
ECONOMIC PROFILE OF MACHINERY MANUFACTURING IN IOWA

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INDUSTRY DEFINITION

Products of the machinery manufacturing subsector apply mechanical force to perform work in specific industries and across a broad variety of industrial applications. Specialty product groupings include agricultural, construction, mining, industrial, commercial and service industry machinery. General-purpose machinery includes heating, ventilating, air-conditioning, and commercial refrigeration equipment; machinery for metalworking; engines, turbines, and power transmission equipment; and other general purpose machinery. Key production processes used in machinery manufacturing include forging, stamping, bending, machining, welding, and assembling.


33311 AGRICULTURAL IMPLEMENT MACHINERY

- Used for planting, harvesting, mowing, livestock farming, turf management, residential lawns and gardens
- Products: combines, plows, planters, milking machines, mowers, lawn and garden tractors

 *John Deere; Kinze Manufacturing Inc.; Hagie Manufacturing Co.*


33312 CONSTRUCTION MACHINERY

- Used for earth moving, grading, crushing, surface mining and logging
- Products: bulldozers and backhoes, pile-drivers, construction tractors and attachments, road graders

 *Vermeer Corp.; Cemen Tech; Palladin*


33313 MINING AND OIL AND GAS FIELD MACHINERY

- Used for underground mining, drilling, and coal and mineral processing
- Products: core drills, coal cutters, oil and gas field derricks, water well drilling machinery

 *Pengo Corp.; Eagle Iron Works; Terex Minerals Processing Systems*

33324 INDUSTRIAL MACHINERY

- Used in the production of food, beverage, paper, textiles, wood, plastics, and other products
- Products: pasteurizers, meat grinders, lathes, printing presses, sewing machines, plastics extruding machinery, semiconductor making machinery

 *Marel Townsend; Freund-Vector Corp.*


33331 COMMERCIAL AND SERVICE INDUSTRY MACHINERY

- Used in offices, restaurants, laundries, repair shops, and other commercial and service industries
- Products: Cameras and lenses, photocopiers, projectors, commercial appliances, vending machines

 *Ryko Solutions Inc.; Siemens Industry Inc.; Bee Line Co.*

33341 VENTILATION, HEATING, AIR-CONDITIONING, AND COMMERCIAL REFRIGERATION EQUIPMENT

- Used for heating, cooling, purifying, and exchanging air (in industrial, commercial, and residential applications)
- Products: Heating and air conditioning units, gas fireplaces, refrigerated cases, attic fans, blowers

 *Barker Company; Carroll Coolers Inc.; Hearth & Home Technologies Inc.*


33351 METALWORKING MACHINERY

- Used for metal cutting, forming, casting, coiling or straightening, rolling, assembling, wire drawing
- Products: Industrial molds, cutting dies and jigs, lathes, stamping machines, roll machines

 *Iowa Precision Industries Inc.; M.S. Ford Manufacturing Co.; MSI Mold Builders*

33361 ENGINE, TURBINE, AND POWER TRANSMISSION EQUIPMENT

- Used to generate and transmit power for industrial processes and other non-automotive applications
- Products: Steam, hydraulic, gas, and wind turbines and turbine generator sets, diesel engines, speed changers, high-speed drives and gears, power transmission bearings, bushings, and joints

 *Clipper Windpower Inc.; St. Louis Gear Co.; Acciona Windpower*


33391 PUMPS AND COMPRESSORS

- Used for pumping or dispensing water, oil, and other fluids and for non-agricultural spraying and dusting
- Products: General purpose and centrifugal pumps, sump pumps, gasoline pumps, air and gas compressors, paint sprayers, power washers

 *Viking Pump Inc.; Armstrong Machine Co.; Carver Pump Company Inc.*

33392 MATERIAL HANDLING EQUIPMENT

- Used for conveying, hoisting, stacking, and transporting materials and equipment
- Products: Elevators and escalators, conveyers, overhead cranes, winches, industrial trucks, forklifts

 *Precision Pulley & Idler Co.; Terex Cranes Inc.; Dur-A-Lift Inc.*

33399 ALL OTHER GENERAL PURPOSE MACHINERY

- Uses: Used for nailing, sawing, welding, packaging, baling, separating, lifting, and other applications not elsewhere specified
- Products: Power-driven handtools, welding equipment, packaging machinery, hydraulic pumps and motors, hydrostatic transmissions, pneumatic jacks

 *Packaging Technologies Inc.; Bobalee Hydraulics; Genesis Systems Group Ltd.*

INDUSTRY SIZE AND COMPOSITION

GROSS DOMESTIC PRODUCT (GDP)

Machinery manufacturing figures prominently within Iowa's economy. Machinery's \$4.65 billion in GDP accounted for 17 percent of Iowa's manufacturing GDP and 3 percent of its total GDP for all industries in 2012. Nationally, machinery manufacturing contributes 7 percent of manufacturing GDP and less than one percent of total GDP.

JOBS

Machinery manufacturing's 41,530 jobs represented 19 percent of Iowa's manufacturing jobs and 2.1 percent of its total jobs in 2013. In the U.S., machinery manufacturing accounts for 9 percent of manufacturing sector jobs and less than one percent of all jobs.

Iowa's machinery manufacturing activities are heavily concentrated in agricultural implements and construction machinery. Together, these two industries comprise more than half (57 percent) of Iowa's machinery manufacturing employment. U.S. jobs in those industries represent just 14 percent of sub-sector employment. Engine, turbine, and power transmission equipment ranks third in Iowa with its 8.4 percent share of machinery manufacturing jobs. Contributing less than one percent of machinery manufacturing jobs in the state, mining and oil and gas field machinery is Iowa's smallest industry within the sub-sector. Nationally, metalworking machinery is the largest machinery industry, accounting for 16 percent of U.S. machinery employment. Figure 1 shows the state and national distribution of machinery employment by detailed industry.

BUSINESS ESTABLISHMENTS

Iowa had 469 machinery manufacturing sector establishments in 2013. Agricultural implements manufacturing accounts for the largest number of establishments, followed by metalworking machinery. The smallest number of establishments is found in mining and oil and gas field machinery.

With an average of 90 employees per establishment, machinery manufacturing firms tend to be larger than the typical Iowa manufacturing firm. Iowa's manufacturing sector averages 54 workers per establishment.

The industry's average establishment size is skewed to some extent by the presence of some very large firms. Data from 2012 show establishments with 500 or more workers accounting for 4 percent of total machinery establishments. Another 13 percent have 100 to 499 workers. About half of Iowa's machinery manufacturing establishments have fewer than 20 employees.

Figure 2 shows the distribution of Iowa's machinery establishments by size and detailed industry.

Construction machinery firms tend to be the largest, averaging about 275 workers per Iowa establishment. More than half of Iowa establishments in this industry have 50 or more workers. Average employment in establishments manufacturing engine, turbine, and power transmission equipment, agricultural implements, and HVAC and commercial refrigeration equipment exceed 100 workers per establishment. Metalworking machinery firms average only 25 workers per establishment, and more than half of these firms have fewer than 10 workers. Figure 3 shows the average and median number of employees per firm by detailed machinery industry in Iowa.

FIGURE 1

Distribution of Machinery Manufacturing Employment by Detailed Industry, 2013

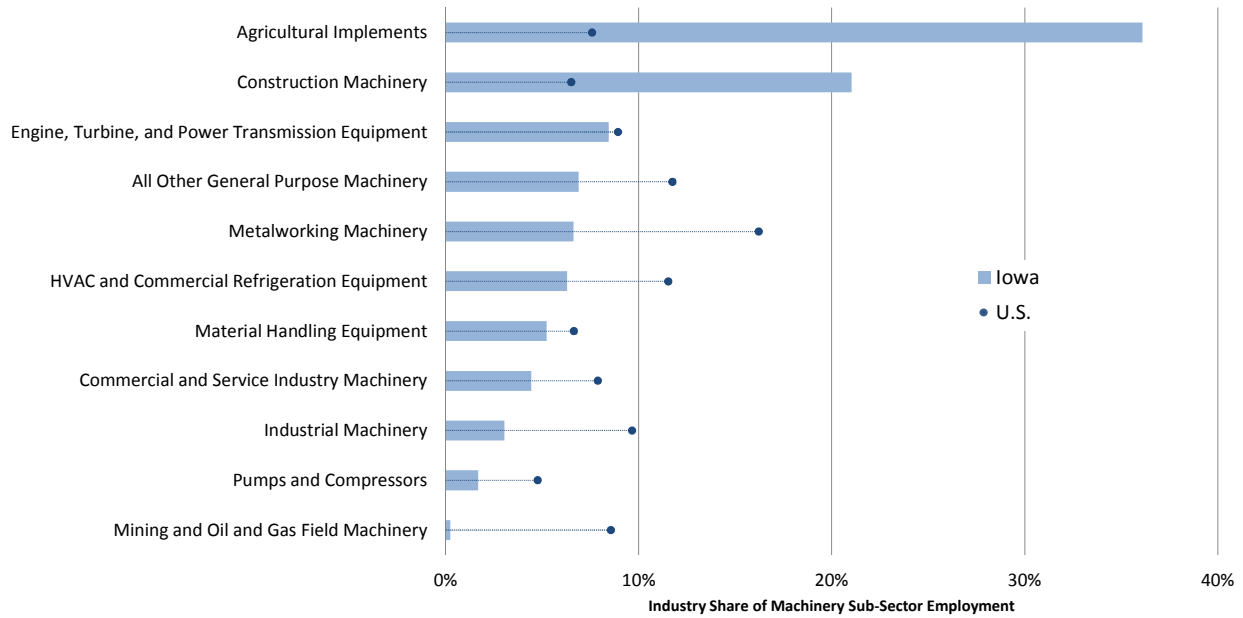


FIGURE 2

Number of Establishments by Employment Size

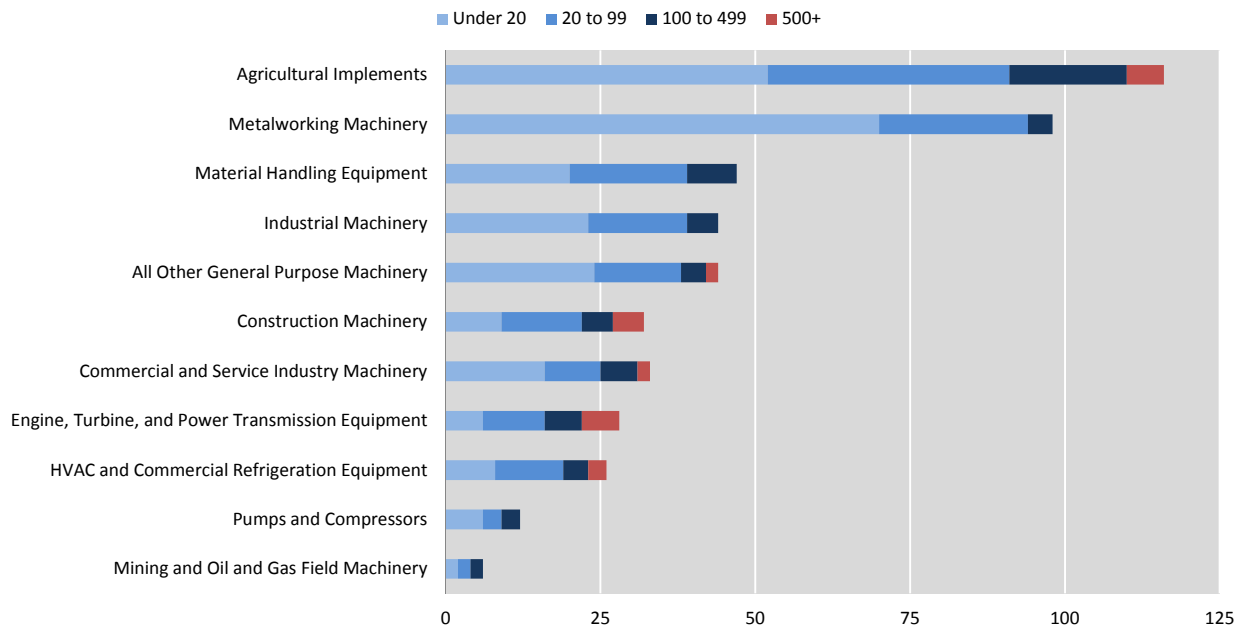
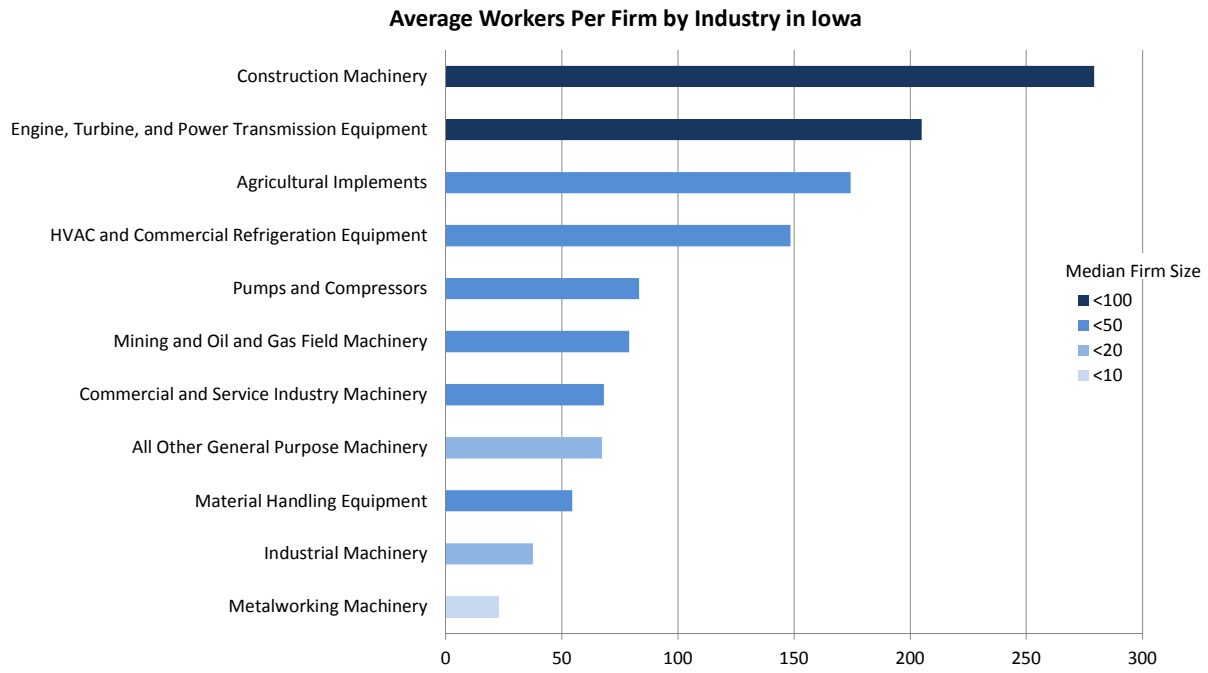


FIGURE 3



IOWA’S COMPETITIVE POSITION

EMPLOYMENT CONCENTRATION

Iowa demonstrates a notable competitive advantage in machinery manufacturing, as suggested by the sub-sector’s high concentration of employment in the state. Nearly four percent of all U.S. machinery manufacturing jobs are located in Iowa. Across all industry sectors, Iowa has just 1.1 percent of U.S. jobs. Figure 4 shows Iowa’s percentage of machinery manufacturing employment by detailed industry.

Location quotients, which measure the state’s share of national employment in a particular industry in relation to the state’s share of all U.S. jobs, show that Iowa has more than three times the number of jobs in machinery manufacturing than would be expected based on national averages. Iowa’s strongest advantages lie within the agricultural implements and construction machinery industries. In both of those industries, Iowa’s location quotient exceeds ten. Mining and oil and gas field machinery represents the only industry in which Iowa has a lower concentration of employment than the national average. Figure 5 illustrates Iowa’s machinery manufacturing location quotients by industry.

FIGURE 4

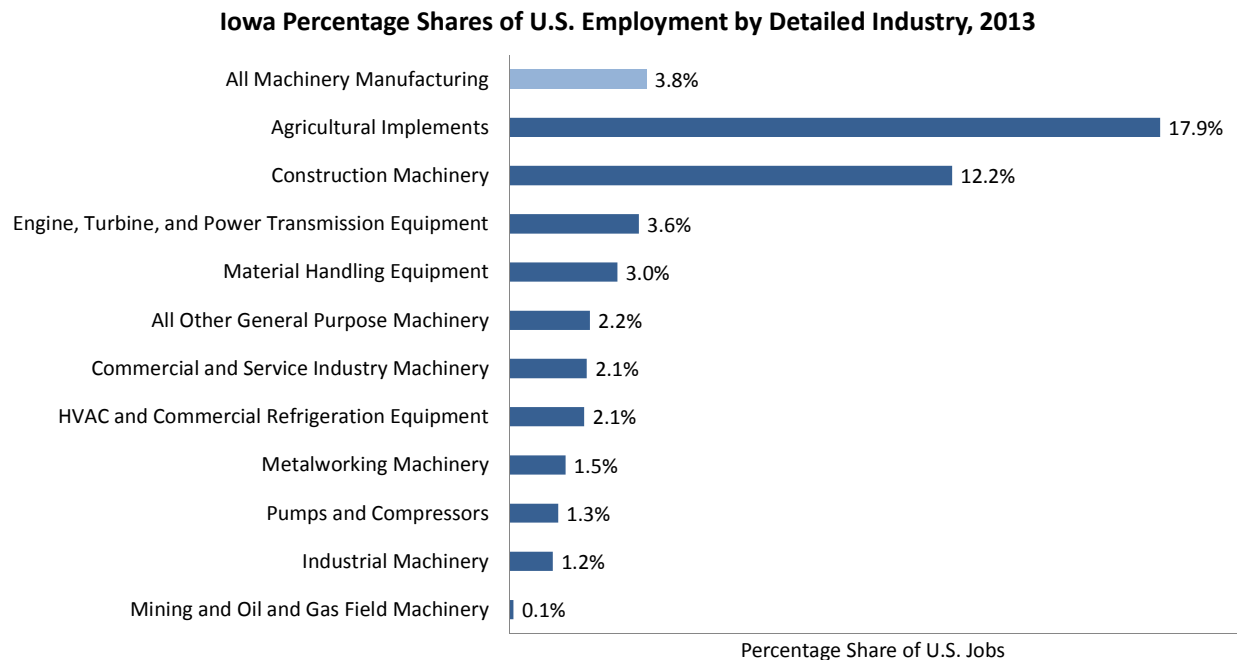
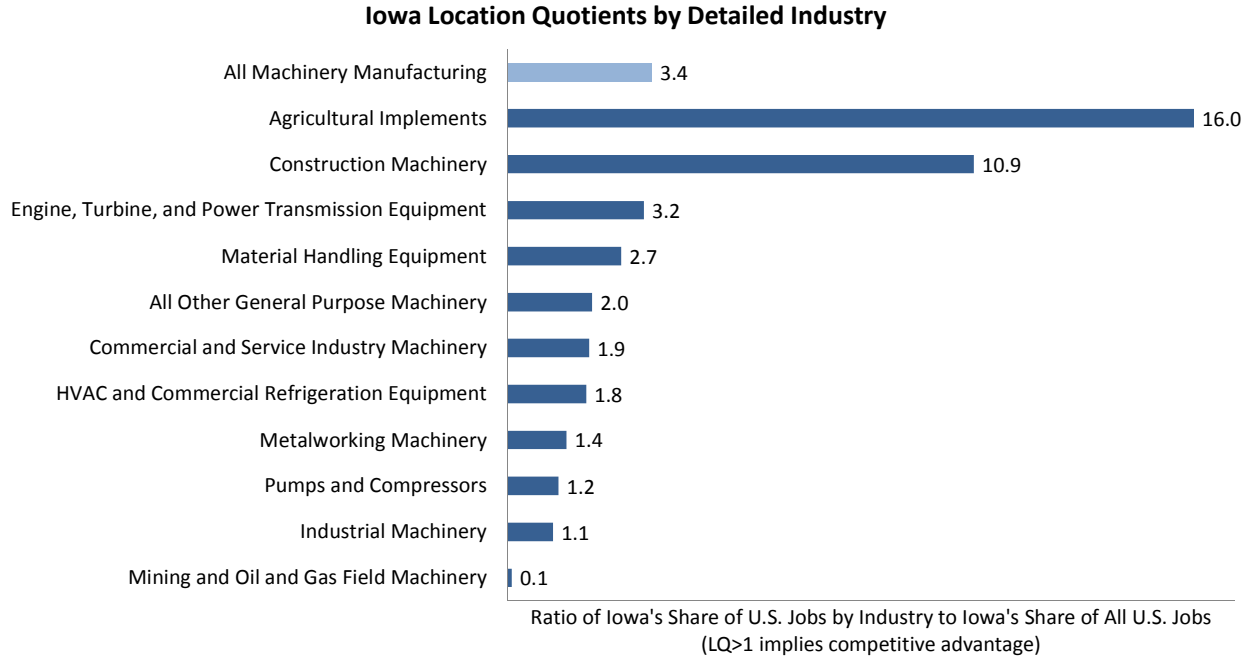


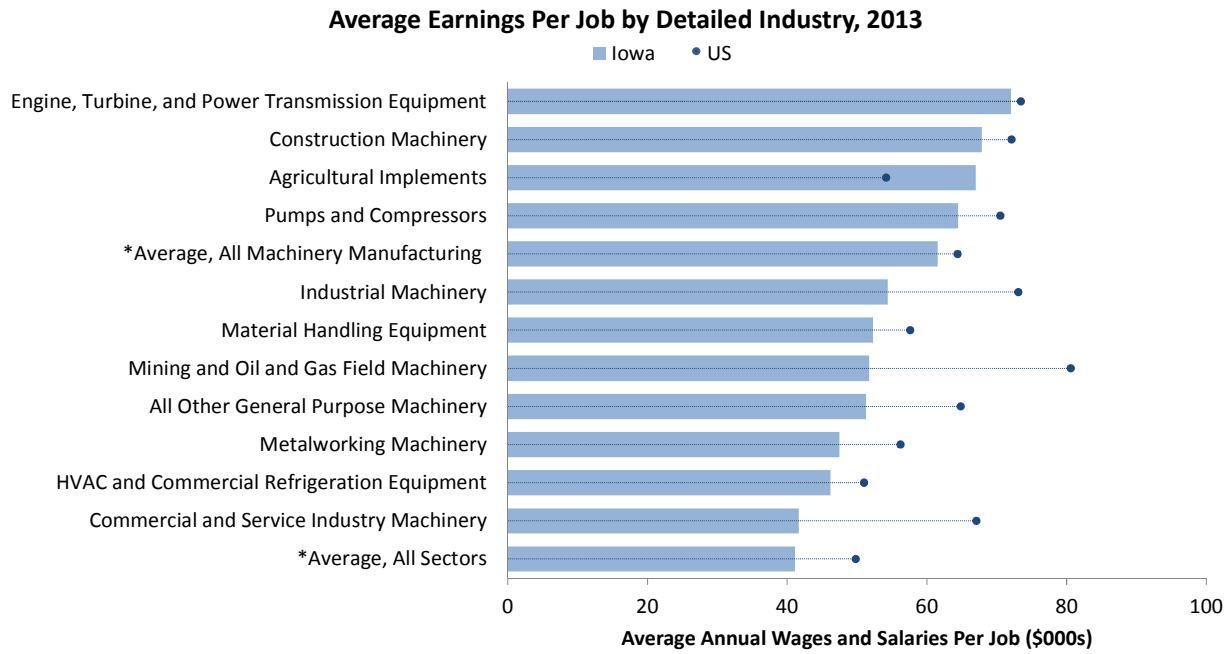
FIGURE 5



AVERAGE EARNINGS

Iowa’s machinery manufacturing workers earned \$61,555 in wages and salaries per job in 2013, which was 96 percent of the national average for the machinery sub-sector. Workers in engine, turbine, and power transmission equipment, Iowa’s highest-paying machinery manufacturing industry, earned \$72,000 in wages and salaries in 2013. U.S. average pay in that industry was slightly higher at \$73,400. Agricultural implement manufacturing, while not the highest-paying of Iowa’s machinery manufacturing industries, is the most competitive with respect to U.S. average annual pay. Iowa workers in that industry earn \$67,000 annually, more than 20 percent higher than the national average of \$54,150. Average earnings per job by detailed industry are shown in Figure 6.

FIGURE 6

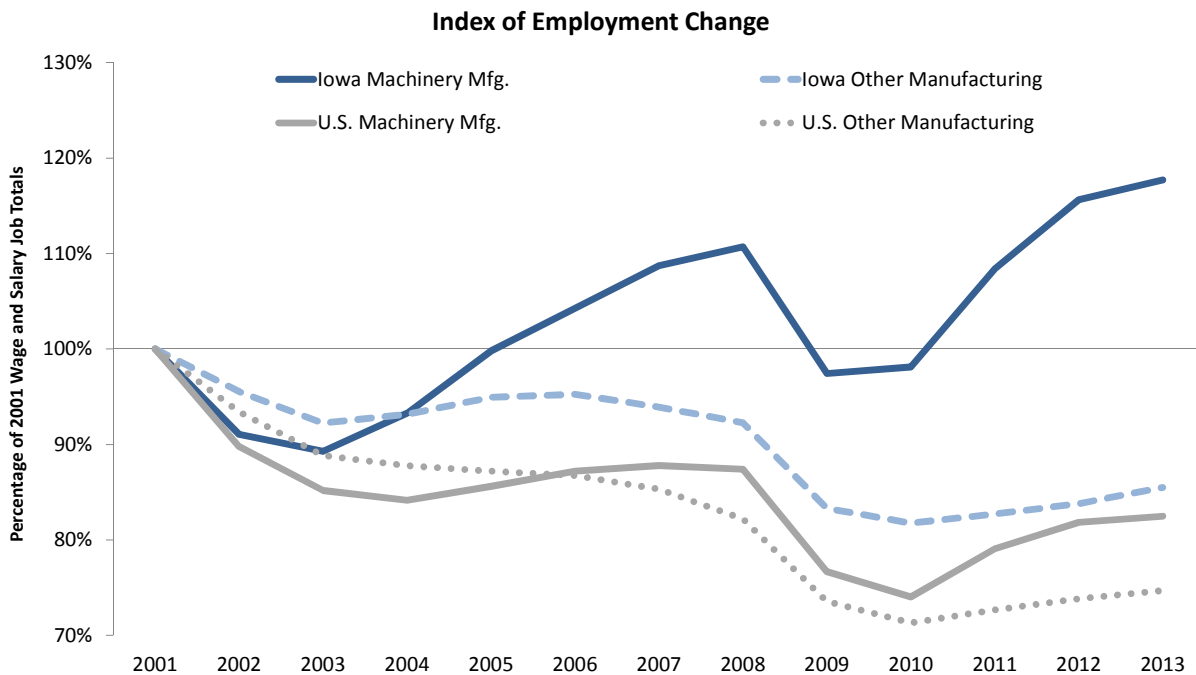


EMPLOYMENT TRENDS

OVERALL TREND

The U.S. machinery manufacturing sub-sector had 1,156,300 jobs in 2013. Nationally, the sub-sector has lost 18 percent of its jobs since 2001. Iowa’s machinery sub-sector, in contrast, had 18 percent more jobs in 2013 than in 2001, with all of the net gain accumulating since 2010. Both in Iowa and nationally, the machinery sub-sector has experienced comparatively fewer job losses than other manufacturing industries. Figure 7 shows recent state and national employment trends in machinery manufacturing and all other manufacturing industries. Employment values are indexed to base year levels in 2001.

FIGURE 7



COMPOSITION OF CHANGE

The composition of recent machinery manufacturing employment change in Iowa differs from the national pattern. The U.S. experienced strong gains in mining and oil and gas field machinery employment while Iowa lost jobs in that industry. The U.S. lost jobs in six of the remaining ten industry groups, but Iowa lost jobs in only three of those industries. Moderate job gains accrued nationally within the construction machinery, agricultural implements, engine, turbine, and power transmission equipment, and pumps and compressors industries. Iowa’s gains in agricultural implements explained 82 percent of the U.S. growth in that industry. Iowa’s gains in engine, turbine, and power transmission equipment accounted for 35 percent of U.S. job gains, and Iowa’s construction machinery growth explained 24 percent of national employment gains. Figure 8 and Figure 9 illustrate the distribution of job gains and losses nationally and in Iowa from 2004-2013.

FIGURE 8. DISTRIBUTION OF RECENT U.S. MACHINERY MANUFACTURING JOB GAINS AND LOSSES BY DETAILED INDUSTRY, 2004-2013

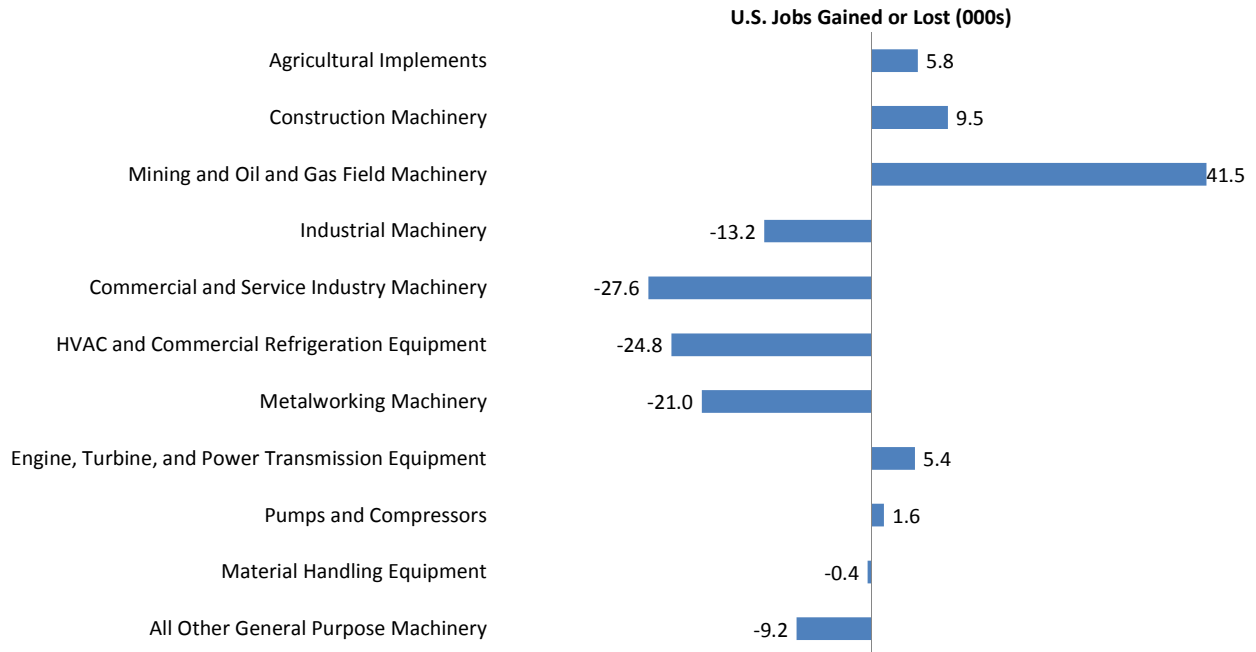
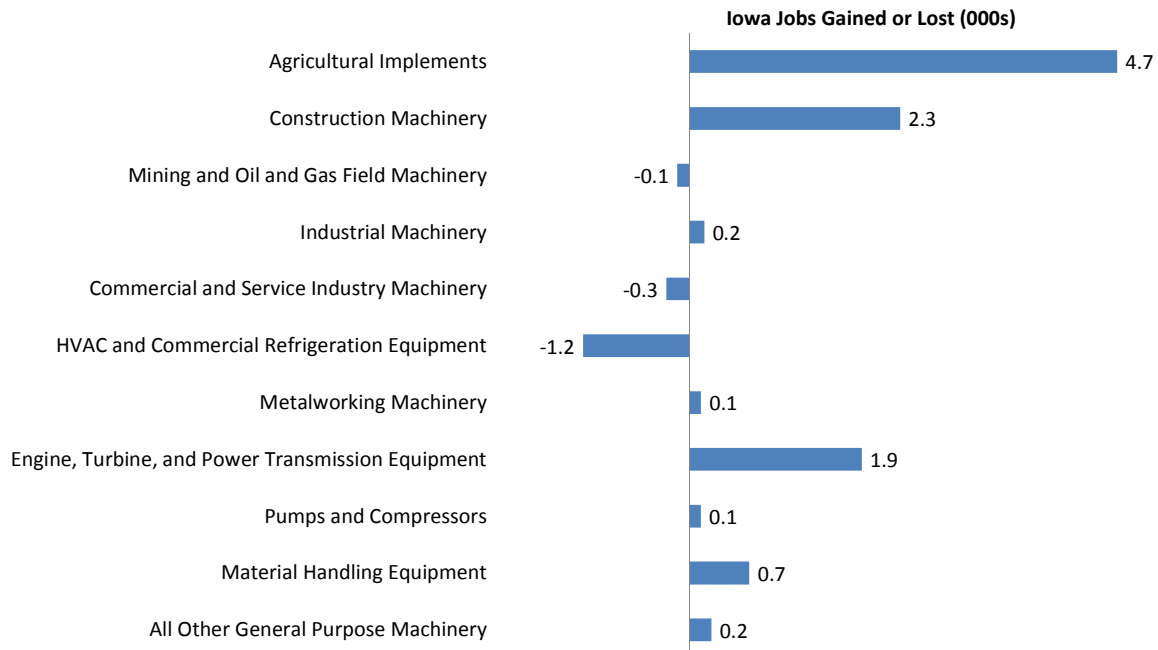


FIGURE 9. DISTRIBUTION OF RECENT IOWA MACHINERY MANUFACTURING JOB GAINS AND LOSSES BY DETAILED INDUSTRY, 2004-2013



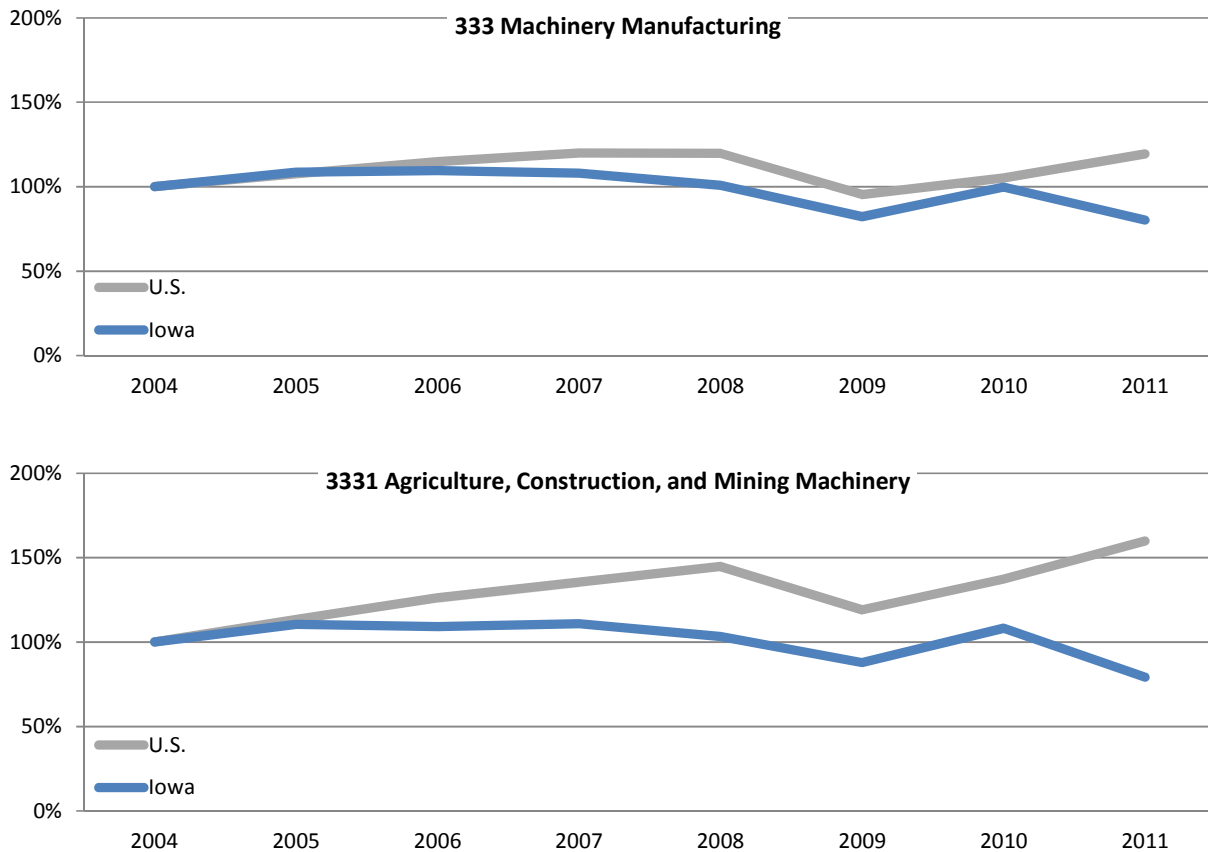
PRODUCTIVITY TRENDS

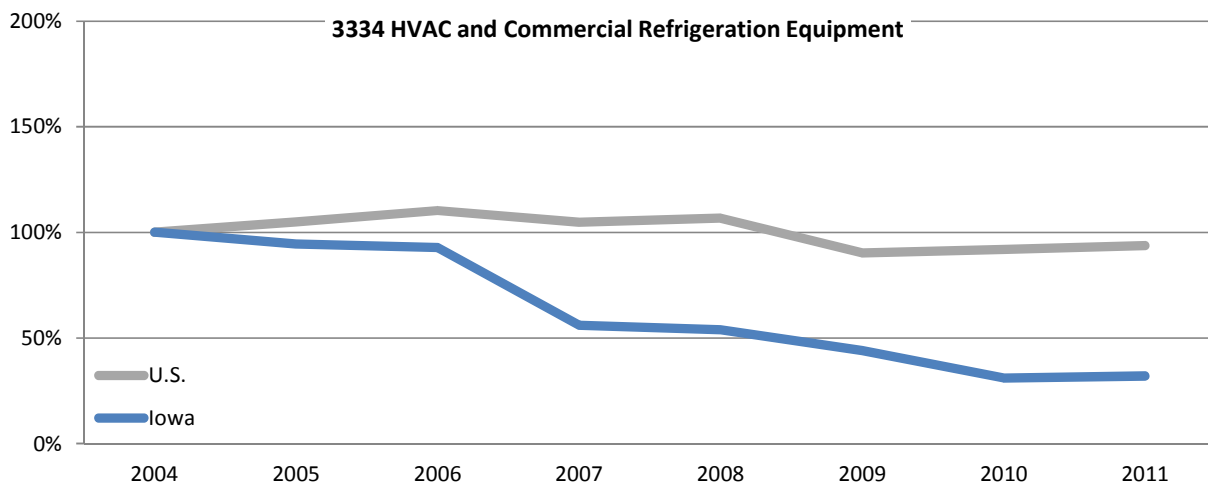
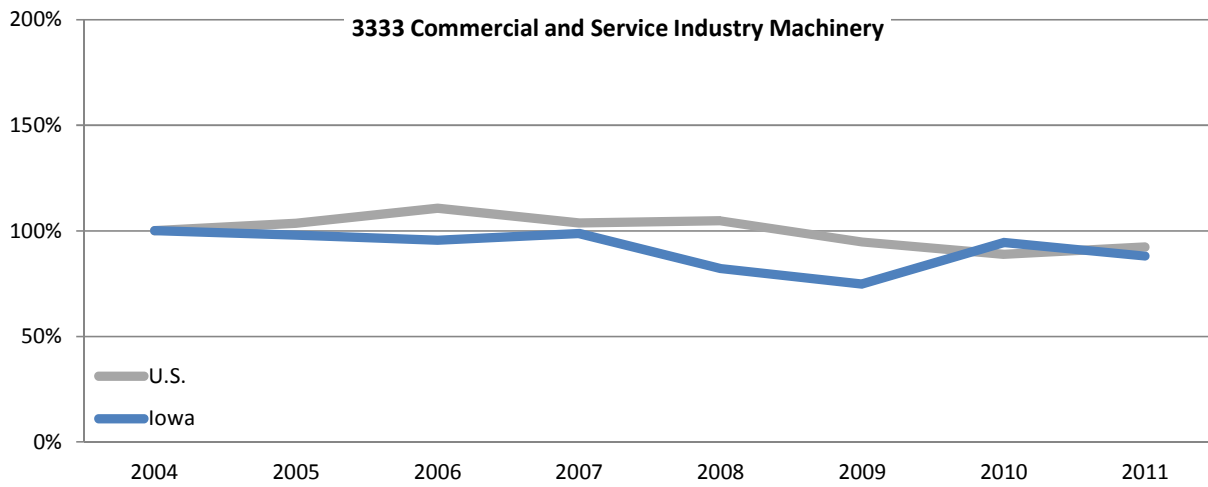
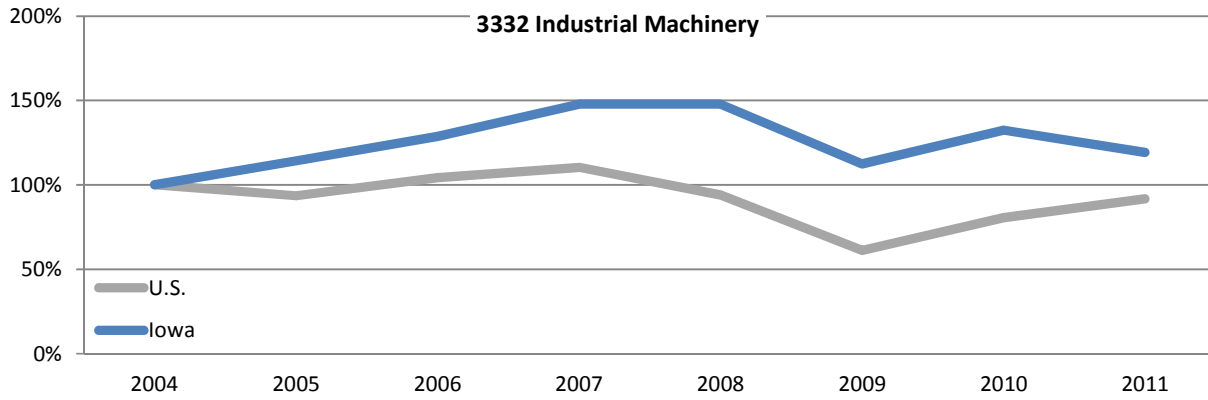
Gross domestic product (GDP) measures the market value of all goods and services produced in a region. GDP includes all payments made to labor, returns to ownership, and indirect tax payments. Real change in GDP over time is used to monitor the economic performance of a region or industry.

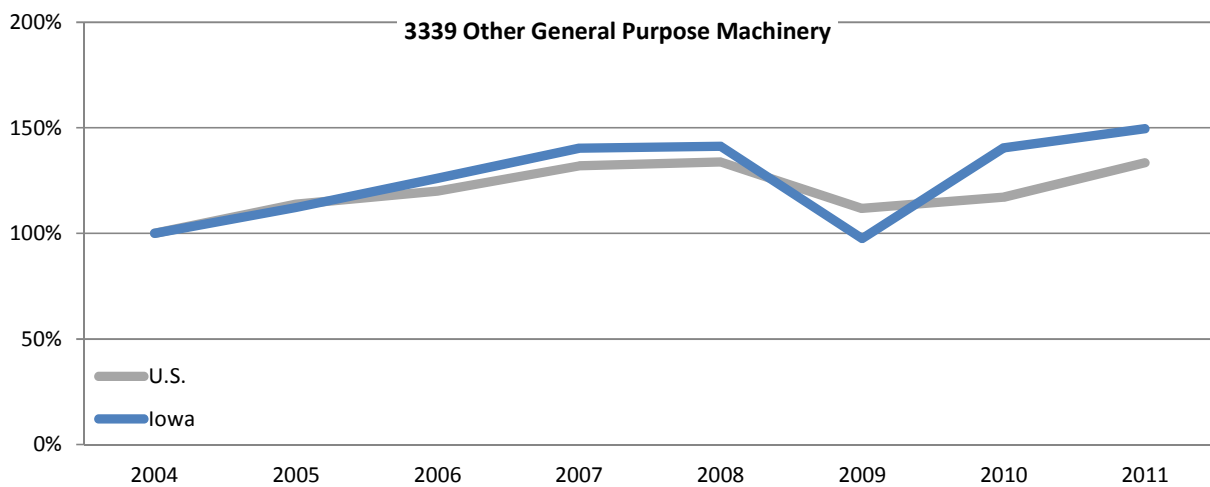
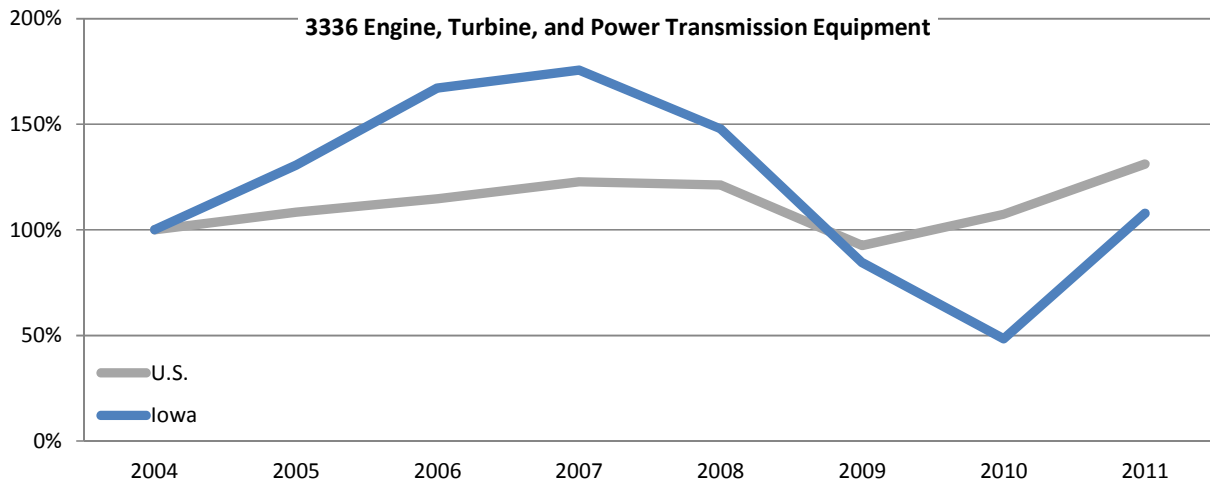
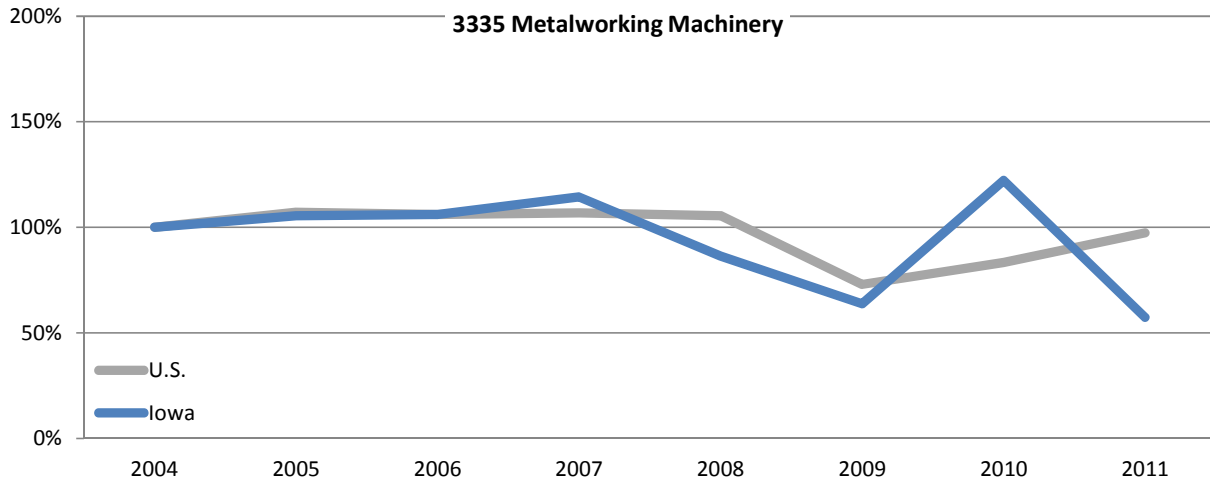
REAL GDP BY INDUSTRY

At the industry level, GDP measures the contribution of labor and capital toward the industry’s gross output. Also referred to as value added, GDP is roughly equivalent to an industry’s sales and other operating income less the value of intermediate inputs of goods and services purchased from other industries. Figure 10 shows trends in real GDP in machinery manufacturing and its component industries. Values are indexed to a base year of 2004.

FIGURE 10. INDEX OF REAL GDP





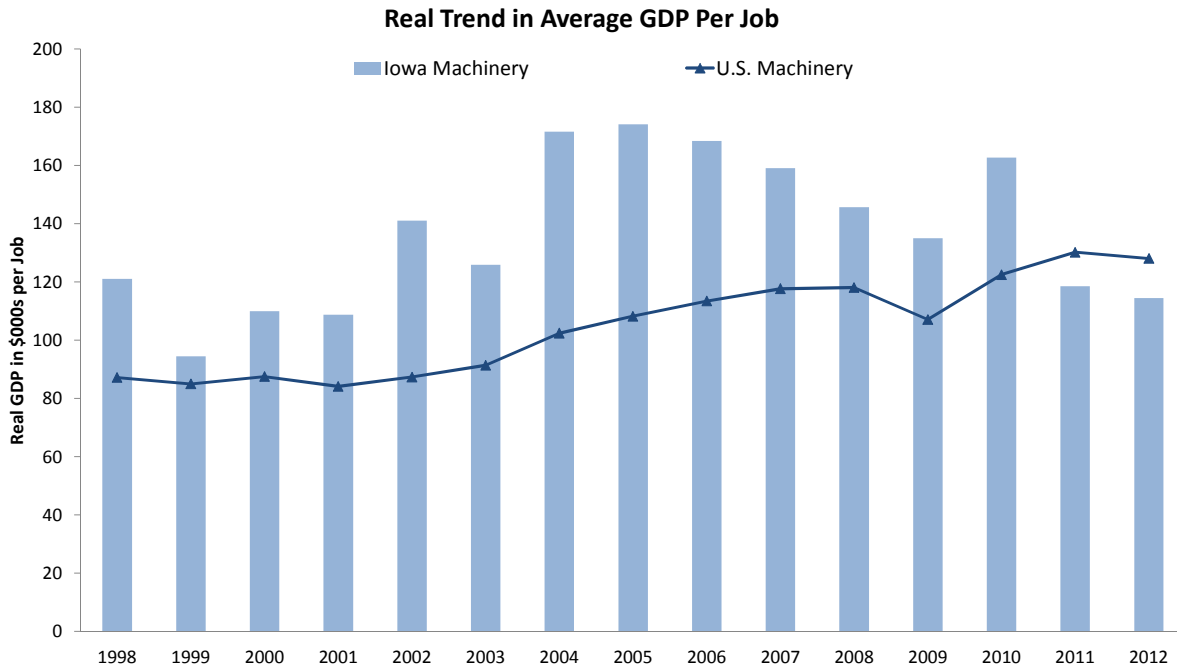


AVERAGE GDP PER JOB

Standardizing real GDP on a per job basis provides an indirect measure of an industry’s productivity over time. Growth in real GDP per job may result from numerous sources including production efficiency gains, increased firm or industry profitability, or adoption of more capital-intensive production processes. Declining GDP per job ratios may indicate falling worker productivity levels or market conditions that contribute to lower firm or industry profitability. Rapid declines in an industry’s GDP per job ratio may signal impending workforce reductions.

Figure 11 shows recent Iowa and U.S. trends in real average GDP per job in the machinery manufacturing sub-sector. The U.S. GDP per job ratio has gradually trended upward since 1999, with just a slight interruption in 2009. Iowa’s real GDP per job also climbed from 2000-2005, but has gradually declined nearly every year since. A sustained period of above-average productivity ended in 2011, when Iowa’s average GDP per job dropped below the national average.

FIGURE 11



EXPORT SALES

U.S. MACHINERY EXPORTS

Export sales account for 30 percent of the total output of U.S. machinery manufacturing industries. In all other manufacturing subsectors, foreign exports account for an average of 16 percent of output.

Figure 12 shows export shares of total output by detailed machinery manufacturing industry in 2012. Miscellaneous general purpose machinery, which includes items such as power-driven hand tools, hydraulic pumps hydrostatic transmissions, and pneumatic jacks, had the highest percentage of its sales to foreign markets. Other categories with exports exceeding 30 percent of sales included agricultural machinery; construction machinery; engine, turbine, and power transmission equipment; and pumps and compressor manufacturing.

The real value of U.S. machinery exports has grown by more than 30 percent since 2000. Exports of agriculture, construction, and mining machinery drove much of the recent growth, accounting for 56 percent of machinery export growth from 2000-2013. Engine, turbine, and power transmission equipment exports explained another 32 percent of the growth. Figure 13 shows the real growth in U.S. machinery exports by industry group since 2000.

FIGURE 12. U.S. PERCENTAGE OF INDUSTRIAL OUTPUT SOLD FOR EXPORT, 2012

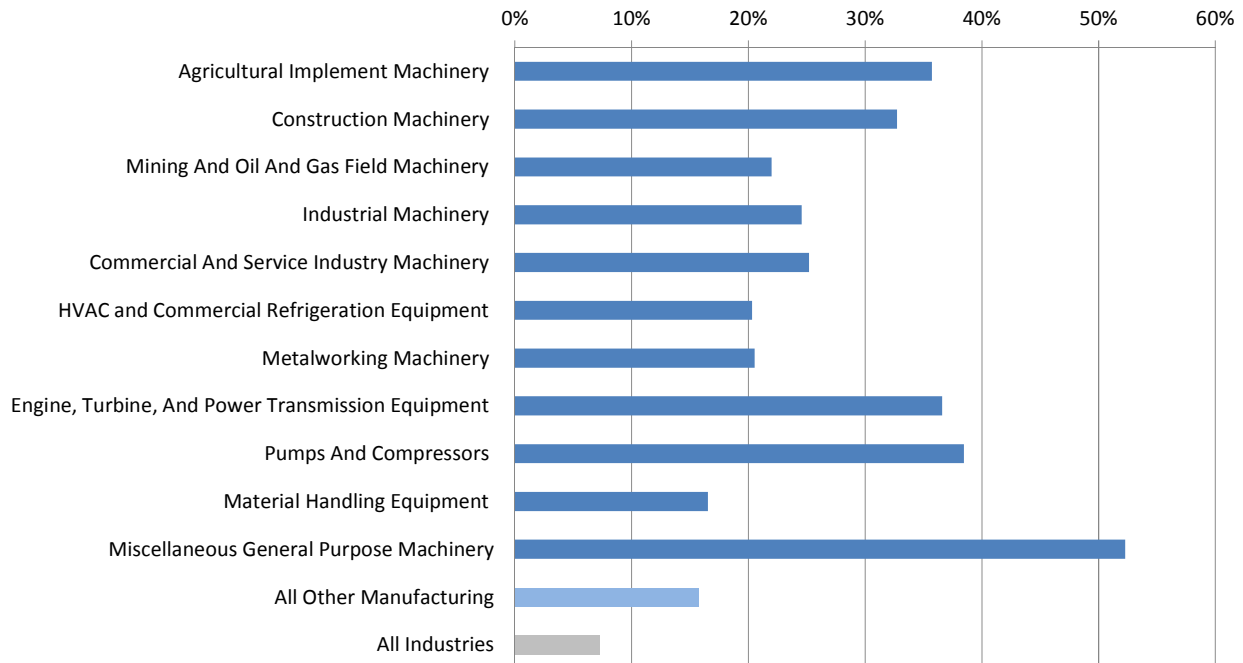
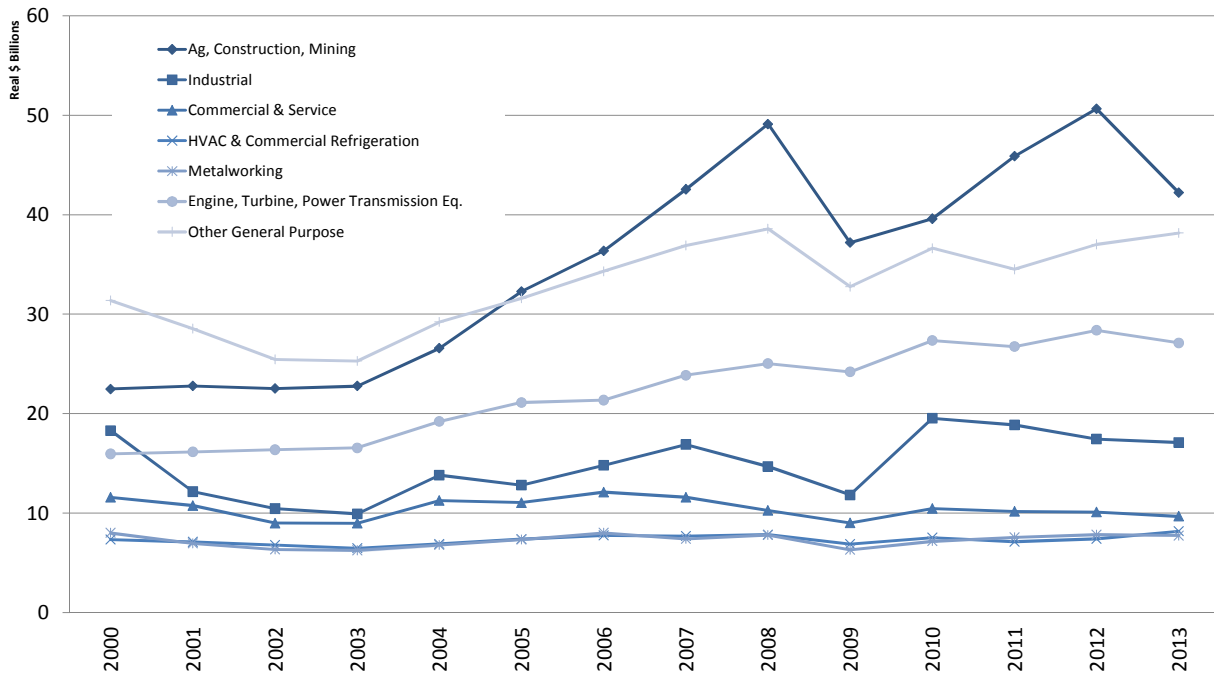


FIGURE 13. REAL U.S. MACHINERY MANUFACTURING EXPORTS BY TYPE, IN BILLIONS OF DOLLARS



IOWA EXPORTS

Iowa produced 2.6 percent of the machinery exported from the United States in 2013. The state’s share of U.S. machinery exports has more than doubled since 2000, when Iowa accounted for 1.2 percent of the national total.

Figure 14 compares real growth in Iowa and U.S. machinery exports indexed to base year levels in 2000. Iowa’s real growth in machinery exports outpaced the national rate from 2000-2008. Iowa exports declined sharply in 2009, but then grew annually until 2012. In 2013, Iowa’s \$3.9 billion in machinery exports were down 13 percent from their inflation-adjusted peak of \$4.5 billion in 2012.

The real value of total U.S. machinery manufacturing exports declined slightly from 2000-2003, grew from 2003-2008, fell in 2009, then grew from 2010-2012. After peaking at \$159 billion in 2012, U.S. real exports dropped slightly to \$150 billion in 2013.

The Machinery sub-sector produces six of Iowa’s top 25 commodity exports as measured by dollar value. These items include: tractors; front-end shovel loaders; track-laying tractors; machinery parts used for haying, mowing, harvesting, threshing, sorting, or grading agricultural produce; self-propelled mechanical shovels, excavators, and shovel loaders; and agricultural mechanical sprayers. Tractors alone accounted for nearly eight percent of Iowa’s total commodity exports in 2013.

IOWA’S TRADING PARTNERS

The top trading partners for Iowa’s machinery exports in 2013 included Canada, Brazil, and Germany. Australia, the Russian Federation, South Africa, Mexico, France, China, and Ukraine rounded out the top ten. Figure 15 illustrates machinery export levels from Iowa to its key trading partners since 2000.

FIGURE 14. INDEX OF REAL CHANGE IN MACHINERY AND OTHER MANUFACTURING EXPORTS

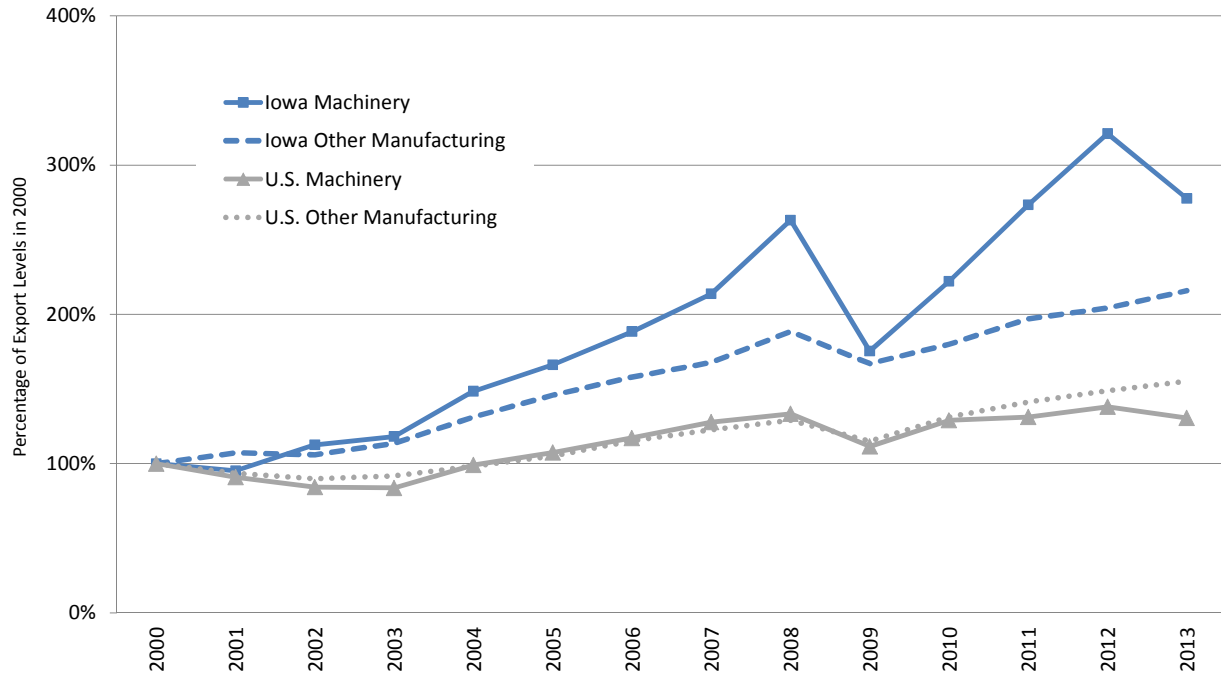
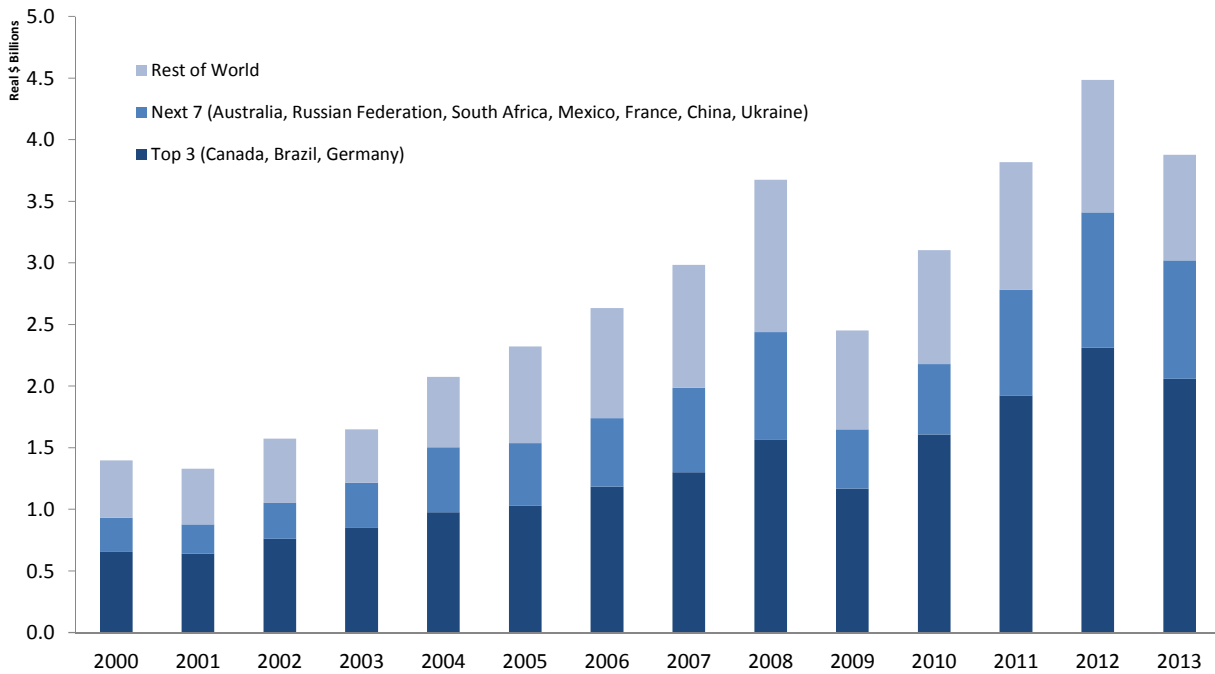


FIGURE 15. REAL MACHINERY EXPORTS FROM IOWA BY TRADING PARTNER GROUP, AS RANKED IN 2013

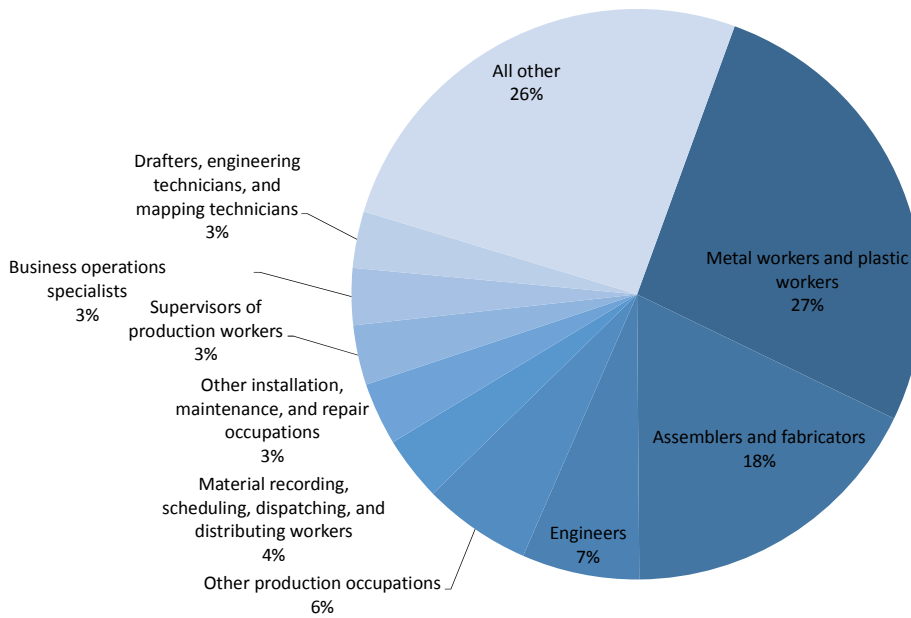


OCCUPATIONAL PROFILE

Workers in production occupations comprise half of the U.S. machinery manufacturing workforce. Metal workers and plastic workers account for more than one quarter of workers, followed by assemblers and fabricators with 18 percent. Other production occupations account for 6 percent of workers.

Ten percent of the machinery industry's workers hold engineering-related occupations, with engineers filling 7 percent of the jobs and engineering technicians and related workers in 3 percent of the jobs. Figure 16 shows the distribution of U.S. machinery manufacturing employment by occupation in 2013.

FIGURE 16. KEY OCCUPATIONS IN U.S. MACHINERY MANUFACTURING INDUSTRIES



RESEARCH AND DEVELOPMENT

U.S. MACHINERY MANUFACTURING R&D

More than one third of U.S. machinery manufacturing firms pursued R&D activities in 2010. The R&D engagement rate for the manufacturing sector as a whole was 23 percent. Industries within the subsector vary widely on this measure (see

Figure 17). More than 80 percent of firms producing semiconductor-making machinery reported R&D activity in 2010. Slightly fewer than half of U.S. agricultural implement manufacturers engaged in R&D activity. Engine, turbine, and power transmission equipment manufacturers pursued R&D efforts at a slightly lower rate, with 42 percent reporting R&D activities. The average across all other machinery industries was 32 percent.

Among U.S. machinery companies with R&D efforts, an average of eight percent of their domestic workforce is involved in the R&D activities (see Figure 18). That eight percent includes scientists and engineers and their managers, technicians and technologists, and clerical and other support staff for R&D programs. R&D performers in the U.S. machinery industry spend an average of \$3.3 million worldwide for their R&D efforts. Agricultural implement manufacturers average \$6.9 million per R&D-performing firm.

Figure 19 illustrates average R&D spending per firm in selected industries in 2010.

FIGURE 17

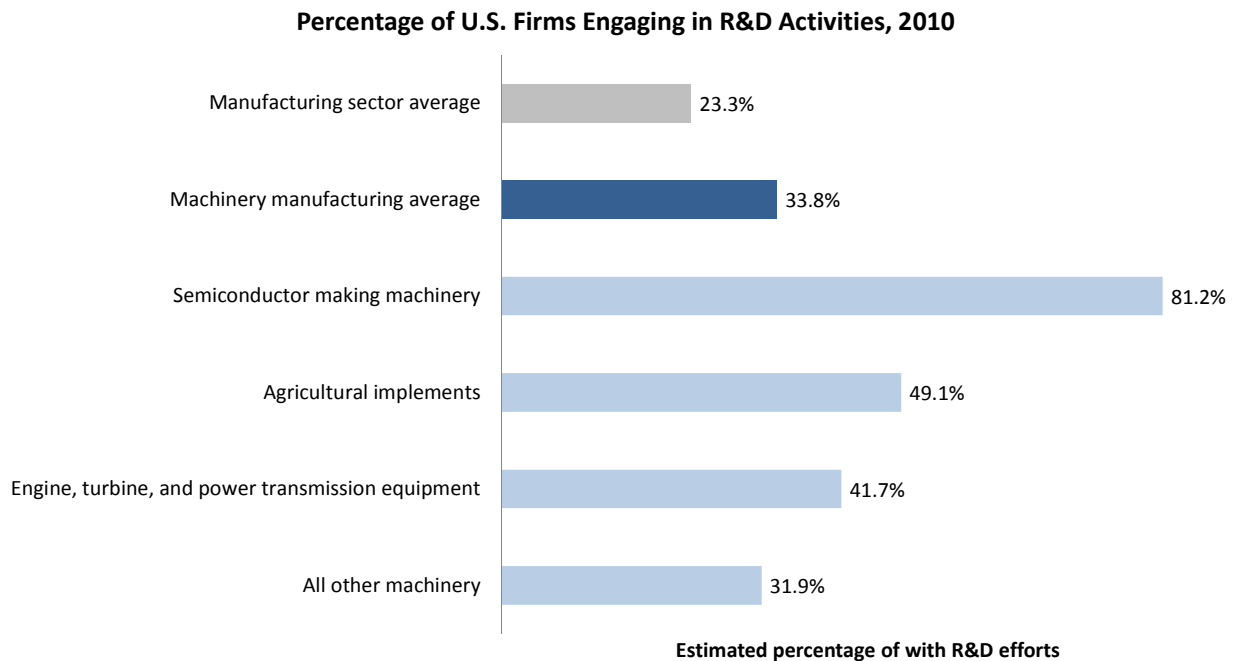


FIGURE 18

Estimated Percentage of Employees Supporting R&D Efforts in R&D-Performing Firms

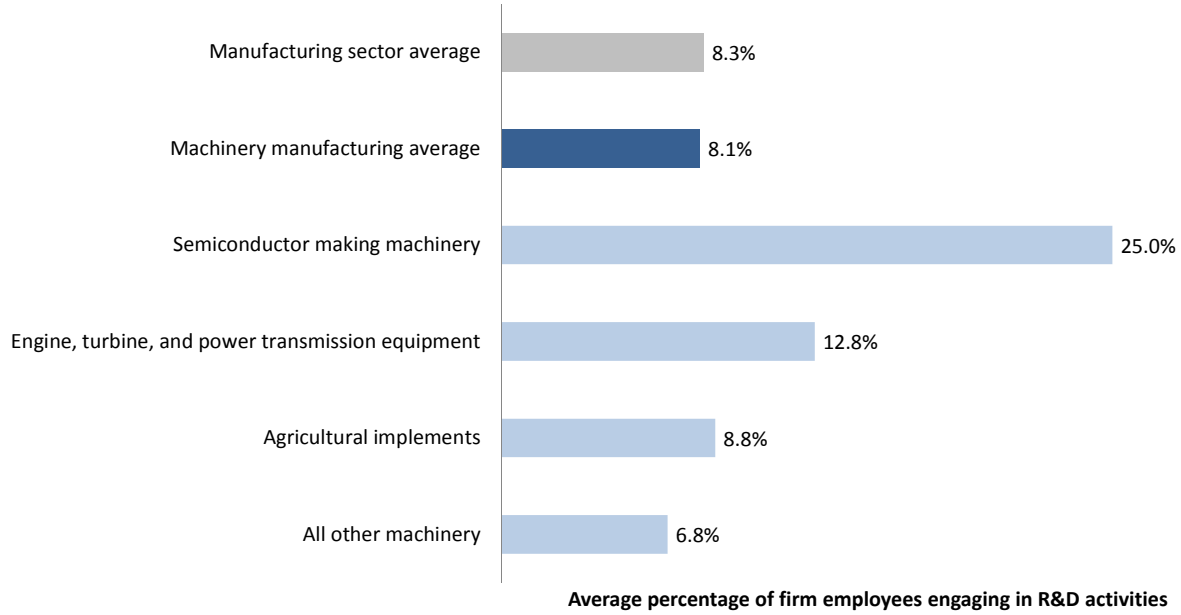
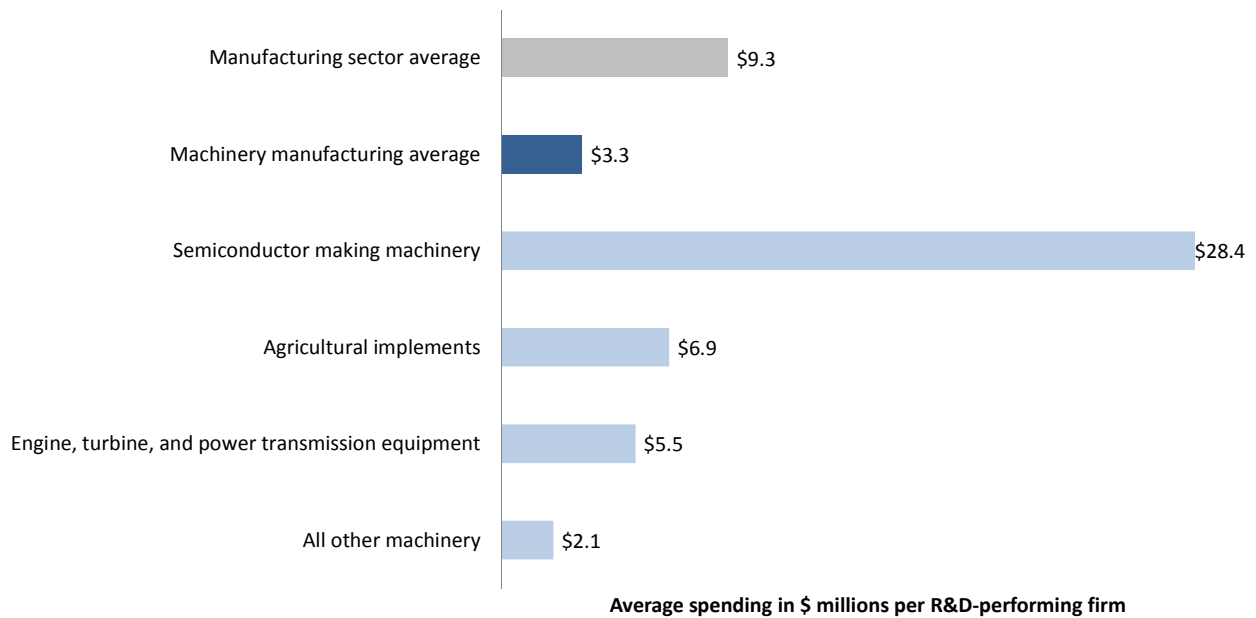


FIGURE 19

Average Worldwide R&D Spending by U.S. Companies Engaged in R&D Efforts



IOWA MACHINERY MANUFACTURING R&D

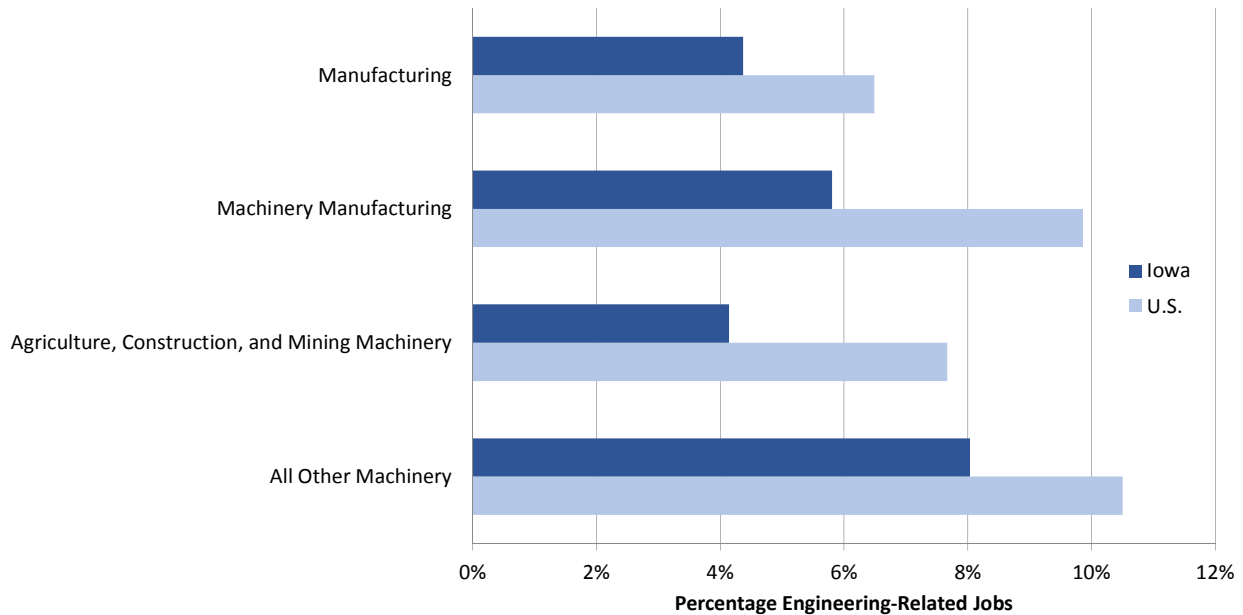
Patenting activity provides one of the few available measures for monitoring R&D level by industry within states. According to data from the U.S. Patent and Trademark Office, 533 machinery manufacturing-related utility patents originated from Iowa during 2009-2012. These patents accounted for 1.4 percent of the national total. When standardized by number of firms in the industry, Iowa’s machinery-related patenting efforts rank 32nd among all states. Iowa originates an average of one patent per every three machinery manufacturing firms per year. The top five states on this measure are Hawaii, Delaware, Utah, Maryland, and New York.

Based on 2009-2012 data, it appears that two companies typically account for well over half of Iowa’s machinery-related patenting activity. Deere & Company was the most active Iowa machinery firm as measured by patenting activity with its 396 utility patents, followed by Vermeer with 59 patents.

Staffing levels of engineering-related workers provide another indirect measure of R&D intensity within a state’s industries. Research estimates produced by the U.S. Bureau of Labor Statistics suggest that Iowa lags the national average in its percentage of engineering-related workers in machinery manufacturing. In Iowa, engineers and engineering technicians account for an estimated 5.8 percent of all machinery workers. The U.S. average for the industry is 9.9 percent. The relative gap is even greater within the state’s agriculture, construction, and mining machinery industries, where just 4.1 percent of workers hold engineering-related jobs in Iowa compared to the U.S. average of 7.7 percent. Figure 20 shows the estimated Iowa and U.S. percentages of engineering-related jobs in machinery industries and the manufacturing sector as a whole.

FIGURE 20

Estimated Percentage of Workers in Engineering-Related Occupations, 2013



KEY DATA SOURCES

International Trade Administration, U.S. Department of Commerce

Science and Engineering Indicators, National Science Foundation

U.S. Bureau of Economic Analysis

U.S. Bureau of Labor Statistics

U.S. Census Bureau

U.S. Patent and Trademark Office