ECONOMIC IMPACTS OF THE AMERICAN STEEL INDUSTRY

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Executive Summary

This study estimates the contributions of the American steel industry to the U.S. economy. The steel industry is defined here to include two sectors: iron and steel mills and ferroalloys and steel product manufacturing from purchased steel. Based upon data compiled by MIG, Inc. from U.S. Department of Commerce data, the American steel industry directly employed more than 139,000 workers and contributed $17.5 billion in value added or gross domestic product during 2010.

The economic contribution of the steel industry to the U.S. economy, however, goes beyond these sector specific measures because steel companies purchase inputs from many other sectors of the U.S. economy. Moreover, the steel industry contributes to household income, which then induces additional rounds of stimulus to the economy as households spend this income on goods and services. For instance, during 2010 the steel industry purchased more than $20 billion of materials produced in other industries, $8 billion of services, $5 billion of energy products, $4.5 billion of machinery, $4.4 billion from wholesale and retail trade sectors, more than $4 billion of transportation services, and generated $12.4 billion in labor income. Clearly, the steel industry supports businesses and jobs in many sectors of the U.S. economy.

To map these interdependencies, this study employs an input-output table of the U.S. economy with the IMPLAN system from MIG, Inc. to estimate these indirect or supply chain impacts as well as the impacts induced by the spending of household income contributed directly and indirectly by the steel industry. Our economic impact analysis indicates that the steel industry directly contributed $17.5 billion of value added, $40 billion indirectly via supply chain spending, and induced another $35.8 billion as households spent their income generated from these activities. So in terms of net contribution to the U.S. economy the American steel industry contributed $93.4 billion to gross domestic product during 2010. Likewise, the steel industry directly employs over 139,000 workers, supports another 360,986 workers indirectly through the supply chain, and induces spending by households that supports another 443,002 jobs in other sectors of the economy. In total the steel industry supported 943,045 jobs in the U.S. economy during 2010.

With higher levels of steel sales during 2011, the American steel industry contributes $101.2 billion to gross domestic product, and generates $22.9 billion in tax revenues at the federal, state, and local level, for a gross economic output of over $246 billion. Since steel is the most prevalent material in our economy, the steel industry is highly interrelated with other economic sectors, as reflected in the ripple effect on employment. Every one job in the U.S. Steel industry creates seven jobs in the U.S. economy. For 2011, the industry directly employs 150,700, and given the multiplier effect, supports more than 1,022,009 jobs.

Definition of Steel Sector

The steel industry in North America is instrumental in supplying the material requirements for construction, manufacturing, and energy industries. For this study, the steel sector is defined to include two industries in the North American Industrial Classification System (NAICS): iron and steel mills and ferroalloy manufacturing and steel products manufactured from purchased steel. The former includes both integrated and electric arc furnace steel producers and companies producing ferroalloy inputs to steel making, including ferrochrome, nickel, and related products. The latter category includes steel pipe and tube manufacturers and companies rolling and drawing purchased steel to produce finished steel products. Given the close overlap of these two industrial sectors, this study combines these sectors into one so-called steel sector.

Employment, labor income, and value added for the steel sector are reported below in Table 1. The iron and steel mill and ferroalloy segment is the largest component of the steel sector with more than 86,000 employees, $8.3 billon in labor income, and $12.6 billion in value added, which is defined to include payments to labor and capital inputs, including profits, proprietor income, and indirect business taxes. The manufacturing of steel products from purchased steel requires more than 52,000 workers who generate $4 billion in labor income and nearly $5 billion in value added. Together these two sectors employ more than 139,000 and generate $12.4 billion in labor income and $17.5 billion in value added (see Table 1).

Table 1: Definition of steel sector in 2010

		Million dollars		
Industry	Employment	Labor Income	Value Added	Gross Output
Iron and steel mills and ferroalloys	86,461	$8,323	$12,559	$60,043
Steel products from purchased steel	52,595	$4,015	$4,969	$23,428
Steel Sector	139,056	$12,338	$17,528	$83,471

Source: MIG, Inc. (Formerly Minnesota IMPLAN Group, Inc.)

The direct tax impacts associated with steel sector activity appear below in Table 2. Tax revenues are paid from contributions to social security, proprietor income, indirect business taxes, household income, and corporate profits. During 2010, the steel sector paid a total of $3.7 billion in federal, state, and local taxes, $1.453 billion in social security taxes, $1.1 billion of income taxes on household income and $350 in corporate taxes earned from the steel sector, and $772 of indirect business taxes, and $9 million of taxes on proprietor income (see Table 2).

Table 2: Direct tax impacts of the steel sector in 2010

Federal Taxes	Employee Compensation	Proprietor Income	Indirect Business Tax	Households	Corporations	Total
Social Security						
Employee	715	9				724
Employers	705					705
Indirect Business Taxes						
Excise Taxes			49			49
Custom Duty			19			19
Fed Non-Taxes			33			33
Corporate Profits Tax					298	298
Personal Income Tax				785		785
Total Federal Tax	1,421	9	101	785	298	2,613
State & Local Taxes						
Dividends					2	2
Social Security						
Employee	10					10
Employers	22					22
Indirect Business Taxes						
Sales Tax			293			293
Property Tax			288			288
Motor Vehicle Lic			6			6
Severance Tax			8			8
Other Taxes			42			42
S/L NonTaxes			34			34
Corporate Profits Tax					52	52
Personal Taxes						
Income Tax				234		234
NonTaxes (Fines-Fees)				65		65
Motor Vehicle License				14		14
Property Taxes				7		7
Other Tax (Fish/Hunt)				6		6
Total State and Local Tax	32	0	671	325	52	1,081
Total Taxes	1,453	9	772	1,110	350	3,694

Source: MIG, Inc. (Formerly Minnesota IMPLAN Group, Inc.)

Labor and multifactor productivity growth continues to allow the industry to produce higher quality output with fewer labor hours. Given this and pressures from international competition, employment levels in the steel sector are down from levels in 2002 (see Figure 1). After a painful period of restructuring, employment steadily declined from 2002 to 2006 until a rebound in 2007-2008. After a sharp fall in value added and employment in the steel sector during 2009, the steel industry recovered during 2010 and recent indications suggest that this recovery is continuing through early 2012.

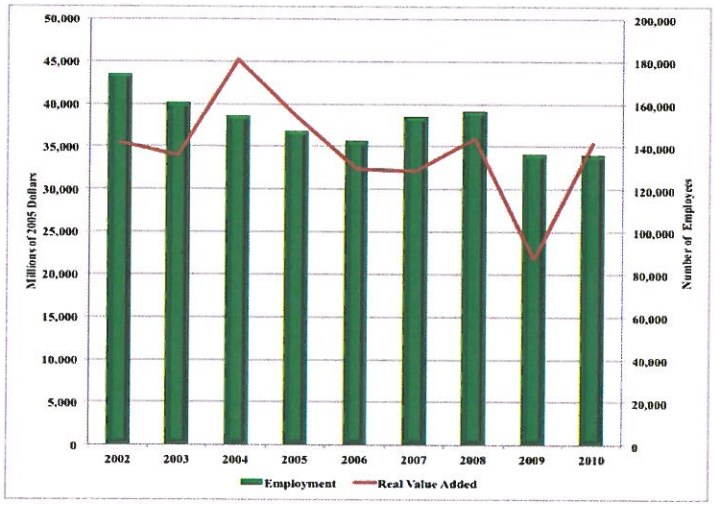

Figure 1: Real value added and employment in steel sector, 2002-2010

This employment and the industry's purchases of energy, materials, and supplies for the production of steel stimulate economic output and employment in other sectors of the U.S. economy. Since steel is the most prevalent material in our economy, the steel industry is highly interrelated with other economic sectors.

In understanding the role of the steel industry in the economy, the first step is to identify the industry's purchases of inputs from other industries. A tabulation of these transactions for 2010 is reported below in Table 2. These estimates are obtained by using the definition of the

steel sector used in Table 1 above. To simplify the presentation, these transactions are classified into several major categories for values greater than $100 million with sub-categories reported below each item.

The largest category is materials, such as scrap and iron ore, comprising nearly 31 percent of inter-industry purchases. The steel sector purchased $9.8 billion of iron and steel scrap, $2.9 billion of steam and metallurgical grade coal, $2.4 billion of iron ore, and $1.1 billion of primary nonferrous metals. Industrial gas purchases totaled $739 million while refractory materials amount to $592 million, and nonferrous metal product purchases were $485 million. In total, the steel sector supports $20 billion in sales of materials, cutting across a broad swatch of the mining and manufacturing sectors of the U.S. economy.

Somewhat surprisingly, the next largest category of inputs to the steel sector at nearly $8 billion is a broad range of services. Management services, services for buildings, securities and investment services, legal, and architectural and specialized design services are the top six service categories, comprising almost 42 percent of purchases of services by the steel sector. The third largest category of purchases by the steel sector is from energy industries with nearly $5 billion in transactions between these two sectors. Sales of machinery, wholesale and retail trade, and transportation to the steel sector are each more than $4 billion (see Table 2). Computers and electronics provide $1.6 billion to the steel sector.

Sales between the two major segments of the steel sector amount to $18 billion so that total inter-industry purchases from other industries to the steel sector amounted to nearly $66 billion in 2010. Value added or gross domestic product generated by the steel industry is $17.5 billion during 2010 with $12.3 billion compensating employees and the remaining $5.2 billion going to payments for capital resources and to governments via taxes.

Table 2: Inter-industry purchases by steel sector in 2010

Industrial Category	*$ Million*	*Industrial Category*	*$ Million*
Services	7,973	*Wholesale & Retail Trade*	4,443
Management of enterprises	1,179	*Energy*	4,980
Services to buildings	677	Power generation & supply	2,366
Securities & investments	443	Natural gas distribution	1,768
Architectural engineering	365	Petroleum refineries	487
Legal	345	Petroleum lubricants	215
Specialized design	338	Other energy and utilities	144
Automotive	337	*Transportation*	4,092
Waste management	306	Transport by rail	2,047
Monetary credit	290	Transport by truck	1,778
Miscellaneous professional	289	Transport by air	153
Repair and maintenance	272	Other transportation	113
Business support services	258	*Computers & Electronics*	1,588
Automotive rental	247	Semiconductors	657
Employment services	245	Printed circuits	413
Telecommunications	238	Industrial control	288
Real estate establishments	180	Lighting & other electronics	229
Consulting services	171	*Materials*	29,626
Food services and drinking	161	Scrap	19,140
Accounting	152	Mining coal	2,933
Warehousing and storage	150	Mining iron ore	2,359
Other support services	148	Primary nonferrous metal	1,076
Advertising	145	Industrial gas	739
Lessors of nonfinancial assets	139	Clay and non-clay refractory	592
Security	117	Nonferrous metal products	485
Other services	779	Lime and gypsum	355
Machinery	4,493	Paperboard container	323
Material handling	1,382	Mineral and earth	311
Maintenance and repair	915	Alumina & aluminum	287
Coating & heat treating	284	Ferrous metal foundries	225
Carbon and graphite	279	Inorganic chemicals	123
Machine shops	266	Other plastics	109
Ball and roller bearing	224	Other organic chemicals	100
Other fabricated metal	213	Other materials	469
Motor vehicle parts	178	*Steel intra-industry sales*	8,726
Special tool, die, & jig	173	*Total Intermediate*	65,921
Pump and pumping	146	*Total Value Added*	17,528
Spring and wire	116	*Employee Compensation*	12,338
Plate work& other	317	*Total Industry Output*	83,449

Source: MIG, Inc. (Formerly Minnesota IMPLAN Group, Inc.)

Methodology

These transactions between the steel sector and other industries determine the impact of the steel industry on the U.S. economy. Economists have devised several measures of these economic impacts that are calibrated to changes in output or final sales. The first are so-called direct impacts reported above in Table 1 in which changes in final steel sector sales directly affect output, employment, labor income, or value added.

If steel sector sales increase then a second round of economic impacts above and beyond the direct impacts occurs as the steel sector purchases inputs to make steel for shipment to customers. These changes are known as indirect impacts and reflect the supply chain stimulus that the steel sector provides. This is one reason why so many countries around the world welcome investments that establish steel mills because they stimulate industrial supply chains. These indirect impacts support jobs in industries supplying the steel industry with inputs of energy, materials, and services, such as those discussed above in Table 2. The sum of the direct and indirect effects divided by the direct impacts are called Type I multipliers.

The third and final set of economic impacts arises from the stimulus that additional labor and capital income provides for households to spend on goods and services. For example, the direct and indirect impacts discussed above increase income to households. This additional income induces consumers to spend more on goods and services, which provides an additional round of stimulus through the direct and indirect channels discussed above. These so-called induced impacts together with the direct and indirect impacts constitute the "total" economic impact of the industry. The ratio of this total impact to the direct impacts is known as a Type II multiplier.

Estimates of Steel Industry Economic Impact

These economic multipliers are calculated for every industry in the United State economy by a variety of government agencies and private companies using the input-output tables collected and published by the U.S. Department of Commerce, Bureau of Economic Analysis. This study employs the IMPLAN (IMpact analysis for PLANing) system developed by MIG, Inc., one of the most widely used and highly regarded system for economic impact analysis.[1]

A summary of the economic multipliers for the two major steel industry related sectors discussed above are presented below in Table 3. For every dollar increase in sales for iron and steel mills and ferroalloy industries, total output in the U.S. economy increases by $2.66, $1 is the direct sales increase, another $0.94 dollars arise from indirect or supply chain impacts, and the remaining $0.73 is generated from the induced impacts as workers and asset holders spend the additional income generated from the direct and indirect impacts (see Table 3). The Type I multiplier of 1.935 means that for every dollar increase in sales for iron and steel mills and ferroalloy industries total output increases $1.94 (see Table 3). The Type II multiplier is 2.66 indicating that for every dollar increase in steel sales, the total economic impact is $2.66. The multipliers for steel products made from purchased steel are slightly larger than for iron and steel mills and ferroalloy manufacturers.

The employment multipliers reported below in Table 3 are measured in jobs per million dollars of gross output. For instance, for every one million dollars of final output, 1.44 jobs are supported directly by the iron and steel mills and ferroalloy industry, which is simply the ratio of employment in this sector 86,461 to gross output of $60,043 million reported in Table 1. With indirect and induced effects, this industry and steel products produced from steel support 10.87

[1] http://implan.com/V4/index.php?option=com_content&view=frontpage&Itemid=1

and 12.74 jobs respectively. Labor income multipliers and value added are also reported in Table 3 and reflect the dollar changes in each of these components for a dollar change in final sales.

Table 3: Economic multipliers for steel related manufacturing sectors in 2010

	Direct	Indirect	Induced	Total	Type I	Type II
Output Multipliers						
Iron and steel mills and ferroalloys	1.000	0.935	0.730	2.665	1.935	2.665
Steel product from purchased steel	1.000	1.117	0.799	2.916	2.117	2.916
Employment (per million of output)						
Iron and steel mills and ferroalloys	1.440	4.227	5.204	10.871	3.936	7.549
Steel product from purchased steel	2.245	4.803	5.693	12.740	3.139	5.675
Labor Income						
Iron and steel mills and ferroalloys	0.141	0.280	0.235	0.656	2.991	4.661
Steel product from purchased steel	0.174	0.309	0.257	0.741	2.776	4.253
Total Value Added						
Iron and steel mills and ferroalloys	0.209	0.478	0.421	1.108	3.285	5.296
Steel product from purchased steel	0.212	0.505	0.460	1.177	3.379	5.549

Source: MIG, Inc. (Formerly Minnesota IMPLAN Group, Inc.)

An aggregate of these two sectors is formed to calculate multipliers for the entire sector. These multipliers are reported below in Table 4 and measure the economic impacts of the steel industry on the U.S. economy. For instance, the steel industry supports 2.722 dollars of output for every dollar of steel industry sales. This multiplier implies that for the current steel industry gross output or sales of $83.5 billion (see Table 1), $227.3 billion in total gross output is generated.

A more meaningful measure of economic impact, however, that avoids double counting is value added or gross domestic product. Using this measure, the steel industry contributed $17.5 billion of valued added directly, $40 billion indirectly via supply chain spending, and $35.8 billion as households spend their income generated from these activities. In summary, the net contribution to the U.S. economy by the steel industry is $93.4 billion.

In terms of employment, for every million dollars of gross output 11.298 jobs are supported. Another way to express the employment impacts is with the Type I and Type II multipliers. For example, for every one job directly created in the steel industry, 3.596 jobs are supported via supply chain impacts and 6.782 jobs are created from the stimulus emanating from industries that supply steel inputs and from households as they spend the additional income that this activity generates. In summary, for every one job directly created in the steel industry seven jobs are created the U.S. economy.

These multipliers also imply that the direct steel industry employment of 139,000 workers, supports another 360,986 workers indirectly through the supply chain, and induces spending by households that supports another 443,002 jobs in other sectors of the economy. In total the steel industry supported 943,045 jobs in the U.S. economy during 2010. With higher levels of steel sales, it would fair to say that the American steel industry supports more than one million jobs.

Table 4: Economic multipliers for aggregate steel sector in 2010

Multiplier	Direct	Indirect	Induced	Total	Type 1*	Type 2**
Output	1.000	0.977	0.745	2.722	1.977	2.722
Labor Income	0.150	0.285	0.240	0.675	2.900	4.498
Value Added	0.210	0.480	0.429	1.119	3.285	5.328
	Jobs or tax $ per million of gross output					
Employment (per million of output)	1.666	4.325	5.307	11.298	3.596	6.782
Federal Taxes	31,305	64,657	56,194	152,154	3.065	4.860
State and Local Taxes	12,979	46,363	41,704	101,046	4.572	7.785
Total taxes	44,284	111,020	97,898	253,200	3.507	5.718

* Ratio of direct plus indirect to direct impacts.
** Ratio of total to direct impacts.
Source: Computations of author using IMPLAN 3 based upon data from MIG, Inc.

The tax multipliers are also displayed below in Table 4. For every million dollars of gross output in the steel sector, $152,154 of federal tax revenues and $101,046 of state and local tax

revenues are generated. Using total gross output of $83.5 billion, the steel sector generated $21.2 billion in federal and state and local taxes during 2010, $3.7 billion directly, $9.1 billion indirectly from supply chain interactions, and $8.2 billion from induced impacts.

Estimates of Steel Industry Economic Impact

The economic contributions of the steel sector presented above are based upon the IMPLAN input-output tables of 2010. These estimates are updated for 2011 based upon preliminary data for employment in the steel sector reported by the Bureau of Labor Statistics. The preliminary estimate for direct steel sector employment in 2011 is 150,700. This level of employment is consistent with gross output of $90.461 billion and valued added of $18.996 billion (see Table 5). Given the multipliers presented above, the steel sector in 2011 supported 1,022,009 jobs in the U.S. economy and contributed $101.211 in value added, and $246.213 in gross output (see Table 5). Given the tax multipliers presented above, during 2011 the steel sector generated $22.9 billion in local, state, and federal taxes (see Table 5).

Table 5: Economic contributions of steel sector in millions of current dollars

	Direct	Indirect	Induced	Total
Employment	150,700	391,213	480,096	1,022,009
Value Added	18,996	43,405	38,811	101,211
Gross Output	90,461	88,365	67,387	246,213
Total Taxes	4,006	10,043	8,856	22,905

Disaggregation of Steel Sector Multipliers

The multipliers appearing in Table 4 are disaggregated by industry in Table 6, sorted by employment impacts from highest to lowest. For instance, the 11.298 employment multiplier is the summation of employment impacts by sector appearing in Table 5. The steel sector contributes 1.963 jobs of this total. The next largest category is professional, scientific, and

technical services with 1.743 jobs per million dollars of gross output. The third largest category is repairs and related services. Education and health care and business support services each

Table 6: Final demand multipliers by industry for steel sector

	Final Demand Type II Multipliers		
	Output	*Labor Income*	*Employment*
	(1)	(2)	(3)
Steel	1.178	1.178	1.963
Professional, scientific, and technical services	0.363	0.687	1.743
Repairs and other services	0.096	0.274	1.470
Education & Health Care	0.095	0.365	1.076
Business support services	0.086	0.318	1.076
Retail Trade	0.055	0.170	0.850
Wholesale Trade	0.102	0.299	0.594
Transportation	0.087	0.228	0.523
Machinery & Equipment	0.070	0.119	0.289
Mining	0.094	0.190	0.281
Publishing & Media	0.032	0.077	0.208
Construction	0.025	0.069	0.204
Government	0.029	0.072	0.138
Agriculture & Forestry	0.015	0.024	0.130
Electricity, Natural Gas, Utilities	0.076	0.096	0.106
Petroleum, Chemicals, Plastics	0.106	0.071	0.095
Wood, Paper, Printing	0.024	0.034	0.082
Electronics	0.036	0.051	0.080
Information	0.032	0.039	0.074
Food & Kindred Products	0.041	0.027	0.073
Stone, Clay, and Glass	0.021	0.028	0.057
Other Metals	0.023	0.027	0.053
Waste Management Services	0.010	0.020	0.049
Transportation Equipment	0.016	0.018	0.034
Misc. Manufacturing	0.004	0.009	0.020
Textiles & Leather Products	0.003	0.005	0.018
Wood Products	0.002	0.004	0.013
Total Impacts	2.722	4.498	11.298

Source: MIG, Inc. (Formerly Minnesota IMPLAN Group, Inc.)

(1) Each entry in column 1 measures the total dollar change in output in the industry corresponding to each row that results from a $1 change in output delivered to final demand by the steel industry

(2) Each entry in column 2 measures the total dollar change in earnings of households employed in the industry corresponding to each row that results from a $1 change in output delivered to final demand by the steel industry

(3) Each entry in column 3 measures total change in the number of jobs in the industry corresponding to each row from a $1 million change in output delivered to final demand by the steel industry

contribute slightly over one job per million dollars of gross output. In summary, these top five industries together constitute about 65 percent of the total employment impact. The next five industries, retail trade, wholesale trade, transportation, machinery and equipment, and mining comprise slightly over 22 percent of the employment impact. The remaining 13 percent is distributed across a broad swatch of the U.S. economy (see Table 5).