The Economic Impact of the California Metals Industry

Methodology and Documentation

Prepared for

By

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November 2017

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Executive Summary:

The Economic Impact of the California Metals Industry study estimates the economic contributions made by the metal production, fabrication, machining, and scrapping to the California economy in 2017. John Dunham & Associates conducted this research, which was funded by the California Metals Coalition (CMC). This work used standard econometric models first developed by the U.S. Forest Service, and now maintained by the IMPLAN. Data came from industry sources, government publications and Infogroup.

The study defines the California metals industry as those firms primarily engaged in production, smelting, refining, foundry and forging operations, primary and secondary fabrication, primary assembly, finishing, machining, and scrap processing of nonferrous and ferrous metals. The study measures the number of jobs in this sector, the wages paid to employees, the value added and the total output. In addition, it measures the business and personal taxes paid by companies and employees involved in the metals industry.

Industries are linked to each other when one firm buys from another to produce its own products. Each industry in turn makes purchases from a different mix of supplier industries, and so on. Employees in all industries extend the economic impact when they spend their earnings. Thus, economic activity started by the metals industry generates output (and jobs) in hundreds of other industries, often in cities and counties far removed from the original economic activity. The impact of supplier firms, and the "induced impact" of the re-spending by employees of industry and supplier firms, is calculated using an input/output model of California. The study calculates the impact on a state basis, by Federal and state legislative districts, and by county.

The study also estimates business and personal taxes paid by the industry and its employees. Federal taxes include industry-specific excise and sales taxes, business and personal income taxes, FICA, and unemployment insurance. State and local tax systems vary widely. Direct retail taxes include state and local sales taxes, license fees, and applicable gross receipt taxes. Metal operations pay real estate and personal property taxes, business income taxes, and other business levies that vary in each state and municipality. All entities engaged in business activity generated by the industry pay similar taxes.

The metals industry is a dynamic part of California's economy, accounting for about $79.73 billion in total economic output or roughly 2.99% percent of GDP.[1] Metal producers, fabricators, machinists, and scrappers directly or indirectly employ approximately 350,095 Californians in 2017. These workers earned over $23.25 billion in wages and benefits, and paid $9.28 billion in federal, state and local business taxes.

Summary Results:

The Economic Impact of the California Metals Industry study measures the impact of the metals industry, defined as those firms primarily engaged in the production, smelting, refining, foundry and forging operations, primary and secondary fabrication, primary assembly, finishing, machining, and scrap processing of nonferrous and ferrous metals, on the entire economy of the California. The industry contributes about $79.73 billion in economic output or 2.99% percent of GDP and, through its production and distribution linkages, impacts firms in 506 of the 536 sectors of the California economy.

[1] Based on California's GDP of $2,671. See: *Gross Domestic Product by State: First Quarter of 2017,* News Release, US Department of Commerce, Bureau of Economic Analysis, July 26, 2017.

The production process (as defined in this study) begins when either scrap metals or raw metal materials are brought to smelters, refiners, and mills to be turned into raw metal products. The production process also includes cold and hot rolling, primary extruding, and sheet and plate forming. The firms that produce basic metal and metal shapes are denoted as nonferrous and ferrous producers, and employ 7,471 people.[2]

In addition, foundries and forges work with primary metal bars and ingots and create basic shapes. Foundries and forges employ 10,394 people in California who are involved in the shaping of metal products.

Primary fabrication itself includes deep drawing, wire drawing, extruding, stamping, bending, cutting, punching, roll forming, spinning, and welding. These fabricators create basic shapes out of metal from raw plate or ingots including tubes, bars, pipes, angles, and gears, employing 28,099 people.

Secondary fabrication encompasses the intermediary processing of metal, after primary fabrication and before it is made into finished products. These processes include finishing, coating, heat treating, the fabrication of barrels, tanks, and drums, the extrusion and fabrications of metal door and window frames, the fabrications of metal wire products like fencing, among other similar processes. These intermediary fabricators employ 28,992 people. Auto assembly in California accounts for 19,143 employees and includes businesses that assemble steering components, body components, engine and transmission parts, and other metal automotive accessories.

Machine shops have the largest impact on the California metals industry, accounting for 40,480 people. These shops provide valuable metal machining services like milling, turning, and drilling.

Of course, little metal production and fabrication would happen without California's scrap operations. Much of California's metal comes from purchased metal that has been collected by salvage, junk, and wrecking yards to be subsequently processed, shredded, and baled. Operations like this employ 24,770 people in the state. All told, the metals industry employs 159,349 people in 2017, or about 1 of every 115 people working in the state.[3]

Other firms are related to metal production, fabrication, machining and scrapping as suppliers. These firms produce and sell a broad range of items including machinery for the production process, fuel, technology, and packaging materials. In addition, supplier firms provide a broad range of services, including personnel services, financial services, advertising services, consulting services or transportation services. Finally, additional people are employed in government enterprises responsible for the regulation of the metals industry. All told, we estimate that the industry is directly responsible for 89,200 supplier jobs. These firms generate about $17.98 billion in economic activity.

An economic analysis of the metals industry will also take additional linkages into account. While it is inappropriate to claim that suppliers to the supplier firms are part of the industry being analyzed the spending by employees of the industry, and those of supplier firms whose jobs are directly dependent on metal sales and production, should surely be included. This spending on everything, but not limited to housing, to food, to educational services and medical care makes up what is traditionally called the "induced impact" or multiplier effect of the industry. In other words, this spending and the jobs it creates is induced by the production, fabrication, machining, and scrapping of metals in California. We estimate

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2 Throughout this study the term "firms" means facilities. One firm might operate dozens of facilities. This study is based on facilities.

3 Based on the labor force as of September 2017. See: *States and selected areas: Employment status of the civilian non institutional population, January 1976 to date, seasonally adjusted,* Bureau of Labor Statistics at: http://www.bls.gov/web/laus/ststdsadata.txt

that the induced impact of the industry is $16.70 billion, and generates 101,546 jobs, for a multiplier of 0.37.[4]

An important part of an impact analysis is the calculation of the contribution of the industry to the public finances of the community. In the case of the metals industry, this contribution consists of the direct taxes paid by the firms as well as those paid by their employees. This equals a total of $9.28 billion in revenues to the federal, state and local governments. Table 1 below presents a summary of the total economic impact of the industry in California.

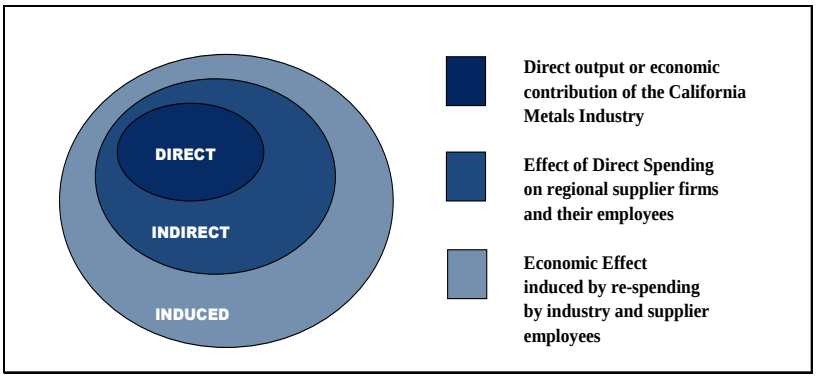
Table 1: Economic Contribution of the California Metals Industry

	Direct	Supplier	Induced
Output	$45,052,045,200	$17,975,980,000	$16,701,146,900
Jobs	159,349	89,200	101,546
Wages	$11,104,315,800	$6,537,618,700	$5,608,193,100
Taxes			$9,281,727,500

Output Model:

John Dunham & Associates, Inc. produced the economic impact study for the CMC. The analysis consists of a number of parts, each of which will be described in the following sections of this document. These include data, models, calculations and outputs. These components were linked together into an interactive system that allows the CMC to examine the links between the various parts of the industry and to produce detailed output documents on an as-needed basis. As such, there is no book – no thick report – outlining the impact of the industry, but rather a system of models and equations that can be continuously queried and updated.

Economic Impact Modeling – Summary:



The economic impact study begins with an accounting of the direct employment in the metals industry including producers (smelters, mills, and foundries), fabricators, machinists, and scrappers. The data come from a variety of government and private sources.

It is sometimes mistakenly thought that initial spending accounts for all of the impact of an economic activity or a product. For example, at first glance it may appear that consumer expenditures for a product are the sum total of the impact on the local economy. However, one economic activity always leads to a ripple effect whereby other sectors and industries benefit from this initial spending. This inter-industry effect of an economic activity can be assessed using multipliers from regional input-output modeling.

[4] This is the employment multiplier. Often economic impact studies present results with very large multipliers – as high as 5. These studies invariably include the firms supplying the supplier industries as part of the induced impact. John Dunham & Associates believes that this is not an appropriate definition of the induced impact and as such limits this calculation to only the effect of spending by direct and supplier employees.

The economic activities of events are linked to other industries in the state economy. The activities required to produce a steel gear, from smelting steel from purchased scrap, to cutting and shaping, to quality control, to shipping generate the direct effects on the economy. Regional (or indirect) impacts occur when these activities require purchases of goods and services such as machinery or electricity from local or regional suppliers. Additionally, induced impacts occur when workers involved in direct and indirect activities spend their wages. The ratio between the induced impact and direct impact is termed the multiplier. The framework in the chart on the previous page illustrates these linkages.

This method of analysis allows the impact of local production activities to be quantified in terms of final demand, earnings, and employment in the state as a whole.

Once the direct impact of the industry has been calculated, the input-output methodology discussed in the following sections is used to calculate the contribution of the supplier sector and of the re-spending in the economy by employees in the industry and its suppliers. This induced impact is the most controversial part of economic impact studies and is often quite inflated. In the case of the CMC model, only the most conservative estimate of the induced impact has been used.

Model Description and Data:

This analysis is based on data provided by Infogroup[5], the CMC and the federal government. The analysis utilizes the IMPLAN Model in order to quantify the economic impact of the metals industry on the economy of the California. The model adopts an accounting framework through which the relationships between different inputs and outputs across industries and sectors are computed. This model can show the impact of a given economic decision – such as a factory opening or operating a sports facility – on a pre-defined, geographic region. It is based on the national income accounts generated by the US Department of Commerce, Bureau of Economic Analysis (BEA).[6]

Every economic impact analysis begins with a description of the industry being examined. In the case of the CMC model, the metals industry is defined as the production, fabrication, machining, and scraping of nonferrous and ferrous metals.

The IMPLAN model is designed to run based on the input of specific direct economic factors. It uses a detailed methodology (see IMPLAN Methodology section) to generate estimates of the other direct impacts, tax impacts and supplier and induced impacts based on these entries. In the case of the Economic Impact of the California Metals Industry model, direct employment in the industry is a base starting point for the analysis. Direct employment is based directly on data provided to John Dunham & Associates by Infogroup as of October 2017. Since the Infogroup data is adjusted on a continual basis, JDA staff verified a large sample of the data. Multiple stages of cleaning were then performed on these data, including removing duplicate records, removing defunct facilities and companies, and correcting inaccurate data where possible. The data from Infogroup was then merged with member data provided by CMC. Cases where data were available from the CMC, the Infogroup data were replaced with these. Missing employment figures were replaced using medians based on the facility's primary mode of

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5 Infogroup, is the leading provider of business and consumer data for the top search engines and leading in-car navigation systems in North America. Infogroup gathers data from a variety of sources by sourcing, refining, matching, appending, filtering, and delivering the best quality data. The company verifies its data at the rate of almost 100,000 phone calls per day to ensure absolute accuracy.

6 RIMS II is a product developed by the U.S. Department of Commerce, Bureau of Economic Analysis as a policy and economic decision analysis tool. IMPLAN was originally developed by the US Forest Service, the Federal Emergency Management Agency and the Bureau of Land Management. It was converted to a user-friendly model by the IMPLAN in 1993. The CMC Model uses the Input-Output tables for 2014.

operation (ferrous production, fabrication, machining, etc.). Missing firm addresses were found by JDA staff using on-line searches.

Once the initial direct employment figures have been established, they are entered into a model linked to the IMPLAN database. The IMPLAN data are used to generate estimates of direct wages and output. Wages are derived from data from the U.S. Department of Labor's ES-202 reports that are used by IMPLAN to provide annual average wage and salary establishment counts, employment counts and payrolls at the county level. Since this data only covers payroll employees, it is modified to add information on independent workers, agricultural employees, construction workers, and certain government employees. Data are then adjusted to account for counties where non-disclosure rules apply. Wage data include not only cash wages, but health and life insurance payments, retirement payments and other non-cash compensation. It includes all income paid to workers by employers. Distribution income and exercised stock options received by proprietors including sole proprietors, and distributions to partners of LLCs are also included in wage figures.

Total output is the value of production by industry in California. It is estimated by IMPLAN from sources similar to those used by the BEA in its RIMS II series. Where no Census or government surveys are available, IMPLAN uses models such as the Bureau of Labor Statistics Growth model to estimate the missing output.

The model also includes information on income received by the Federal, state and local governments, and produces estimates for the following taxes at the Federal level: Corporate income; payroll, personal income, estate and gift, and excise taxes, customs duties; and fines, fees, etc. State and local tax revenues include estimates of: Corporate profits, property, sales, severance, estate and gift and personal income taxes; licenses and fees and certain payroll taxes.

While IMPLAN is used to calculate the state level impacts, Infogroup data provide the basis for Congressional and state legislative district level, and county level estimates. Publicly available data at the county and legislative district level is limited by disclosure restrictions, especially for smaller sectors of the economy. Our model therefore uses actual physical location data provided by Infogroup in order to allocate jobs – and the resulting economic activity – by physical address or when that is not available, zip code. For zip codes entirely contained in a single legislative district, jobs are allocated based on the percentage of total sector jobs in each zip code. For zip codes that are broken by legislative districts, allocations are based on the percentage of total jobs physically located in each segment of the zip code. Physical locations are based wherever possible on the actual address of the facility. When an address cannot be determined, JDA staff use either Google Earth or Google Maps to physically locate the facility. All supplier and indirect jobs are allocated based on the percentage of a state's employment in that sector in each of the districts. Again, these percentages are based on Infogroup data.

IMPLAN Methodology:[7]

Francoise Quesnay one of the fathers of modern economics, first developed the analytical concept of inter-industry relationships in 1758. The concept was actualized into input-output analysis by Wassily Leontief during the Second World War, an accomplishment for which he received the 1973 Nobel Prize in Economics.

Input-Output analysis is an econometric technique used to examine the relationships within an economy.

[7] This section is paraphrased from IMPLAN Professional: Users Guide, Analysis Guide, Data Guide, Version 2.0, MIG, Inc., June 2000.

It captures all monetary market transactions for consumption in a given period and for a specific geography. The IMPLAN model uses data from many different sources – as published government data series, unpublished data, sets of relationships, ratios, or as estimates. The IMPLAN gathers this data, converts it into a consistent format, and estimates the missing components.

There are three different levels of data generally available in the United States: Federal, state and county. Most of the detailed data is available at the county level, and as such there are many issues with disclosure, especially in the case of smaller industries. IMPLAN overcomes these disclosure problems by combining a large number of datasets and by estimating those variables that are not found from any of them. The data is then converted into national input-output matrices (Use, Make, By-products, Absorption and Market Shares) as well as national tables for deflators, regional purchase coefficients and margins.

The IMPLAN Make matrix represents the production of commodities by industry. The Bureau of Economic Analysis (BEA) Benchmark I/O Study of the US Make Table forms the bases of the IMPLAN model. The Benchmark Make Table is updated to current year prices, and rearranged into the IMPLAN sector format. The IMPLAN Use matrix is based on estimates of final demand, value-added by sector and total industry and commodity output data as provided by government statistics or estimated by IMPLAN. The BEA Benchmark Use Table is then bridged to the IMPLAN sectors. Once the re-sectoring is complete, the Use Tables can be updated based on the other data and model calculations of interstate and international trade.

In the IMPLAN model, as with any input-output framework, all expenditures are in terms of producer prices. This allocates all expenditures to the industries that produce goods and services. As a result, all data not received in producer prices is converted using margins which are derived from the BEA Input-Output model. Margins represent the difference between producer and consumer prices. As such, the margins for any good add to one. If, for example, 10 percent of the consumer price of steel is from the purchase of steel scrap, then the ore margin would be 0.1.

Deflators, which account for relative price changes during different time periods, are derived from the Bureau of Labor Statistics (BLS) Growth Model. The 224 sector BLS model is mapped to the 536 sectors of the IMPLAN model. Where data are missing, deflators from BEA's Survey of Current Businesses are used.

Finally, one of the most important parts of the IMPLAN model, the Regional Purchase Coefficients (RPCs) must be derived. IMPLAN is derived from a national model, which represents the "average" condition for a particular industry. Since national production functions do not necessarily represent particular regional differences, adjustments need to be made. Regional trade flows are estimated based on the Multi-Regional Input-Output Accounts, a cross-sectional database with consistent cross interstate trade flows developed in 1977. These data are updated and bridged to the 536 sector IMPLAN model.

Once the databases and matrices are created, they go through an extensive validation process. IMPLAN builds separate state and county models and evaluates them, checking to ensure that no ratios are outside of recognized bounds. The final datasets and matrices are not released before extensive testing takes place.