3.0% | 3.1% | 4.5% | 5.4% | 5.9% |

Source: Occupational Employment Statistics (OES) Program, U.S. Bureau of Labor Statistics (BLS), at www.stats.bls.gov/oes/. As noted by the BLS analysts, the relative standard error (RSE) is a measure of the reliability of a statistic; the smaller the relative standard error, the more precise the estimate.

| Wage Trends (Mean) National | | | | | | | | | | | | |
|---|---|------------------|----------|----------|----------|----------|---------------------------|--|------|------|------|------|
| SOC Code | Occupation | Mean Annual Wage | | | | | Change 2007 to 2011 | Relative Standard Error of the Mean Annual Wage | | | | |
| | | 2007 | 2008 | 2009 | 2010 | 2011 | | 2007 | 2008 | 2009 | 2010 | 2011 |
| 51-4121 | Welders, Cutters, Solderers, and Brazers | \$33,960 | \$35,370 | \$36,630 | \$37,370 | \$37,920 | +11.7% | 0.3% | 0.3% | 0.3% | 0.3% | 0.3% |
| Wage Trends (Mean) Ohio | | | | | | | | | | | | |
| SOC Code | Occupation | Mean Annual Wage | | | | | Change 2007 to 2011 | Relative Standard Error of the Mean Annual Wage | | | | |
| | | 2007 | 2008 | 2009 | 2010 | 2011 | | 2007 | 2008 | 2009 | 2010 | 2011 |
| 51-4121 | Welders, Cutters, Solderers, and Brazers | \$33,750 | \$34,490 | \$35,170 | \$35,450 | \$35,930 | +6.5% | 1.2% | 1.2% | 1.3% | 1.1% | 0.9% |
| Wage Trends (Mean) Columbus, Ohio, Metropolitan Statistical Area (MSA) | | | | | | | | | | | | |
| SOC Code | Occupation | Mean Annual Wage | | | | | Change 2007 to 2011 | Relative Standard Error of the Mean Annual Wage | | | | |
| | | 2007 | 2008 | 2009 | 2010 | 2011 | | 2007 | 2008 | 2009 | 2010 | 2011 |
| 51-4121 | Welders, Cutters, Solderers, and Brazers | \$31,210 | \$32,450 | \$33,220 | \$33,310 | \$34,290 | +9.9% | 2.1% | 2.1% | 1.7% | 1.5% | 1.9% |

Source: Occupational Employment Statistics (OES) Program, U.S. Bureau of Labor Statistics (BLS), at www.stats.bls.gov/oes/. As noted by the BLS analysts, the relative standard error (RSE) is a measure of the reliability of a statistic; the smaller the relative standard error, the more precise the estimate.