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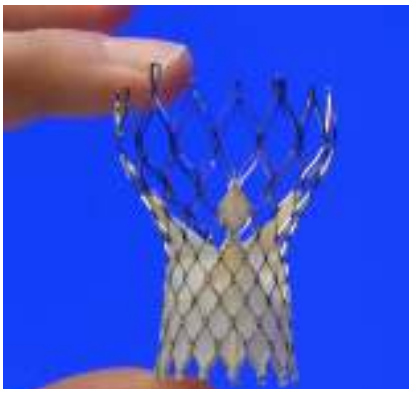

HEALTHCARE AND HUMAN SERVICES POLICY, RESEARCH, AND CONSULTING—WITH REAL-WORLD PERSPECTIVE.

The Economic Impact of the Medical Technology Industry

Task 1: National Impact

Prepared for: **Advanced Medical Technology Association (AdvaMed)**

Submitted by: **The Lewin Group, Inc.**

November 2015

AdvaMed
Advanced Medical Technology Association

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Executive Summary

The U.S. medical technology industry (MTI)[1] is a highly diversified manufacturing sector with significant impacts on health status, quality of life, and the U.S. economy. The industry encompasses the manufacturing of everyday medical devices such as contact lenses and thermometers to such high-tech devices and equipment as transcatheter aortic valves, molecular diagnostics, neuro-stimulators, and state-of-the-art multimodal imaging systems. In this report, The Lewin Group presents estimates of the national impact of the industry, extracted from the most recent business data from the 2012 Economic Census. This report provides updated figures from our previous industry analysis, released in 2010.[2] The industry's economic impact on each of the 50 states and the District of Columbia will be presented in a subsequent report.

The MTI is a strong and innovative sector of the U.S., playing a critical role in our national economy. In 2012, this industry accounted for the following direct benefits to the national economy:

- Employed 394,887 workers
- Generated a total payroll of $25.7 billion[3]
- Generated an average payroll of $65,000 per employee, compared to $52,700 for the average manufacturing job and less than $45,000 for the average job across all industries
- Shipped $141.6 billion worth of products[4]

Relative to the corresponding 2007 and 2008 data provided in our 2010 report, these figures for 2012 represent a net reduction in the number of employees and an increase in payroll and shipments (i.e., sales). Those changes in employment, payroll, and shipments in the MTI sector differed relative to changes in the manufacturing industry overall. Employment in the MTI sector declined substantially less than in manufacturing as a whole, with MTI payroll showing a small increase compared to a decrease for manufacturing as a whole. Workforce reductions for the MTI and the manufacturing industry overall were 6.6% and 11.8%, respectively. Payroll for the MTI increased by 4.5% but decreased for manufacturing overall by 2.3%. The value of shipments increased for the MTI by 4.2% and increased for the manufacturing industry overall by 4.9%.

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1 The medical technology industry (MTI) is defined as comprising the following eight North American Industry Classification System (NAICS) subsectors: Surgical and medical instrument manufacturing; Surgical appliance and supplies manufacturing; Electromedical and electrotherapeutic apparatus manufacturing; In-vitro diagnostic substance manufacturing; Irradiation apparatus manufacturing; Dental equipment and supplies manufacturing; Ophthalmic goods manufacturing, and Dental laboratories.

2 The Lewin Group. State Economic Impact of the Medical Technology Industry. Prepared for AdvaMed, June 2010. That previous industry report analyzed data from the 2007 Annual Survey of Manufacturers and the 2008 Economic Census data.

3 Payroll is defined by the U.S. Economic Census as all forms of compensation, such as salaries, wages, commissions, dismissal pay, bonuses, vacation allowances, sick-leave pay, and employee contributions to qualified pension plans paid during the year to all employees.

4 As defined by the U.S. Economic Census, total value of shipments, also referred to as sales, comprises the primary product value of shipments, the secondary product value of shipments, and total miscellaneous receipts.

National MTI data are derived from the Manufacturing section of the 2012 Economic Census, and are compared to historic data from the 2008 Annual Survey of Manufacturers as well as the Manufacturing section of the 2007 Economic Census.

This report does not provide estimates of the indirect effect of the MTI on U.S. employment. Our 2007 report[5] provided estimates of state-specific and national "multipliers" of MTI jobs (released by the U.S. Bureau of Economic Analysis, using the Regional Input-output Modeling System, version II). For example, as noted in the 2007 report, in the median state, each MTI job generated an additional 2.0 jobs within that state, while each MTI job in the U.S. generated an additional 4.5 jobs in the national economy. State job multipliers were smaller than the national multiplier because in-state multipliers do not account for interstate economic impacts. Because the U.S. Bureau of Economic Analysis ceased releasing national multipliers in 2009, our 2010 report did not provide national multiplier estimates for the MTI. Our 2010 report did provide state multiplier estimates; for example, in the median state, each MTI job generated an additional 1.5 jobs within that state.

5 The Lewin Group. State Impacts of the Medical Technology Industry. Prepared for AdvaMed, May 2007.

I. Introduction

The U.S. medical technology industry (MTI) makes substantial contributions to the health and quality of life for people in the U.S. and globally. The MTI develops, manufactures, and distributes products that are used across a diverse range of applications in health care. Medical technologies assist in screening for diseases and disorders in asymptomatic people; diagnosis, treatment, and other management of disease; rehabilitation from disease or injury; and palliation (to ease severity, pain, or discomfort). The more common MTI products include those used to improve vision (e.g., eyeglasses and contact lenses), and those used in everyday health care settings (e.g., thermometers and blood pressure monitors). More complex MTI products include cardiac pacemakers, hemodialysis machines for kidney failure, artificial limbs and joints, advanced medical imaging equipment, and molecular diagnostic tests guiding selection of targeted cancer therapies. Most of the clinical equipment and furnishings in hospitals, physicians' and dentists' offices, and medical laboratories are products of the MTI. In the context of greater demand for value in health care, the MTI must continue to innovate toward preventing or delaying onset of disease, improving patient outcomes, reducing unnecessary health services utilization, and improving resource allocation and other efficiencies in the health care system.

Methodology

The scope and economic impact of various industries in the U.S. can be tracked using data collected by the U.S. Census Bureau for industries defined by the North American Industry Classification System (NAICS) codes covered by the Office of Health and Consumer Goods. The U.S. Census Bureau lists 18 main industries, including, e.g., Mining, quarrying, and oil and gas extraction (NAICS industry code 21); Utilities (22); Construction (23); and Manufacturing (31-33). Each industry is defined to include specific product types and associated manufacturing processes. Within each industry is a set of sectors and subsectors. The U.S. Census Bureau does not classify the MTI as an industry as such. However, the MTI is approximated by a set of eight industry subsectors, all under the Manufacturing industry, as listed in Exhibit 1.

Except for one of its subsectors, the industry sector of Pharmaceutical and medicine manufacturing (3254) is not included in the MTI. This industry sector includes, e.g., antibiotics; drugs to manage such conditions as hypertension, osteoporosis, and diabetes; and biologics such as vaccines, blood products, and therapies derived from recombinant DNA. The one subsector categorized under Pharmaceutical and medicine manufacturing that is included in the MTI for this report is In vitro diagnostic substance manufacturing (325413).

Another NAICS industry, Health care and social assistance (NAICS industry code 62), addresses health care services provided by type of delivery site, i.e., Ambulatory health care services (621); Hospitals (622); Nursing and residential care facilities (623); and Social assistance (624). This industry is not included in the MTI.

Exhibit 1: Medical Technology Industry Subsectors

NAICS Code	Subsector	Items Manufactured
339112	Surgical and medical instrument manufacturing	Includes anesthesia apparatuses, orthopedic instruments, optical diagnostics apparatuses, blood transfusion devices, syringes, hypodermic needles, medical thermometers, and catheters
339113	Surgical appliance and supplies manufacturing	Includes artificial joints and limbs, stents, orthopedic appliances, surgical dressings, disposable surgical drapes, hydrotherapy appliances, surgical kits, hospital beds, operating room tables, rubber medical and surgical gloves, and wheelchairs.
334510	Electromedical and electrotherapeutic apparatus manufacturing	Includes a variety of powered devices, such as pacemakers, patient-monitoring systems, MRI machines, diagnostic imaging equipment (including informatics equipment), and ultrasonic scanning devices.
325413	In vitro diagnostic substance manufacturing	Includes in vitro (i.e., not taken internally) diagnostic substances, such as chemical, biological, or radioactive substances (used for diagnostic tests that are performed in test tubes, petri dished, machines, and other diagnostic test-type devices).
334517	Irradiation apparatus manufacturing	Includes X-ray devices and other diagnostic imaging, as well as computed tomography equipment.
339114	Dental equipment and supplies manufacturing	Includes equipment, instruments, and supplies used by dentists, dental hygienists, and laboratories. Specific products include dental hand instruments, plaster, drills, amalgams, cements, sterilizers, and dental chairs.
339115	Ophthalmic goods manufacturing	Includes prescription eyeglasses (except manufactured In a retail setting), contact lenses, sunglasses, eyeglass frames, reading glasses made to standard powers, protective eyewear.
339116	Dental laboratories	Includes dentures, crowns, bridges, orthodontic appliances (customized for individual applications).

The currency of the MTI data reported here reflects the frequency of certain reports from the U.S. Census Bureau, which conducts various scheduled periodic surveys representing national and state data. The Annual Survey of Manufacturers (ASM) is conducted annually, except for years ending in 2 or 7, when ASM statistics are included in the Manufacturing section of the Economic Census. For this report, national MTI data were obtained for each of the eight sectors specified above from the Manufacturing section of the 2012 Economic Census. The MTI data were assessed by subsector as well as cumulatively, and compared to the manufacturing industry overall (data obtained from the Manufacturing section of the Economic Census, NAICS codes 31-33), as well as the 2007 ASM data and the 2008 Economic Census data. Estimates of aggregate wages and number of workers were based on Social Security Administration, Average Wage Index (AWI) series and underlying data.

II. Direct Value of the Medical Technology Industry

The U.S. remains the largest medical device market in the world, representing about 38% of the global medical device market in 2012.[6] As summarized in Exhibit 2, the MTI employed 394,887 workers across the U.S. in 2012, accounting for approximately 0.34% of the total U.S. work force. Workers earned $25.7 billion in payroll, or an average of $65,000 per year. The total value of industry shipments, or sales, was $141.6 billion in 2012.

Exhibit 2: Employees, Payroll, and Value of Shipments by MTI Subsector, 2012

MTI Subsectors	Number of Employees	Payroll ($1,000)	Value of sales, shipments, receipts, revenue or business ($1,000)
Surgical and medical instrument manufacturing	104,127	6,642,290	37,090,501
Surgical appliance and supplies manufacturing	96,689	6,274,462	37,508,787
Electromedical and electrotherapeutic apparatus manufacturing	70,280	5,469,499	28,162,614
In vitro diagnostic substance manufacturing	25,427	2,233,755	12,960,492
Irradiation apparatus manufacturing	15,606	1,356,984	9,513,443
Dental equipment and supplies manufacturing	14,632	835,170	5,170,603
Ophthalmic goods manufacturing	22,585	1,139,309	6,467,029
Dental laboratories	45,541	1,746,641	4,731,565
2012 MTI Totals	**394,887**	**25,698,110**	**141,605,034**

More than 50% of MTI employment and sales are attributable to two subsectors: Surgical and medical instrument manufacturing and Surgical appliance and supplies manufacturing. The Surgical and medical instrument subsector, which includes the manufacture of, e.g., scalpels, clamps, and syringes, accounted for 104,127 employees and $37.1 billion in sales. The Surgical appliance and supplies subsector, which includes the manufacture of, e.g., orthopedic devices, surgical sutures and dressings, accounted for 96,689 employees and $37.5 billion in sales. The next largest subsector for employment and sales, Electromedical and electrotherapeutic apparatus manufacturing, includes such diverse electrical devices as pacemakers, hearing aids, heart monitors, endoscopes, ultrasound equipment, and magnetic resonance imaging equipment.

[6] United States Department of Commerce. http://selectusa.commerce.gov/industry-snapshots/medical-device-industry-united-states. Accessed February 17, 2015.

Employment

The MTI comprised 12,691 establishments in 2012,[7] most of which were small (< 20 employees) and medium (20-99 employees) sized enterprises, as shown in Exhibits 3a, 3b, and 3c. Of those 12,691 establishments, the subsector of dental laboratories accounted for more than half (6,817 establishments), 94% of which were small.

Exhibit 3a: Percentage of MTI Establishments by Number of Employees, All 8 Subsectors

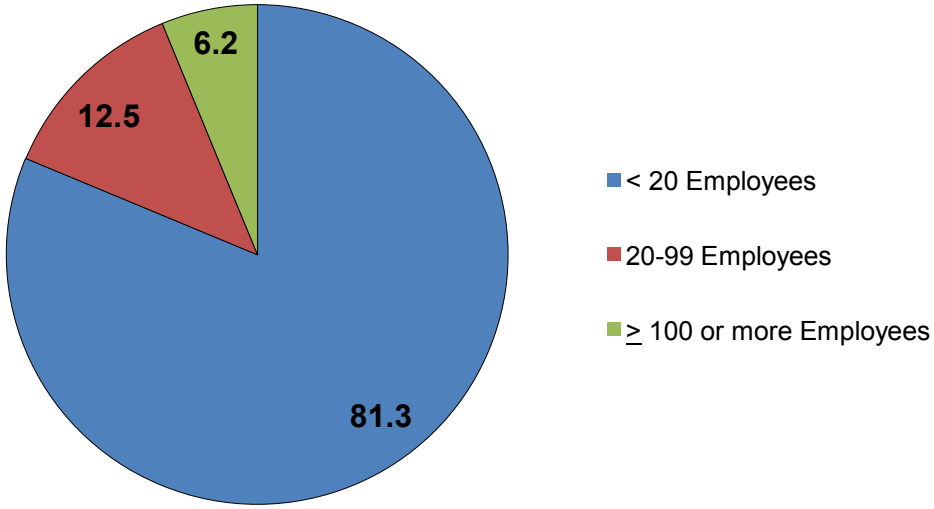
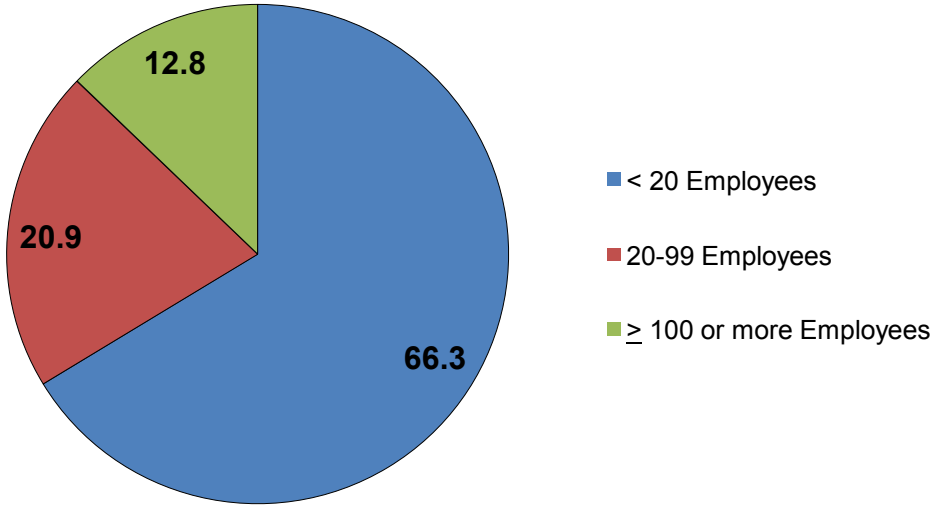


Exhibit 3b: Percentage of MTI Establishments by Number of Employees, Excluding Dental Labs



[7] The U.S. Census describes an establishment as generally a single physical location where business is conducted or where services or industrial operations are performed. An enterprise, on the other hand, may consist of more than one location performing the same or different types of economic activities. Each establishment of that enterprise is assigned a NAICS code based on its own primary business activity.

Exhibit 3c: Number of Establishments by MTI Subsector and Number of Employees, 2012

	<20 Empl.	20-99 Empl.	≥100 Empl.	Total
In-vitro diagnostic substance	103	79	53	235
Electromed & electrother apparatus	451	179	155	785
Irradiation apparatus	100	39	28	167
Surgical and medical instrument	782	298	246	1,326
Surgical appliance and supplies	1,469	412	194	2,075
Dental equipment and supplies	601	89	31	721
Ophthalmic goods	388	130	47	565
Dental laboratories	6,424	359	34	6,817
Total	**10,318**	**1,585**	**788**	**12,691**

In 2008, the year analyzed in the previous report, the MTI employed 422,778 workers. By 2012, total MTI employment had declined by 6.6% to 394,887 employees, or about 0.34% of the total U.S work force. The changes in employment by MTI subsector are shown in Exhibit 4. The 6.6% reduction in MTI employment from 2008 to 2012 was less than the 11.8% decrease in employment for the overall manufacturing industry during the same time frame (Exhibit 5), which amounted to 1.5 million jobs. The downturn in employment experienced by the manufacturing industry overall was due in part to the effects of the economic recession spanning approximately December 2007 through June 2009 and other factors in the larger economic environment.

Exhibit 4: Change in Number of Employees by MTI Subsectors, 2008-2012

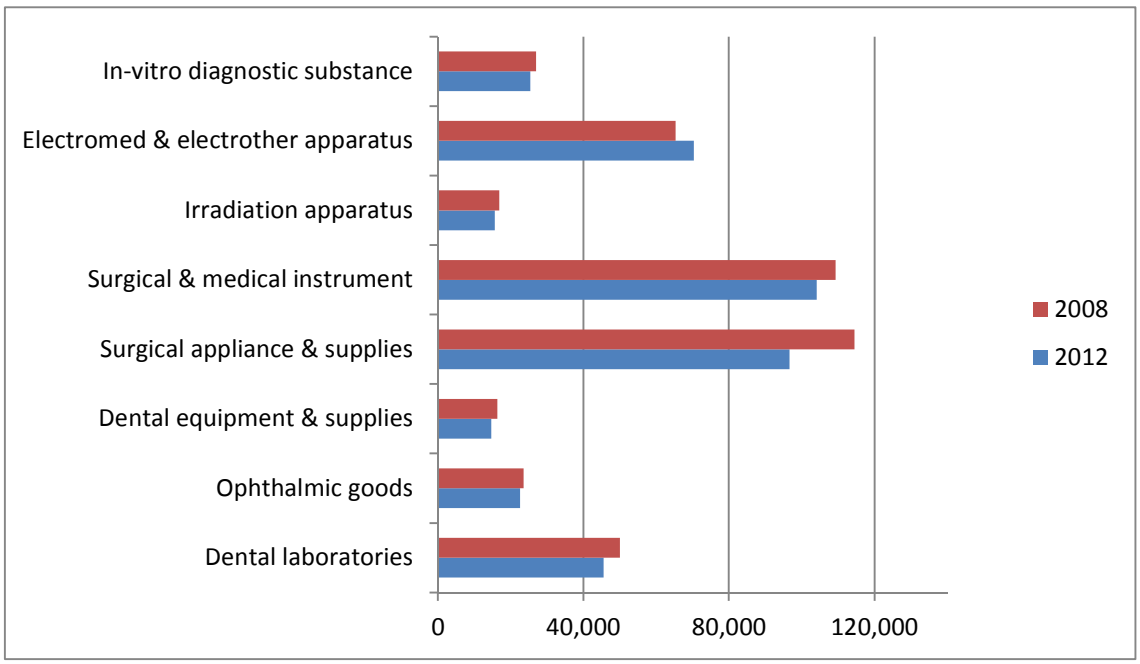


Exhibit 5: Change in Number of Employees, MTI and All Manufacturing, 2008-2012

	2008	2012	% Change
Medical Technology Industry	422,778	394,887	-6.6
All Manufacturing	12,781,169	11,268,906	-11.8

Payroll

In 2008, the MTI paid $24.6 billion in payroll. In 2012, the total MTI payroll grew to $25.7 billion, an increase of 4.5%. The increase in payroll is not as steep as the increases of 11.3% for the previous analysis spanning 2005 to 2008. This difference is due in part to the effects of the economic recession spanning approximately December 2007 through June 2009 and slowed growth in health care spending since 2008. Even so, the growth in MTI payroll of 4.5% for 2008 through 2012 contrasts with that of the manufacturing sector overall, which experienced a 2.3% loss in payroll during the same period (Exhibit 6).

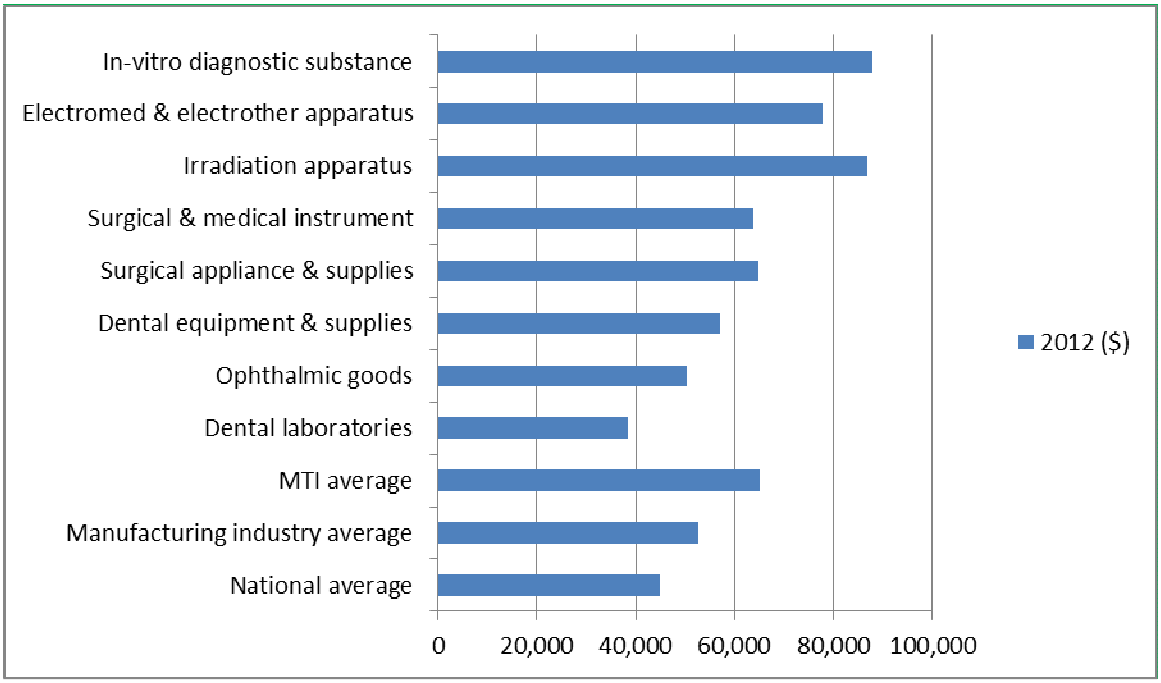
Exhibit 6: Change in Total Payroll for MTI, All Manufacturing, and National ($ billion), 2008-2012

	2008	2012	% Change
Medical Technology Industry	24.6	25.7	4.5
All Manufacturing	607.4	593.7	-2.3
National*	6,163.4	6,529.1	5.9

*National figures based on U.S. Social Security Administration, Average Wage Index (AWI) series and underlying data: raw data for aggregate wages and number of workers.

A consistent characteristic of the MTI is its robust compensation relative to other industrial sectors. Nationally, MTI jobs produced an average individual payroll of more than $65,000 per employee in 2012, compared to $52,700 for the average manufacturing job[8] and less than $45,000 for the average job across all industries (Exhibit 7). That is, the 2012 MTI payroll was 23% higher than that of the average manufacturing job and 45% higher than that of the average job across all industries.

Exhibit 7: Average Employee Payroll by MTI Subsector, All Manufacturing, and National, 2012



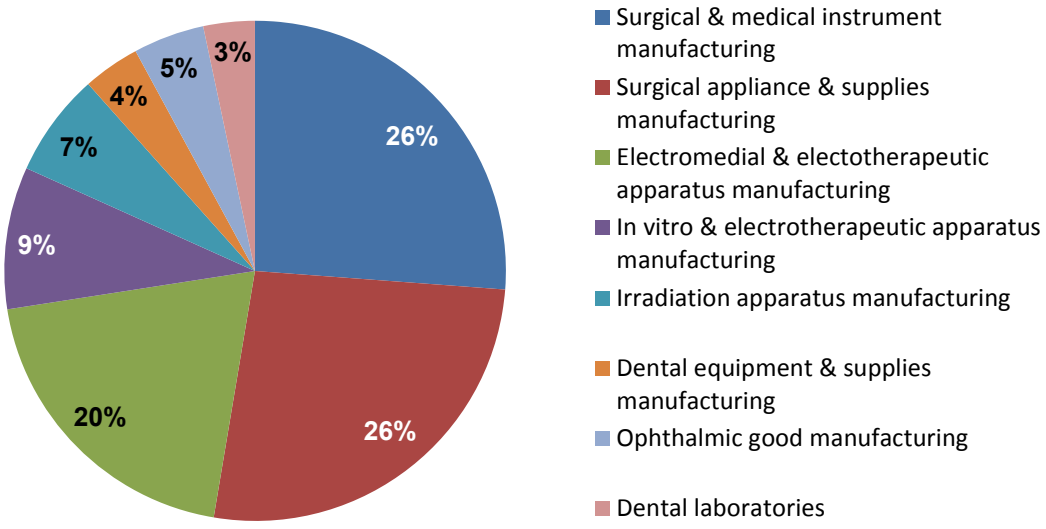
Shipments

In 2008, the total value of MTI shipments was $135.9 billion. In 2012, the total value of MTI shipments was $141.6 billion, an increase of 4.2%. The value of MTI shipments was equivalent to about 5% of the total national health expenditures in 2012, which were $2.8 trillion in that year, according to the Centers for Medicare and Medicaid Services.[9] The distribution of shipments by MTI subsector in 2012 is shown in Exhibit 8.

[8] NAICS industry codes 31-33.

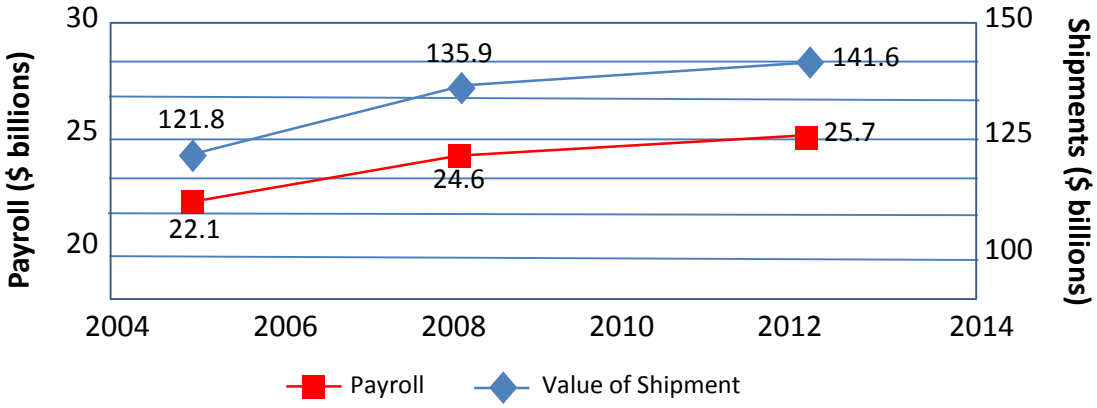
[9] U.S. Centers for Medicare and Medicaid Services. National Health Expenditures by type of service and source of funds, CY 1960-2013.

Exhibit 8: Percentage of Total Value of MTI Shipments by Subsector, 2012



The increase in shipments from 2008 to 2012 is not as steep as the increase of 11.6% for the previous analysis spanning 2005 to 2008, as shown in Exhibit 9. This difference is due in part to the effects of the economic recession and to slowed growth in health care spending since 2008. The 4.2% growth in MTI shipments during 2008-2012 lagged that of the overall manufacturing industry, which was 4.9% during the same period.

Exhibit 9: MTI Aggregate Payroll and Shipments, 2005-2012 (2012 dollars)



III. Conclusion

This report presents updated estimates of the economic contributions of the MTI, comparing data from the previous report for 2008 to data for 2012. From 2008 to 2012, there was a net decrease in the number of employees in the MTI, an increase in payroll for MTI employees, and an increase in the value of shipments. Beyond the value that the MTI brings to the health status and quality of life for patients in the U.S. and abroad, the industry provides significant benefit to the U.S. economy by offering employee compensation that is 45% greater than for the average job across all industries. The increases in payroll of 4.5% and in the value of shipments of 4.2% from 2008 to 2012 were not as steep as the increases of 11.3% and 11.6%, respectively, for the previous analysis spanning 2005 to 2008. These differences are due in part to the economic recession and to slower growth in health care spending from 2008 through 2012, which continued through 2014.

Certainly, an interrelated set of trends will continue to affect the economic impact of the U.S. MTI, and particularly of the many small companies in the industry. Among these trends are: the increased emphasis on the need to demonstrate and deliver value, entry of competitors from non-health sectors, growing costs of clearing regulatory and payment hurdles, more selective venture capital support for the industry,[10] and shifting patterns of international supply and demand for medical technologies.[11,12]

[10] As reported by PricewaterhouseCoopers, from 2007 to 2012, the total investment in venture capital and number of deals in the MTI declined. From 2012 through 2014, venture capital for the MTI experienced great fluctuation in investment levels and number of deals. From Q4 2013 to Q4 2014, venture capital for the MTI increased by 59% across 11% fewer deals. PricewaterhouseCoopers. Biotech Funding Surges. February 2015. https://www.pwcmoneytree.com/Reports/FullArchive/Life%20Sciences_2014-4.pdf

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Data Sources

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