Sectoral Analysis of Fabricated Metals in Los Angeles County

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Executive Summary

Introduction

The dizzying flight of manufacturing jobs from the United States over the past four decades has left American policy makers in the difficult position of trying to find ways to make low value-added service sector employment provide an adequate living for millions of Americans. Meanwhile, unnoticed and frequently unwanted, manufacturing still exists in this country, and is still a major employer in Southern California, with over 2,300 establishments employing at least 52,000 workers in Los Angeles County—1.3% of the total workforce. At the heart of this manufacturing activity lies the fabricated metals subsector, integral to the manufacturing supersector. Fabricated metals are internally and externally interdependent between metals operations and other sectors including construction, defense contracting, utilities, and transportation. Understanding this sector will prove essential to the development of effective regional, industrial, environmental, and economic policy.

Statement of Purpose

This report provides an overview of the fabricated metals sector, in order to aid policy makers in attracting, retaining, and improving employment opportunities in manufacturing in a socially and environmentally sustainable way.

Statement of Scope

We have focused on the fabricated metals sector, as defined by the OMB's designation "NAICS 332: Fabricated Metal Product Manufacturing," but also discuss the closely related sector "NAICS 331: Primary Metal Manufacturing." This report concentrates on industry aspects critical to regional and industrial economic policy. We discuss environmental impacts only briefly and generally.

Methodology

This study integrates quantitative findings drawn primarily from government data sources with qualitative information, enhanced by **interviews and site visits** with businesses and a local union, as well as discussions with other researchers and a trade association representative. We were able to undertake only a small number of interviews; future studies should seek to take advantage of a much broader range of interviews and site visits. The **Bureau of Labor Statistics (BLS), U.S. Census, and California Employment Development Department (EDD)** were especially rich sources of quantitative data. We also drew from **existing reports**, especially IBISWorld. Finally, with the help of a trade association representative, we were able to distribute a qualitative **survey** to several businesses, from whom we received valuable responses (Appendix D).

Main Findings

Industry Structure – Internal and External

The fabricated metals sector produces final and intermediate goods, but intermediate goods and services are more prevalent in and more integral to the Los Angeles economy. Some additional findings:

- All finished goods with metal or metal parts involve metal fabrication at some point. Much of this metal fabrication is excluded from NAICS 332 (and thus our figures) because it is *vertically integrated* in the manufacturing process.
- U.S. and Los Angeles fabricated metals manufacturing employment has fallen in tandem with manufacturing broadly for three main reasons:
    - *Low wages* in competing markets
    - *Low regulation* (especially environmental) in competing markets
    - *Productivity growth* outpacing demand growth.
- Most firms are small businesses with between 0 and 19 employees.

Markets, Commodity Chains, and Geography
Fabricated metals are integral to an agglomeration of manufacturing activity in Los Angeles County. Fabricated metals firms cluster according to labor, transportation, and most importantly the presence of suppliers and customers. Additional findings include:

- The basis of competition varies depending on the product, but most products have a baseline of required quality, after which firms compete on *cost*, then speed.
- Firms remaining in Los Angeles can remain most competitive either by:
    - Making *specialized* products, or
    - Providing *localized* services that are difficult to export.
- Metal fabrication is *interdependent* within the sector and with manufacturing—and dependence goes both ways:
    - Fabrication depends on downstream industries including aerospace, construction, and defense contracting to maintain demand
    - Downstream industries depend on fabrication to provide necessary intermediate goods and services that may be inefficient to incorporate in-house
- Metal fabrication is present throughout Los Angeles's heavy industrial zones.

Labor
Union density depends on the specific subsector, but generally ranges from 2-15 percent. Production occupations frequently recruit high school dropouts and graduates with low skills and train in-house; yet these workers are frequently able to earn a living wage. Other findings:

- The most common occupations within the sector and median wages in CA are:
    - Production, $15.49 per hour
    - Office Administrative Support, $15.53 per hour
- Employers try to maximize labor flexibility for cost efficiency in two major ways:
    - Some employers maintain a small workforce in times of uncertainty and pay frequent overtime over the medium term. Such a workforce will be trained in a variety of tasks.
    - Union-based "man-up, man-down" or the use of temp-agencies

Community, Government, and Environment
Metals firms are highly regulated on environmental impacts, which include high carbon and other emissions in energy-intense operations, and toxic chemical effluent or disposal for operations involving chemicals, especially plating and treating industries. Other findings include:

- Manufacturing can be seriously threatened by *zoning*. The conversion of heavy industrial to residential, commercial, or mixed zoning can spell the end of remaining establishments.
- California corporate taxes are on par with other states when tax credits are factored in, but many incentives favor larger businesses
- Los Angeles City imposes business taxes at a variety of rates, which are not uniform among metal fabrication
- Most current political alliances and bureaucratic structure do not favor metal fabrication or manufacturing broadly, unions, moderate environmental groups, and economic development groups have many shared interests.

Recommendations

Manufacturing in the United States is not dead, and policy should not act as if it were, or as if it wanted it to be. Where they exist, metal fabrication jobs can provide a road from poverty to a middle class life for initially low-skilled workers. Policy should focus on attracting, developing, and retaining these jobs, while restricting unacceptable environmental outcomes. More specific recommendations include:

Taking advantage of agglomeration. Because metal fabrication firms are mutually dependent on each other and interdependent with the local economy, policy must consider its immediate as well as secondary effects on fabrication establishments. This interdependence also presents opportunities for collaboration on technology, risk pooling, and employee training. Government should encourage this collaboration, providing support where appropriate.

Zoning. The concerns of industry must be taken seriously in zoning debates. Residential, commercial, and public use developers lobby for zoning changes with the confidence that they will win support once structures are built and conflicts arise. In short, extreme caution should be taken when zoning new uses near heavy industry.

Taxation and Regulation. Care must be taken that taxation minimizes perverse incentives. Municipal business taxes should be replaced where possible. Proposition 13 should be repealed to increase flexibility and allow property taxes to take the place of bizarre and damaging taxes such as the warehousing tax on “toolings.” Statewide carbon regulation is highly suspect, when regulation results not in lower global emissions, but geographically shifted emissions. In such cases, a choice must be made between retaining jobs, or becoming a symbolic leader in environmental regulation. One policy to consider would be national regulation with matching targeted tariffs.

Collaboration. Unions, moderate environmental groups, social justice and community development all share a powerful interest in the fate of metals fabrication. Unions in particular work symbiotically with manufacturing establishments. Efforts should be made to encourage unionization, which could simultaneously provide safeguards for workers, while increasing the political coalition for retaining manufacturing. More immediately, government and nonprofits should seek to leverage the political potential from shared interests between firms and unions, environment, and development.

Note About Data Sources:
While an attempt has been made to use the most recent data available for this report, the use of various different data sources provides different statistics for different variables. For example the most recent Economic Census was last published in 2007. Thus this data does not represent the effects of the recent recession. Likewise, Bureau of Labor Statistics data is available for 2010, however, the BLS does not provide many types of data such as the value of shipments. Thus, when talking about the number of workers in the Fabricated metal sector in relationship to the 2007 Economic Census data the number will be higher than the current number of workers reported by the BLS. When groups of statistics are listed we have maintained the consistency of each data source and therefore numbers for specific variables will vary throughout the report.

I. Overview of Fabricated Metal Sector.

Overview of Fabricated Metal Sector

The metal fabrication sub-sector generally performs two functions: **fabricating** metal objects out of primary metal materials and **finishing** metal products. Metal fabrication includes processes such as metal bending, forming, welding, cutting, punching, extruding, shearing, and so on; metal finishing includes various coating and hardening treatments.

The metal fabrication industry produces an incredibly wide assortment of goods. Fabricated metal goods may be either intermediate parts or finished products. Intermediate parts include rebar, springs, and ball bearings; finished products include final goods such as handguns, prefabricated sheds, bathtubs, tea kettles, and cooking utensils.

An estimated 54,300 U.S. metal fabrication firms employ 1.6 million workers and generate a total of $345 billion in annual revenue; an additional 40,000 nonemployer metal fabrication firms generate $2.5 billion in annual receipts (U.S. Economic Census 2007). California has more metal fabrication firms than any other state and accounts for 9% of U.S. metal fabrication revenues (U.S. Economic Census 2007). About half of all California metal fabrication activity is concentrated in Southern California, with Los Angeles County alone generating over a third of state-wide metal fabrication revenues (QWI 2010).

Table 1. Comparison of National, California, and Los Angeles County Fabricated Metal Firms.

	Establishments	Employees	Value Shipped
United States	60,664	1,608,631	$345,104,298,000
California	7,329	157,588	$29,606,705,000
Los Angeles	2,315	52,333	$9,668,675,000

Source: US Economic Census 2007

NAICS/SIC Classification

Under the North American Industry Classification System (NAICS), metal fabrication is classified as a manufacturing sub-sector and is identified by code **332**; under the former Standard Industrial Classification (SIC) system, metal fabrication was identified by code **34**. The NAICS classification divides metal fabrication into nine major categories which can be seen in the chart below. The NAICS definition of metal fabrication excludes machinery, computers, electronics,

furniture, coins, and jewelry manufacturing, as well as certain types of metal products, such as cast iron or precious metal objects (NAICS 2007).

Table 2. Comparison of NAICS and SIC categories of metal fabrication sub-sectors.

NAICS Category	SIC category
3321 – Forging and stamping	346 – Metal forgings and stampings
3322 – Cutlery and handtool manufacturing	342 – Cutlery, handtools, and general hardware
3323 – Architectural and structural metals manufacturing	344 – Fabricated structural metal products
3324 – Boiler, tank, and shipping container manufacturing	341 – Metal cans and shipping containers
3325 – Hardware manufacturing	342 – Cutlery, handtools, and general hardware
3326 – Spring and wire product manufacturing	345 – Screw machine products, bolts, nuts, screws, rivets, and washers
3327 – Machine shops and threaded product manufacturing	347 – Coating, engraving, and allied services
3328 – Coating, engraving, heat treating, and allied activities	348 – Ordnance and accessories, except vehicles and guided missiles
3329 – Other fabricated metal product manufacturing	349 – Miscellaneous fabricated metal products

Source: U.S. Census Bureau, 2007.

While other NAICS manufacturing sub-sectors produce similar or even identical metal goods, the NAICS 332 classification includes *only* those firms that use previously formed metal products as their input. Vertically integrated firms that both manufacture metal *and* form it into metal products are excluded from the NAICS 332 category; such firms would instead be classified as primary metal manufacturers. Thus an analysis of the fabricated metal sub-sector should eventually expand to include other metal manufacturers, as policy recommendations may overlap.

While the NAICS and SIC definitions of fabricated metal goods are broadly similar (see table 2 above), the NAICS 332 category, created in 1997, also includes products that were formerly excluded from the SIC 34 category. The SIC to NAICS conversion absorbed certain primary metal manufacturing and industrial tools or intermediate goods into the metal fabrication sub-sector. Furthermore, the NAICS conversion folded weapons and ammunition into the "other" category, while placing a higher emphasis on machine shops and hardware manufacturing. In general, however, the SIC and NAICS categories for fabricated metal goods are similar and converting between the two systems is simple; the U.S. Census Bureau provides a detailed guide online (US Census 1997). For a complete listing of NAICS Code 332 subsectors see Appendix 1.

Distribution of Fabricated Metal Goods

Because the fabricated metal sub-sector produces both intermediate and final goods, some products are sent directly to mass retailers, some are custom made, and some are further processed before reaching consumers. For example, the Ball Corporation, the largest can producer in the U.S., supplies Coca-Cola Inc. with aluminum cans. The cans are sent through Coca-Cola processing plants, shipped to retailers, and then bought by consumers (Reference for Business 2010). On the other hand, Trinity Industries, a large Texas-based firm that produces both various industrial parts, including wind turbine towers, works directly with turbine manufactures and clients on specific projects (Trinity Industries 2010).

Sector Profitability

The fabricated metal sector creates profit by adding value to primary metal materials. Firms take prefabricated metal products (such as sheet metal or plate metal) and through investments of energy and labor create new, higher-value products. According to the U.S. Bureau of Economic Analysis, in 2008 the fabricated metal sub-sector added $136 billion in value, generating a total of $339 billion in output, or 0.9% of the US GDP (BEA GDP 1998-2009).

Because the fabricated metal sector produces both industrial products and consumer goods, some firms operate primarily as commercial suppliers, while others focus on retail markets (Hoovers 2010). For metal fabrication firms that sell to industrial firms, macroeconomic fluctuations are important since their products are consumed during the construction and assembly processes. Therefore their profitability will be closely linked with economic growth in the wider economy.

Firms that supply consumer goods are more subject to specific retail trends. For instance, metal fabrication firms that supply kitchen goods such as flatware, cutlery and pots expanded to meet increased American interest in cooking during the late 1990s (Reference for Business 2010).

Efficiency and niche production are also important concerns for the fabricated metal sector. Although large firms have an advantage of economies of scale, particularly when purchasing primary metal materials, many fabricated metal products require specialization, providing niches for smaller firms. Margins have become increasingly tight as regulation and competition from overseas have forced US firms to automate to maintain their competitive advantage.

Markets for Fabricated Metal Goods

The range of customers for fabricated metal products is highly varied. The fabricated metal sector supplies several disparate markets, including construction, machinery assembly, transportation equipment, packaging, military, and housewares (Freedonia 2010). Specific customers may include retailers, other manufacturers, project specific requests, or international distributors.

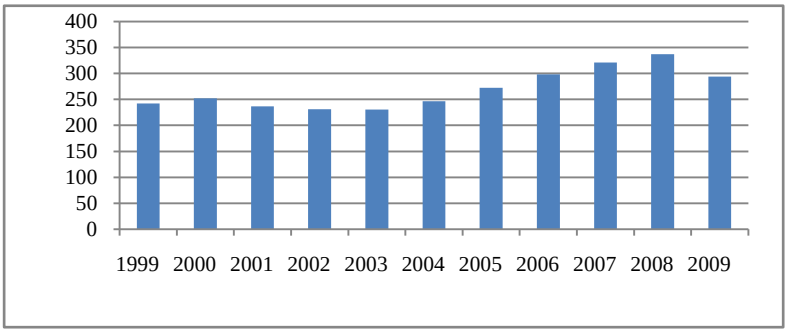
Nationwide there are over 55,000 firms in fabricated metal sector involved in exporting (Hoovers 2010). Despite the large number of firms involved in exporting metal products, however, the U.S. currently imports more fabricated metal products than it exports. An industry report estimates that the U.S. runs a trade deficit of $12.1 billion in this sector (Freedonia 2010). However, because certain fabricated metal products are difficult to transport, some markets remain mostly domestic—cast iron bathtubs, for instance, are too heavy to export cost-effectively (Reference for Business 2010).

Recent Dynamics and Economic Trends

As noted previously, metal fabrication firms are largely dependent upon other industries. For example, the success of the construction industry is fundamental to the success of the architectural and structural metal sub-sector, as 95% of structural metal products are consumed by the commercial construction sector. Similarly, demand in the general component sub-sector is directly related to demand for public works construction. Since demand for the fabricated metal sector is generated by retail and construction activity, which are highly cyclical industries, the fabricated metal sector is susceptible to shifts in the economy.

Advances in transportation and comparatively underpriced foreign labor and materials have increased foreign competition in the last decade. Although overall U.S. exports have increased slightly faster than foreign imports, a strong trade deficit still persists, particularly in automotive goods and consumer goods (Bureau of Economic Analysis 2010). According to some reports, imports of fabricated metal products from China rose by nearly 60 percent between 2005 and 2008 (Hoovers 2010). Despite the economic recession, however, U.S. exports of capital goods have consistently exceeded imports (Bureau of Economic Analysis 2010). As the fabricated metal sector produces both finished consumer goods and intermediate parts that are used in the manufacture of capital and automotive goods, certain types of sub-sectors of the fabricated metal industry may have more promising futures than others.

Figure 1. Total shipments of U.S. fabricated metal goods (billions of dollars), both domestic and international.



Source: Freedonia, 2010.

Major International Firms.

A list of the top five international firms involved in metal fabrication includes two Japanese companies, a Spanish company, an Australian company, and a Luxembourg company. Note, however, that much of these firms' business lies outside of the fabricated metals sector.

Table 3. Major International Fabricated Metal Firms.

Company	Location
Mitsubishi Steel Mfg. Co., Ltd.	Tokyo, Japan
Herreria Logarri Sociedad Limitada	Loiu, Vizcaya, Spain
Shinsho Corporation	Osaka, Japan
Metalcorp Steel Pty Limited	Ballarat, Victoria, Australia
ArcelorMittal Sourcing SCA	Luxembourg, Luxembourg

Source: Hoovers 2010.

Many large metal fabrication companies are also primary metals manufacturers. For example, the massive **Mitsubishi Steel Manufacturing Co., Ltd.** of Tokyo (not be confused with related, but not legally affiliated Mitsubishi companies such as Mitsubishi Corporation and Mitsubishi Motors) is heavily involved in steel wire drawing and steel foundries (NAICS 3312, 3315) as well as forging and stamping (NAICS 33211). Another Japanese company, **Shinsho Corporation** is a large and diverse metals company, serving mostly domestic clients. **Metalcorp Steel Manufacturing Company, Ltd** of Altona North, Victoria, Australia is a large

producer of fabricated structural metal (NAICS 32312). **ArcelorMittal SA** of Luxembourg was mentioned by Hoovers but is not significantly engaged in metal fabrication; it is relevant, however, as the world's largest producer of steel—and thus a possible supplier for, rather than competitor with, American metal fabricators (Hoover's Company Reports 2010).

Major Domestic Firms

IBISWorld's Industry Reports was used to compile a shortlist of major players in the U.S. metal fabrication sector. **Precision Castparts Corp.** of Portland, Oregon and **Mueller Industries** of Memphis, Tennessee are prominent firms engaged in forging (NAICS 3321) and employ 18,100 and 3,300 workers respectively. **Nucor Corporation** of Charlotte, NC and **Commercial Metals Co.** of Irving, TX are major producers of primary iron and steel—a different but closely related sector—are also heavily involved in structural metals manufacturing (NAICS 3323) and employ 20,400 and 13,500 workers. The highly diverse **Ball Corporation**, formerly a home canning and jar producer, focuses on packaging of all kinds; a large component of its business is in the production of metal containers (NAICS 332431). Ball Corp. is located in Broomfield, Colorado and employs 14,500 individuals. **Stanley Black and Decker** is a recent merger between Stanley Works and the popular power tool (NAICS 3322) manufacturer Black and Decker of Towson, Maryland. The firm is now headquartered in New Britain, Connecticut, and employs 16,700 workers. Finally, located in Canton, Ohio is **The Timken Company**, which has made a name for itself through its manufacture of ball and roller bearings (NAICS 332991), and has a payroll of 16,600. Firm employment data are taken from Hoover's Company Reports.

Metal Fabrication in California

Although the five largest metal fabrication firms are headquartered outside of California, according to U.S. Census Bureau data from 2008, California has more fabricated metal firms than any other state. California's firms make up 11% of nation-wide architectural and structural metal fabrication firms, 11% of forging and stamping firms, 13% of the machine shops and threaded product firms, and 15% of metal coating, engraving, and heat treating firms. Of the 7,200 fabricated metal manufacturing firms in California, 2,300 are located in Los Angeles County. Michigan, Illinois, Texas, and Ohio also have large numbers of establishments producing various fabricated metal products (See section three for maps of firm locations).

Metal Fabrication in Los Angeles County

The Economic Development Department of California (EDD) releases the names and addresses of establishments, sorted by number of employees and NAICS classification. Thus it was possible to compile a list of all metal fabrication establishments in Los Angeles County employing over 250 people, which provides a good starting point for investigating the region's major establishments. There is a danger in placing too much emphasis on major firms, however: EDD's data revealed a very large number of relatively small establishments, ranging from 1-4 employees to 250-499 employees. No establishments employed 500 or more workers.

Table 4. Metal Fabrication Firms in Los Angeles with More Than 250 Employees.

Subsector	Description	Name	City
332116	Metal Stamping	Baumann Engineering	Claremont, CA
332111	Iron and Steel Forging	Carlton Forge Works	Paramount, CA
332312	Fabricated Structural Metal	Stainless Steel Products	Burbank, CA
332312	Fabricated Structural Metal	Shultz Steel	South Gate, CA
332313	Plate Work	Washington Ornamental Iron Works	Gardena, CA
332312	Structural Metal	Cemco	City of Industry, CA
332510	Hardware	Valmont Coatings	Los Angeles, CA
332721	Screw Machine Products	Hi Rel Connectors	Claremont, CA
332722	Nuts, Screws, Rivets, and Washers	P B Fasteners	Gardena, CA
332722	Bolts, Nuts, Screws, Rivets, and Washers	Monogram Aerospace Fasteners	Commerce, CA
332999	Miscellaneous Fabricated Metal Products	Franklin Reinforcing Steel	Santa Fe Springs, CA
332991	Ball and Roller Bearings	New Hampshire Ball Bearings	Chatsworth, CA
332911	Industrial Valves	Pacific Valves	Signal Hill, CA

Source: Economic Development Department, 2010.

Trade Associations

A wide array of trade associations are relevant to fabricated metals production, to particular sub-sectors of metal fabrication, to closely related sectors in which fabricated metals producers are frequently involved, and to manufacturing in general. Their diversity reflects the diversity of the fabricated metals industry. Rolledsteel.com also has a list of trade associations a copy of which is provided in Appendix 2.

Table 5. Metal Fabrication Trade Associations.

Name of Association	Website
American Bearing Manufacturers Association	http://www.americanbearings.org/
Bearing Specialists Association	http://www.bsahome.org/
American Hardware Manufacturers Association	http://www.ahma.org/
Metal Roofing Alliance	http://www.metalroofing.com/
National Defense Industrial Association	http://www.ndia.org/
National Ornamental & Miscellaneous Metals Association	http://nomma.org/
Sheet Metal and Air Conditioning Contractors' National Association	http://www.smacna.org/
National Association of Manufacturers	http://www.nam.org/
Metal Construction Association	http://www.metalconstruction.org/
Metal Building Manufacturers Association	http://www.mbma.com/
American Institute of Steel Construction	http://www.aisc.org/
Air-Conditioning, Heating, and Refrigeration Institute	http://www.ahrinet.org/
Can Manufacturers Institute	http://www.cancentral.com/
Association for Manufacturing Technology	http://www.amtonline.org/
American Welding Society	http://www.aws.org/w/a/
American Iron and Steel Institute	http://www.steel.org/
International Council on Mining and Metals	http://www.icmm.com/
National Machining and Tooling Association	https://www.ntma.org/

Trade Journals
In addition to materials published by trade associations (e.g. **Modern Steel Construction**, published by the American Institute of Steel Construction), which are most likely to be relevant to that association's specialty, there is also a good variety of more general trade journals available.

Table 6. Metal Fabrication Journals.

Journal Name	Website
The Fabricator	http://www.thefabricator.com/
Modern Metals	http://www.modernmetals.com
American Metal Market	http://www.amm.com/
Platts Metal Week	http://www.platts.com/
Forging	http://www.forgingmagazine.com/
Welding Design & Fabrication	http://weldingdesign.com/
American Machinist	http://www.americanmachinist.com/
Fabricating and Metalworking	http://www.fandmmag.com/
Machine Design	http://machinedesign.com/
Industry Week	http://www.industryweek.com/
Today's Machining World	http://www.todaysmachiningworld.com/

II. Industry Structure and Composition

II.A. Industry Structure

Overview of Industry Structure
The fabricated metal sector employs 1.4 million people, or 0.9% of the U.S. workforce. A majority of these employees work for small, privately held firms that employ less than 20 people (Bureau of Labor Statistics CES 2010). Wages vary by subsector and occupation, with managerial employees earning the most per hour (a median of $44/hour) and maintenance employees the least (a median of $11/hour). Most employees work in production or office and administrative support.

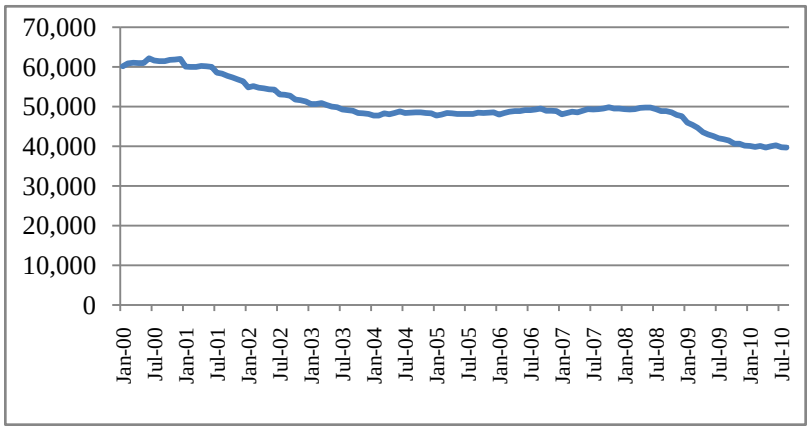
Output in the fabricated metal sector has risen over the last decade in real dollars, although the recent economic downturn has increased the number of layoff events and slowed overall production. In general, with the exception of a limited number of subsectors, production is not concentrated within a few firms.

Even though the majority of fabricated metal firms are small in size, a review of fabricated metal firms publicly traded on U.S. exchanges reveals that several are part of multinational corporations, vast conglomerates, or holdings companies. Administrative offices and manufacturing plants are widely dispersed throughout the U.S., Europe, and China. Many of the companies have been in the fabricated metal sector for many years, although they may have changed subsectors over time. During our review, we also found that a fair number of firms we attempted to analyze had since dissolved due to bankruptcy.

Employment

As of the second quarter of 2010, the most current quarter for which sector employment data is available, fabricated metal sector workers make up 0.9% of the national workforce (Bureau of Labor Statistics CES 2010). The fabricated metal sector has seen a gradual decline in employment over the past decade. In 1997, the sector employed an estimated 1.76 million persons; by 2002, this number had dropped to 1.57 million (U.S. Economic Census 1997, 2002). From 2002 to 2007, employment figures held steady, but due to the U.S. economic crisis, by 2010, employment had declined further to 1.4 million persons (U.S. Economic Census 2007; Bureau of Labor Statistics CES 2010).

Figure 2. Number of Persons Employed in the California Fabricated Metal Sector.

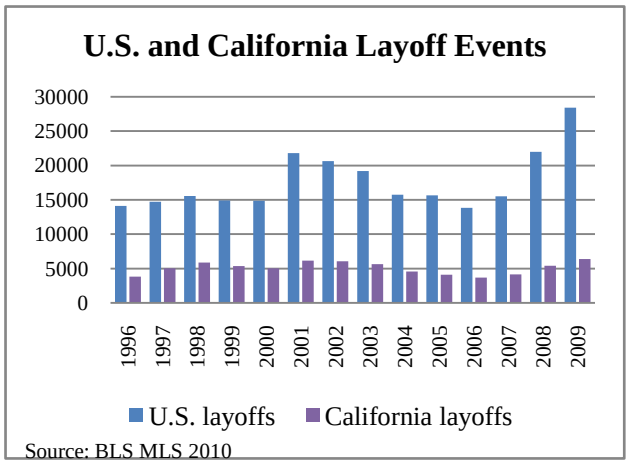


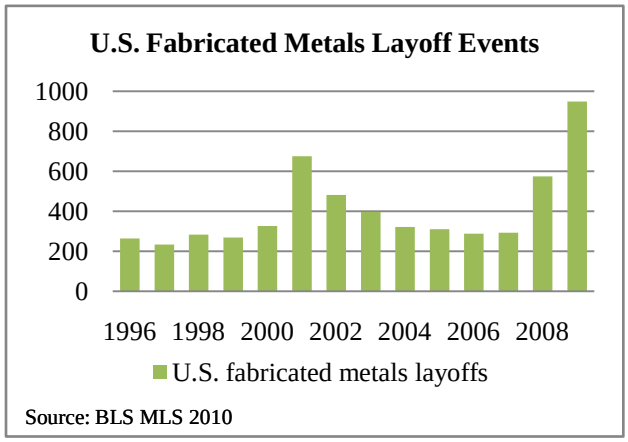
Source: CA-EED LMID 2010

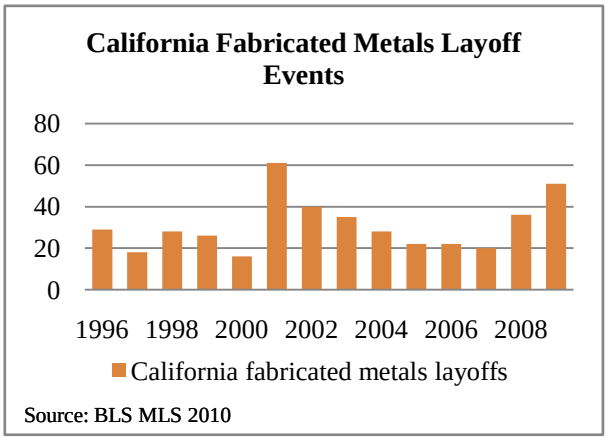
Within California, the number of employees within the fabricated metal sector has also declined steadily since the end of 2000 (see graph above). Previous projections for 2016 (forecasted from 2006) predicted a slow decline to 46,700 employees in California sector-wide, but the recession greatly accelerated the shrinkage of this sector (CA-EDD LMID 2010). According to the California Employment Development Department, as of August 2010, the fabricated metal sector has diminished to 39,700 employees from 62,000 employees in 2000, a 36% decrease over a decade (CA-EDD LMID 2010).

As the graphs below illustrate, overall layoffs in manufacturing, as well as in the fabricated metal sector and the state of California, are highly sensitive to trends in the greater U.S. economy. In both 2001 and 2009, the national economy experienced several large cuts in employment. Similarly, nationwide fabricated metal layoffs peaked in 2009 with a total number of 'mass layoff events' (any event which results in 50 or more employees filing for unemployment benefits) in the sector reaching 949; California mirrored trends in the overall U.S. economy with peaks in state fabricated metals layoffs reaching 61 events in 2001 and and 51 events in 2009 (BLS MLS 2010). Since the majority of fabricated metal firms employ under 20 employees (and would thus never meet the 50-person qualifying threshold for a "mass layoff event"), the Bureau of Labor Statistics likely underestimates the number of layoffs occurring at any given time in the sector.

Figures 3-6.



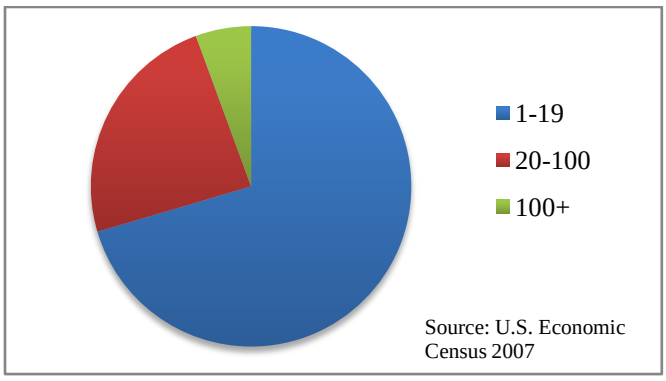




Firms by Number of Employees

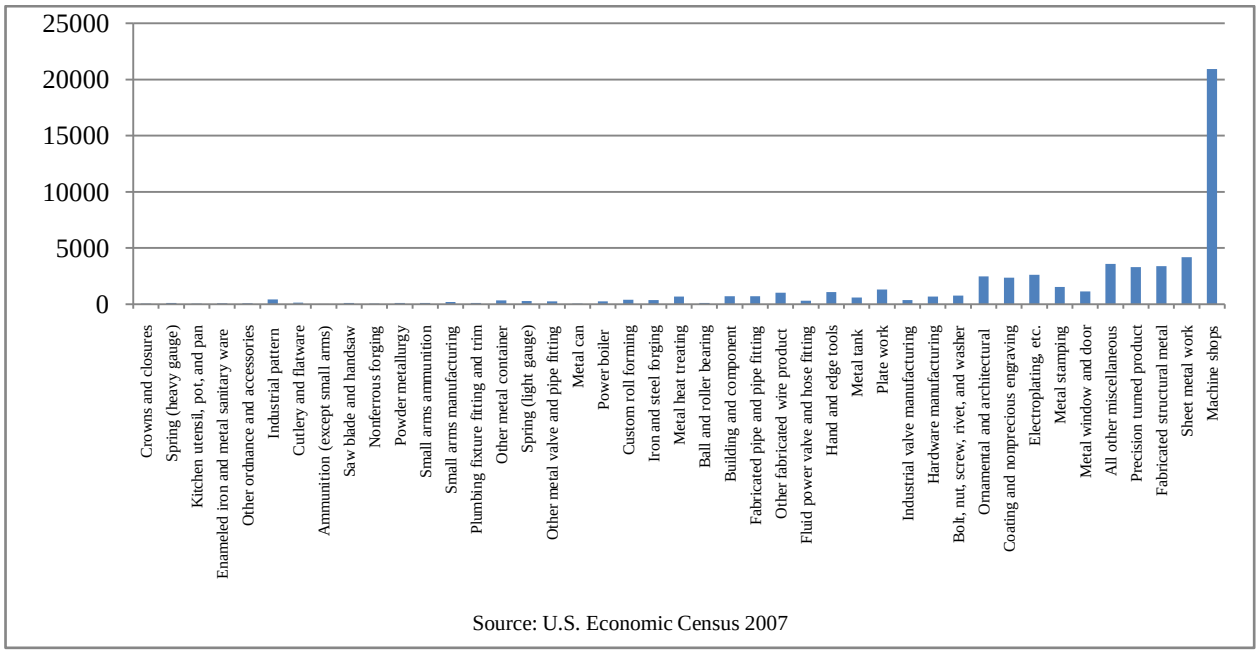
As of the last U.S. Economic Census, there were a total of 57,633 metal fabrication firms in the U.S. (2007). Of these firms, 70% were classified as small (employing between 1 to19 employees), 24% were medium-sized (employing 20 to 99 employees), and 6% were considered large (employing more than 100 employees) (U.S. Economic Census 2007).

Figure 7. Breakdown of U.S. Fabricated Metal Firms by Size (No. of Employees)



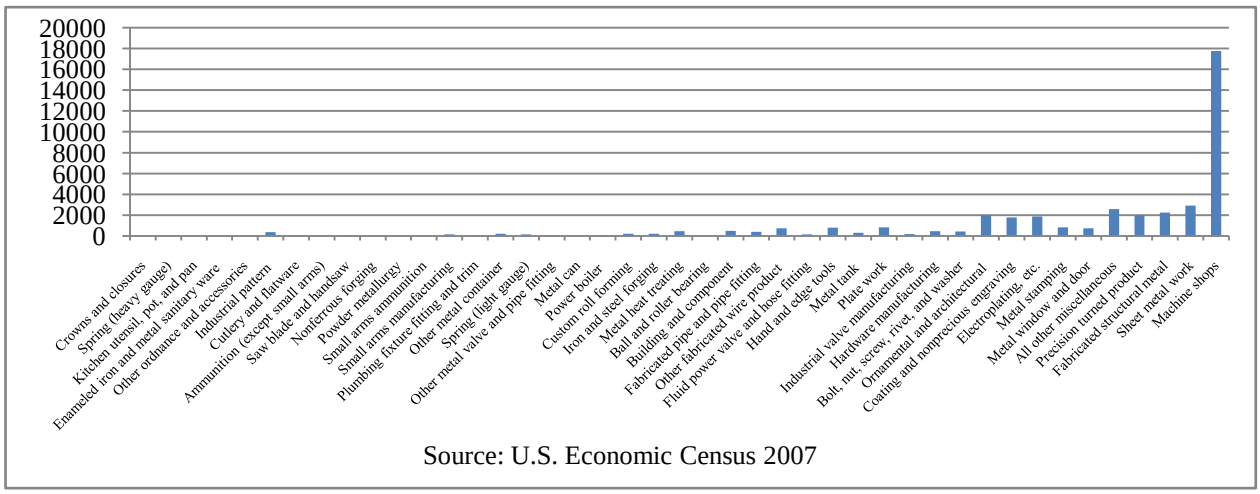
Machine shops make up the largest subsector in the fabricated metal industry, accounting for 36% of all firms. In comparison, sheet metal (7.3%), fabricated structural metal (5.9%), and precision turned products (5.7%) were the next largest subsectors (U.S. Economic Census 2007).

Figure 8. Number of U.S. Fabricated Metal Firms by Subsector



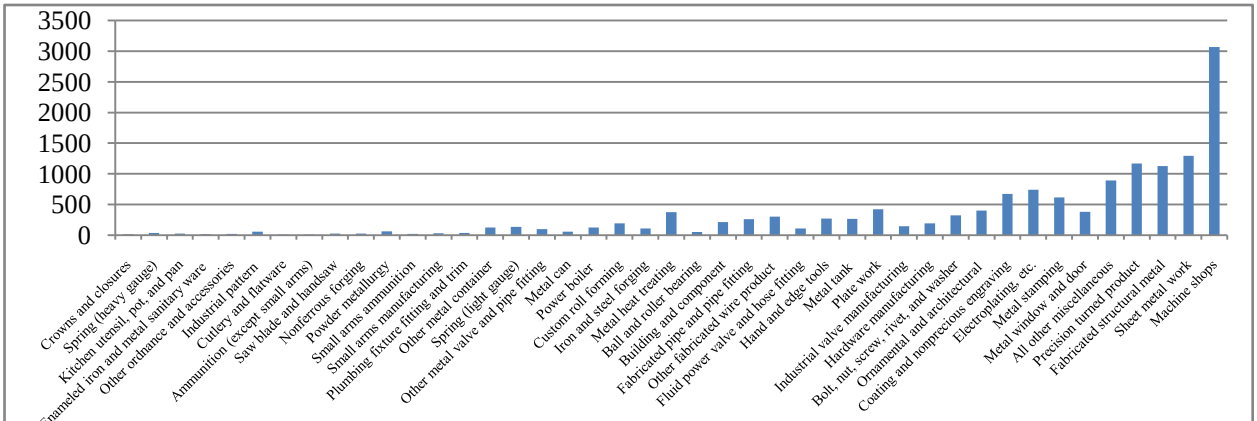
This distribution of firms in particular subsectors varies with firm size. Since small firms make up the majority of the sector they mirror the overall trend much closer than medium and larger firms do. Machine shops accounted for 41.6% of all small firms. The sheet metal manufacturing (6.8%), fabricated structural metal manufacturing (5.3%), ornamental architecture products manufacturing (4.8%) and precision turned products manufacturing (4.7%) subsectors also had significant numbers of small firms (U.S. Economic Census 2007).

Figure 9. U.S. Fabricated Metal Establishments with 1 to 19 Employees



Medium-sized firms are more evenly distributed between subsectors; however, machine shops are still the largest subsector, representing 21% of all medium-sized firms. Sheet metal (8.9%), precision turned products (8.0%), and fabricated structural metal (7.8%) turned products represented a quarter of medium-sized firms.

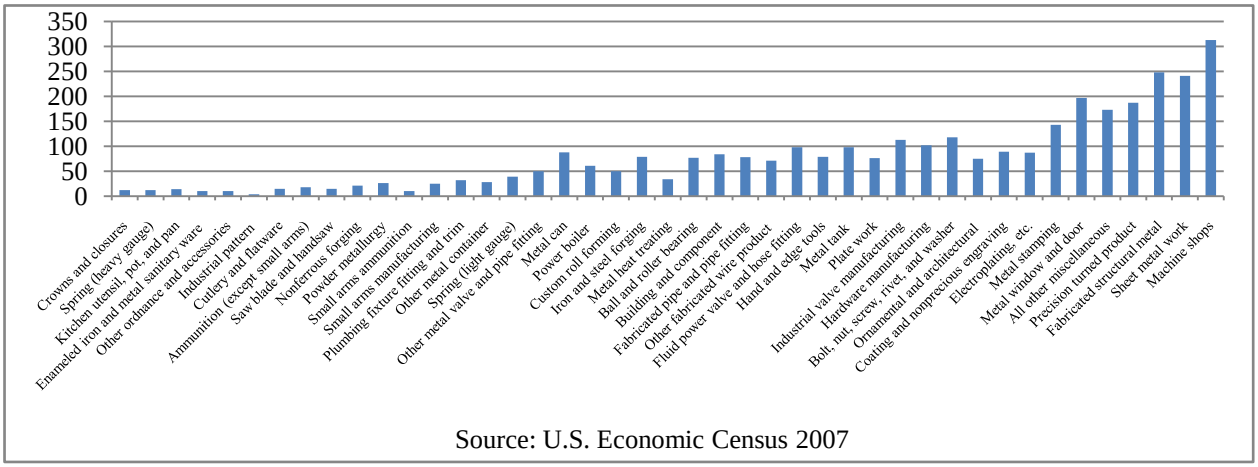
Figure 10. U.S Fabricated Metal Establishments with 20 to 99 Employees



Source: U.S. Economic Census 2007

Among large firms, no one subsector claims more than 10% of the total number of firms. The largest subsectors include machine shops (9.2%), fabricated structural metal (7.29%), sheet metal (7.1%), metal windows and doors (5.8%), and precision turned products (5.5%). This may be due in part to the fact that large firms tend to have a large array of manufacturing processes and are able to produce a diverse portfolio of fabricated metal goods, rather than specializing in any single type of good.

Figure 11. U.S Fabricated Metal Establishments with 100 employees or more



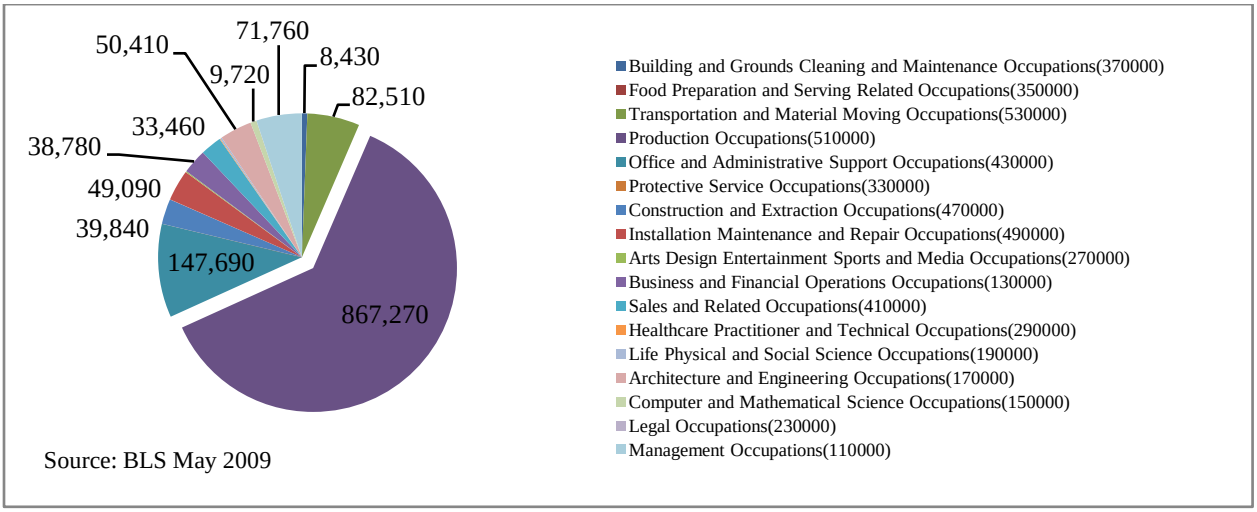
Source: U.S. Economic Census 2007

Occupations

Within the industry, the largest occupational class is the Bureau of Labor Statistics classification "Production Occupation" (code 510000) followed by "Office and Administrative Support" (code 430000). Production occupations include plant and system operators, machine setters, and equipment tenders; office and administrative occupations include freight and shipping agents,

order and procurement clerks, bookkeepers, customer service representatives, and various quality control positions. These two occupational categories account for 72% of the employees within the sector; production alone accounts for 62% (BLS CES 2010). Transportation/materials moving (code 530000) and management occupations (code 110000) make up the next largest categories, each accounting for approximately 7% of overall sector employment.

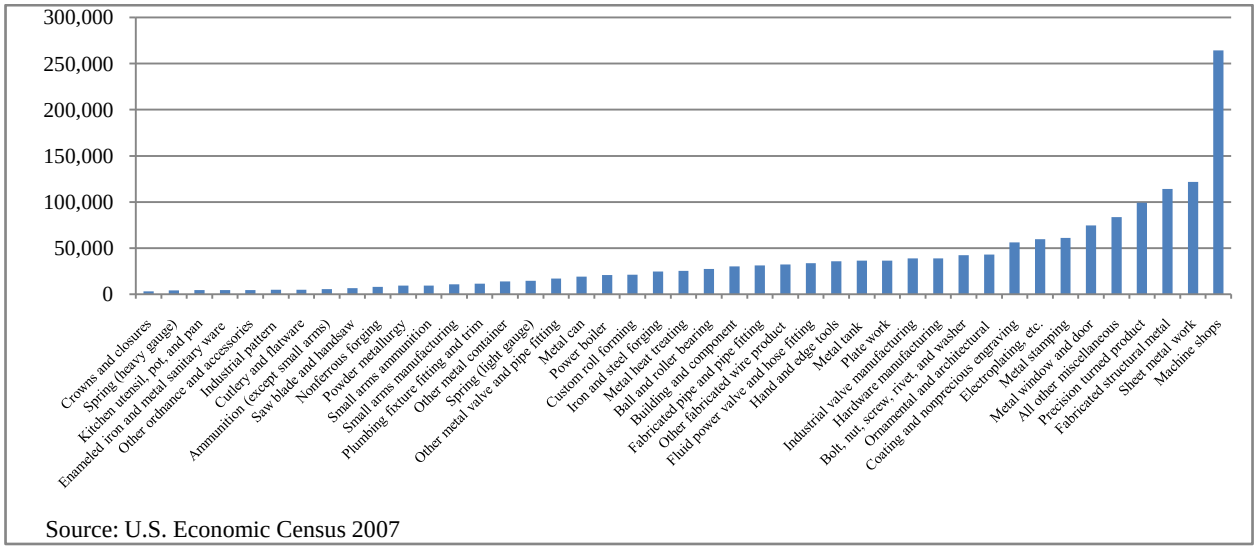
Figure 12. Breakdown of Occupations in the U.S. Fabricated Metal



Given that the vast majority of fabricated metal firms are very small, it makes sense that more than three out of every five employees are directly involved with the production process; since an individual fabricated metal firm may procure from and sell to several different markets, it also makes sense that 10% of employees work in administrative functions. According to the U.S. Bureau of Labor Statistics, jobs in production occupations are generally expected to decline in number, but individual jobs should continue to provide good employment opportunities, as the number of trained candidates has been insufficient to meet demand. This is especially true of jobs that require a high level of both classroom and on-the-job training, such as welding. Job prospects in administrative functions are expected to vary, with demand for some increasing quickly (freight agents, procurement clerks), especially as the current labor force retires, but decreasing for others (order clerks) as some tasks become automated.

Analyzing the U.S. fabricated metal industry by subsector, we find that machine shops are the largest employer of fabricated metal workers, accounting for 16.4% of all employees sector-wide. Sheet metal manufacturing (7.6%), fabricated structural metal manufacturing (7.1%), and precision tuned metal manufacturing (6.2%) account for the next largest subsectors (U.S. Economic Census 2007).

Figure 13. Number of Persons Employed in U.S. Fabricated Metal

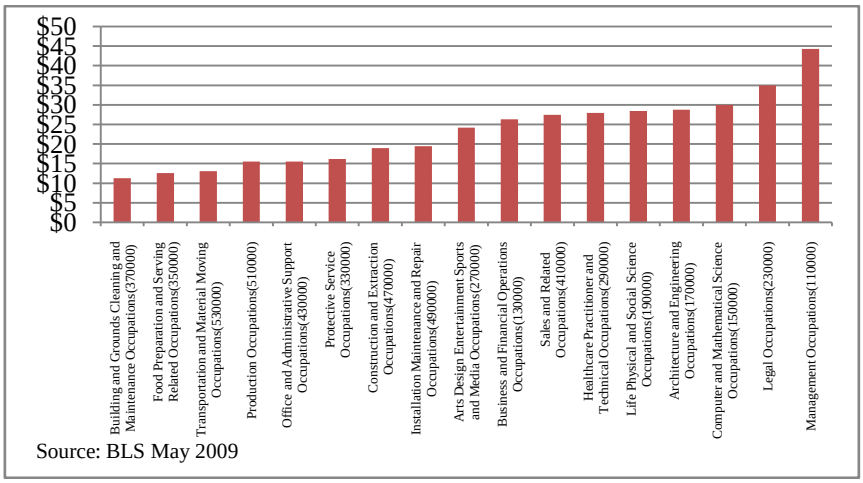


Source: U.S. Economic Census 2007

Wages

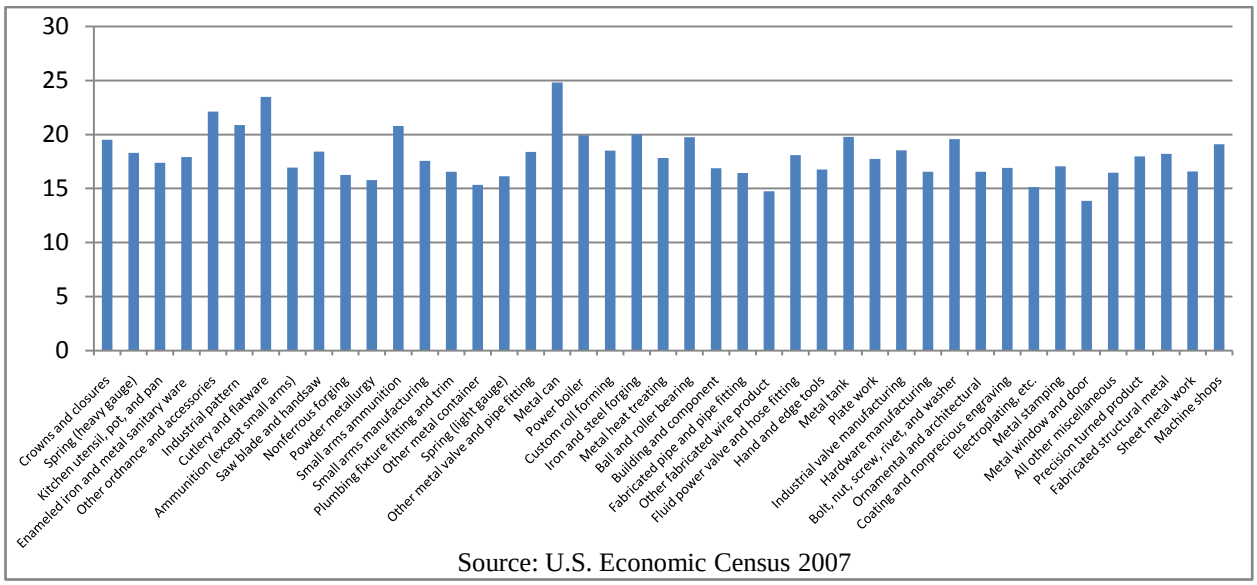
Wages in the fabricated metal industry vary by occupation, with median wages ranging from $44/hour for management-level employees to $11/hour for building and grounds maintenance workers. As is typical with income distributions, median wages are lower than mean wages across all occupations. The two fabricated metal occupations with the most employees—productions occupations and office administrative support—have median wages of $15.49/hour and $15.53/hour respectively, which are slightly higher than national production ($14.41/hour) and office administrative (14.62/hour) median wages for all industries (BLS CES 2010).

Figure 14. Median Hourly Wage in the U.S. Fabricated Metal Sector by Occupation



Just as employment levels vary by subsector, production wages also vary by subsector. At the high end, metal can and cutlery production workers earned $25/hour and $23/hour respectively. At the low end, metal window and door manufacturers earned only $14/hr (U.S. Economic Census 2002).

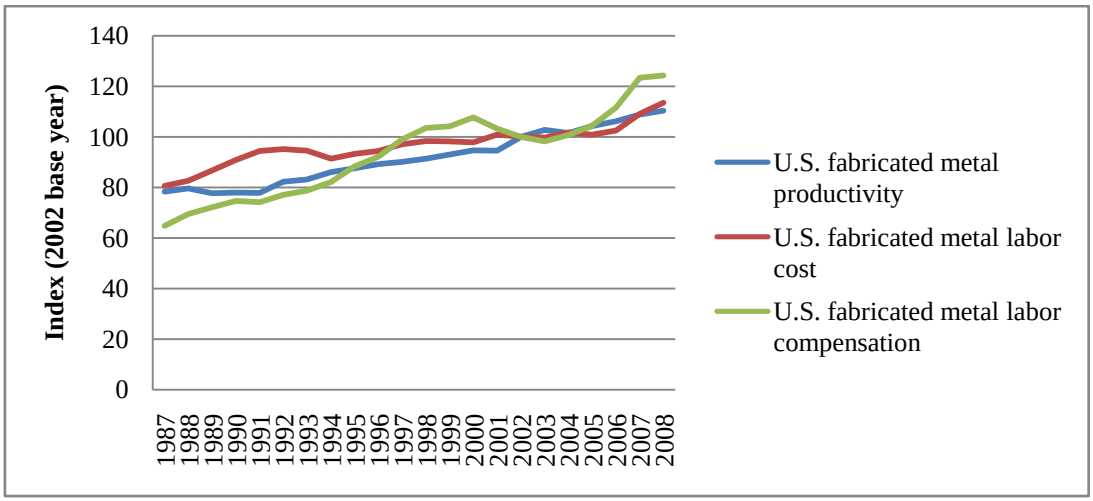
Figure 15. Production Wages/Production Hours in the U.S. Fabricated Metal Sector



Sector Output and Productivity

In contrast to the decline in employment, total output has risen in the fabricated metal sector from $243 billion in 1997, to $247 billion in 2002, to $345 billion in real dollars in 2007 (U.S. Economic Census 1997, 2002, 2007). At the same time, productivity, measured as output of all persons in the sector, has also steadily increased over the last two decades. While output and productivity are up, labor costs have increased as well, likely due to increases in labor compensation, as the graph below illustrates (BLS LPC 2010).

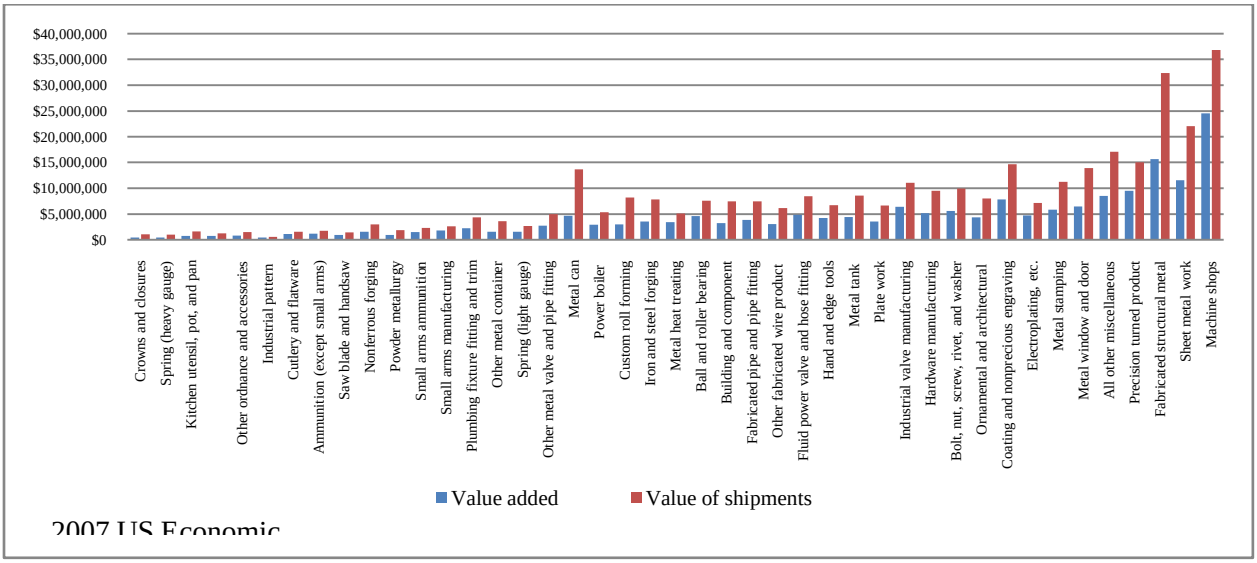
Figure 16. U.S. Fabricated Metal Sector Productivity



Source: BLS

Due to the methodology used by the Bureau of Labor Statistics in calculating productivity, productivity data is aggregate across the entire sector; however, we can analyze subsector productivity by comparing total shipment values (see chart below).

Figure 17. U.S. Fabricated Metal Value Added and Shipments ($1,000)



On average, total value added across the entire U.S. fabricated metal sector equals 54% of total shipments. Large subsectors, such as machine shops and fabricated structural metal manufacturing, generate the highest total shipment values in the U.S. fabricated metal sector, while small subsectors, such as springs and ammunition, generate a relatively small fraction. On the other hand, by examining value added compared to total shipments, total employees, and total establishments, we gain a different sense of the industry. The value added as a percentage of total shipments ranges from a maximum of 74% for cutlery to a minimum of 34% for metal

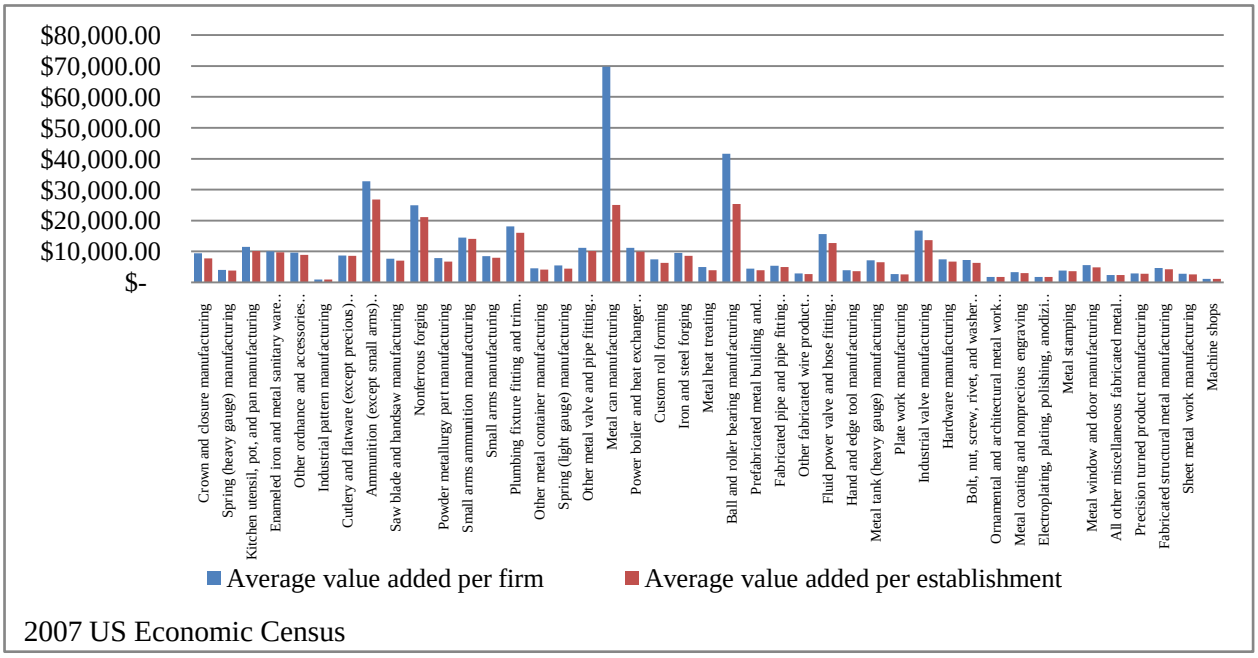
cans. A table below lists the top five most profitable subsectors of the U.S fabricated metal industry, as measured by value added compared to total shipments:

Table 7. Value Added as a Percentage of Total Shipments in the U.S. Fabricated Metal Sector

2007 NAICS code	Meaning of 2007 NAICS code	Value added divided by total shipments (%)
332211	Cutlery and flatware (except precious) manufacturing	74%
332997	Industrial pattern manufacturing	71%
332994	Small arms manufacturing	68%
332993	Ammunition (except small arms) manufacturing	67%
332811	Metal heat treating	67%

Source: U.S. Economic Census 2007

Figure 18. Average Value Added per Firm and Establishment ($1,000)



2007 US Economic Census

As the graph above shows, in the largest subsectors firms compete for smaller profits, while in a select few subsectors, a select few firms operate with higher profit margins. This pattern can further be seen by examining concentration ratios (below).

Concentration Ratios

Concentration ratios measure the percentage of output in a sector or subsector that is produced by a given number of firms. The ratios are used to determine the degree of oligopoly in a given subsector. One of the most common concentration ratios is the Herfindahl-Hirschman Index (HHI). Markets where the HHI is between 1000 and 1800 points are generally considered to be "moderately concentrated," while those where the HHI is in excess of 1800 points are considered "concentrated," signifying a high degree of control by a select number of firms (U.S. Department of Justice and the Federal Trade Commission 2010).

Table 8. Concentration Within Fabricated Metal Subsectors

NAICS code (2002)	NAICS code meaning	Value added (%)	Herfindahl-Hirschman index
332612	Spring (light gauge) manufacturing	81.8	965.1
332993	Ammunition (except small arms) manufacturing	100	1,037.60
332991	Ball & roller bearing manufacturing	98.1	1,089.00
332115	Crown & closure manufacturing	99.9	1,337.40
332213	Saw blade & handsaw manufacturing	95.7	1,422.20
332998	Enameled iron & metal sanitary ware manufacturing	99.6	1,427.40
332431	Metal can manufacturing	99.8	1,517.80
332211	Cutlery & flatware (except precious) manufacturing	98	1,678.30
332214	Kitchen utensil, pot, & pan manufacturing	99.6	1,749.50
332913	Plumbing fixture fitting & trim manufacturing	96.4	1,830.00
332992	Small arms ammunition manufacturing	98.8	2,098.30
332995	Other ordnance & accessories manufacturing	99.9	2,993.50

Source : U.S. Economic Census 2002

The metal can and cutlery manufacturing subsectors are moderately concentrated, as the average value added and total shipments data suggested. In the chart above, we can further see that three subsectors can be considered highly concentrated: plumbing fixture fitting and trim manufacturing, small arms manufacturing, and other ordnance and accessories (which includes ammunition for tanks and aircraft). There are a very small number of firms in these subsectors, and what firms do exist are relatively large. At the same time, while overall production is small in these subsectors, value added per physical plant is above average, suggesting that certain types of fabricated metal manufacturing have much higher economies of scale than others (See figure 19 above).

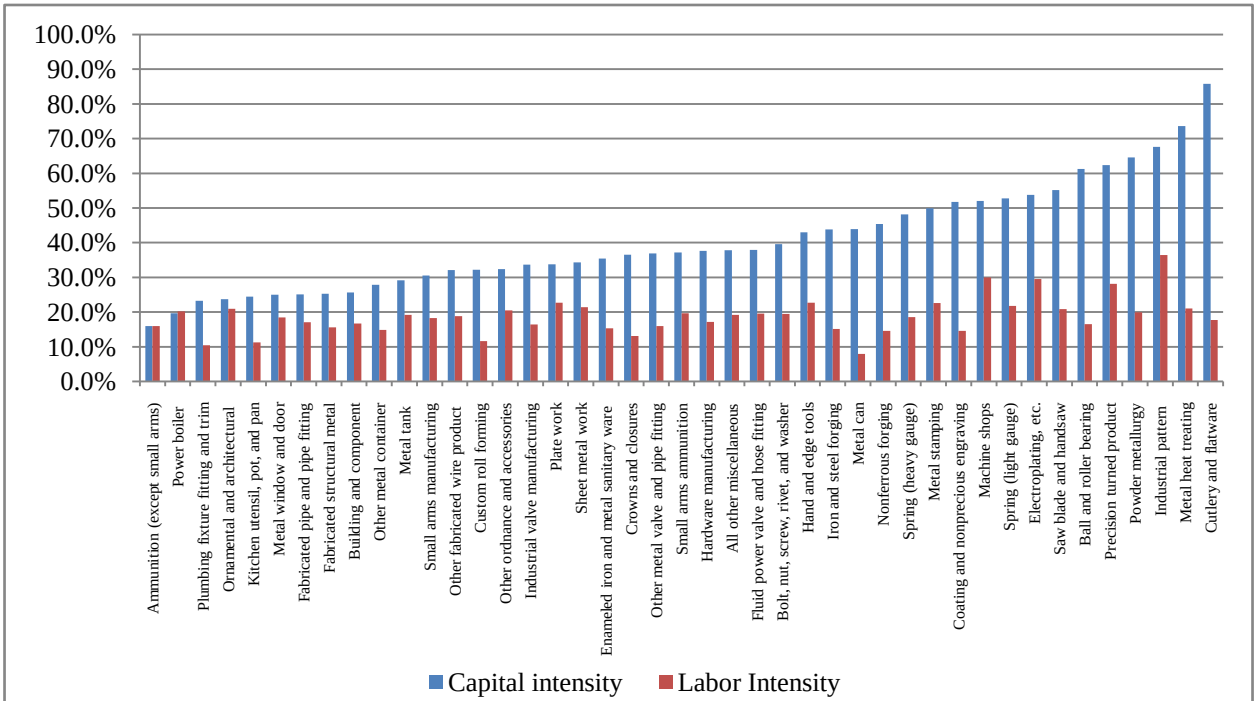
Capital Intensity and Labor Intensity

Capital and labor intensity measure the amount of capital and labor required to produce a certain value of goods. Capital intensity is the relationship between the amount of fixed capital that is necessary for production. It can be seen as a measure of an industry's profitability, as in general, the more capital required to produce a good, the less profit there is to be earned. Capital intensity can be measured as the ratio of total assets to total revenues. In the fabricated metal goods sector, capital intensity varies dramatically from 16% (ammunition) to 85% (cutlery) showing that different subsectors have greater margins of profitability (U.S. Economic Census 2007).

Labor intensity describes the amount of labor required in relationship to the amount of capital. A key component is the issue of variability. Labor is considered variable since workers can be hired or fired based on product demand, whereas capital investments are fixed. Labor intensity can be

measured as the cost of wages in proportion to total revenue. Labor intensity ranges from a low of 7.9% for metal cans to a high of 36.5% for industrial patterns (U.S. Economic Census 2007). As can be seen from the chart below, there does not seem to be a clear relationship between capital and labor intensity within the sectors.

Figure 19. Capital and Labor Intensity in the U.S. Fabricated Metal Sector



Source: U.S. Economic Census 2007

Ownership and Structure

A majority of firms in the U.S. fabricated metal sector are privately held. The 2007 U.S. Economic Census lists over 50,000 firms in the NAICS 332 sector; however, a search on Mergent Online found only 102 companies listed on U.S. stock exchanges, while a search of all stock exchanges returned less than 500 companies. Several of the firms listed on U.S. stock exchanges were holding companies; other firms had no manufacturing plants, distribution centers, or even administrative offices in the U.S.

In order to gain a qualitative picture of common firm structures in the industry nationwide, we profiled the structure, contracting and outsourcing practices, age, and corporate histories of five large firms in three fabricated metals subsectors of particular interest to us in terms of future green manufacturing: forging and stamping (NAICS 3321); architectural and structural metals (NAICS 3323); and machine shops (NAICS 3327). Though these firms do not constitute a statistical sample, we did attempt to make a representative selection, seeking diversity in terms of firm size, location, and product. The two exceptions to this are that four of five are publicly traded (all except Federal Screw Works, which privatized in 2005); and that firms undergoing bankruptcy were avoided—there were several major firms in this situation. Firm information is

drawn from corporate websites, most recent SEC 10k filings (2009), and from Hoover's Company profiles.

Fabricated metal production in forging and stamping, architectural and structural metals, and machine shops does not appear to experience significant economies of scale. The firms we examined in the forging and stamping and architectural and structural metals subsectors were medium-to-large, publicly traded international corporations, that had mostly grown through acquiring subsidiaries and horizontal integration. A horizontal integration strategy largely involves acquiring niche businesses in an effort to expand particular production capabilities and locate within new markets. (Vertically integrated firms are generally considered primary metal manufacturers and may potentially be much larger and face different structural challenges compared to the fabricated metals sector). Large firms in forging and stamping and architectural and structural metals manufacturing g (but not machine shops) tend to cut costs by locating large-scale production offshore in low-wage labor markets, while keeping smaller-scale custom work closer to product markets.

Forging and Stamping (NAICS 3321).

> **Ladish Co., Inc.** (www.ladishco.com) was founded in 1905, is headquartered in Cudahy, Wisconsin and employs 1,137 workers domestically and 500 in Poland. Eighty-eight percent of Ladish's business consists of manufacturing jet engine and aerospace components. The company has facilities in Wisconsin, California, Connecticut, Oregon, and Poland, most of which were acquired through buyouts of smaller private firms. Of particular interest to Southern California is Chen-Tech of Irvine, CA, which Ladish acquired in 2008. The filing does not mention outsourcing, though nearly a third of Ladish's total employees are offshore in its Poland facility. In 2009, Ladish spent $2.7 million on research and development, $1.2 million of which was reimbursed by customers.
>
> **Precision Castparts Corp.** (www.precast.com) was founded in 1956, is headquartered in Portland, Oregon and employs 18,100 workers. Their business is split between three segments: Investment Cast Products, Forged Products, and Fastener Products. Precision does not appear to outsource its work, but aggressively seeks to maximize efficiency by purchasing domestic and foreign subsidiaries. Precision operates over 110 facilities in the United States, the United Kingdom, Ireland, Germany, France, the Netherlands, Luxembourg, Belgium, Canada, Australia, Japan, Hungary, the Czech Republic, Italy, India, Brazil, Mexico, China (PRC), Hong Kong, Taiwan, and Singapore. These include the Paramount, California-based aircraft engine manufacturer Carlton Forge Works, acquired in 2009. Precision spent $25.6 million on research and development in 2010.

Structural and Architectural Metals (NAICS 3323).

> **Harsco Corp.** (www.harsco.com) was incorporated in 1956, is headquartered in Camp Hill, Pennsylvania, and employs 19,600 workers. Harsco is engaged in a long list of related business segments, including engineered scaffolding, concrete forming and shoring, outsourced on-site services to metals producers, railway track maintenance, heat

transfer products, and minerals and recycling technologies. Harsco is the supplier of, rather than a customer for, outsourcing contracts, but Harsco does seek to cut costs by locating processes offshore, and in fact has over 400 locations in 50 different countries representing all major world regions. Harsco spent $3.2 million on research and development in 2009.

Valmont Industries, Inc. (www.valmont.com) was incorporated in 1946, is headquartered in Omaha, Nebraska, and employs 6,600 workers. Valmont produces a variety of fabricated metal products, including engineered support structures, utility support structures, metal coatings, and irrigation equipment. The company has dozens of domestic and offshore subsidiaries scattered across the globe, in both high-wage and low-wage locations. This includes facilities in Long Beach and Los Angeles, California. Valmont spent $3.2 million on research and development in 2009.

Machine Shops (NAICS 3327).

Federal Screw Works (www.federalscrew.com), denoted "FSW," was incorporated in 1919 and is headquartered in St. Clair Shores, Michigan. FSW manufactures industrial component parts, including locknuts, bolts, piston pins, studs, bushings, shafts, and other machined parts. It does not outsource work, and divides its output between five plants, all located in Michigan. Unsurprisingly, most of FSW's sales are to car and truck manufacturers.

II.B. Internal Composition

Overview of Industry Composition

In order to better understand industry composition, especially as it pertains to California and Los Angeles County, we also examined all 102 publicly held companies listed on Mergent Online and identified 29 (just under one third) that own or lease property in the state of California. Of these 29, about a dozen had several California properties (either manufacturing, distributing, or administrative). We have profiled some of them using information drawn from the most recent SEC filings, Mergent Online's company database, and corporate websites.

Based on this preliminary data, we find that fabricated metals subsectors are alike in some aspects of industry composition, and very unlike in others. For example, while most major firms have converted to more flexible production processes, using a combination of their own subsidiaries and other manufacturing and distribution plants both in the U.S. and overseas, production processes can vary significantly between subsectors. Again, we have used some specific cases to get a sense of research and development spending, product design, important production processes, new technologies, and equipment and machinery spending.

Research and Development

The amount spent on research and development at large fabricated metal firms varies depending on the nature of the metal product. On average, companies that produce construction materials and consumer goods seem to spend less than 1% of their total expenditures on research and development, with defense-related companies expending much more. Ball Corporation, a major can manufacturer with plants in Torrance, Fairfield, Oakdale, and Chino, California, spent $25.6 million on R&D in 2009, representing 0.4% of its total expenditures. Most of its research and

development, however, is conducted in Westminster, Colorado and Bonn, Germany, and is focused largely on packaging innovation and aerospace systems innovation. Ameron, which constructs pipes, wind towers, and construction materials, spent $8 million, representing 0.2% of expenditures. Valmont Industry, a pipe, tower, and irrigation products manufacturer, spent $3.2 million in R&D expenditures in 2009, or 0.2% of its total spending. Unsurprisingly, firms engaged in high-tech manufacturing spend much more. Parker Hannifin, an industrial valves manufacturer, spent $339 million in 2009, representing 3.6% of its total expenditures.

Product Design

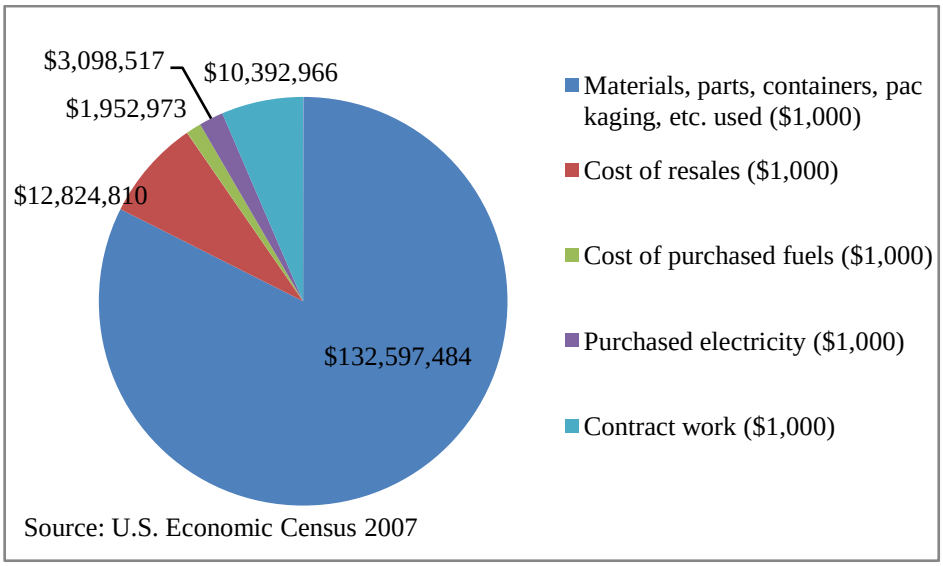
Ball Corporation, whose products are aimed directly or indirectly (i.e. after being filled with food or beverage) at consumer markets, is concerned with form as well as function in its product design. Like other fabricated metals subsectors, metal can manufacturers have to deliver a functional product based on the specifications of their clients; however, they must also focus on the ultimate effect of its product on the market appeal of the food, beverage, or other item contained in Ball's packaging. Thus the company is embracing technologies like enhanced can printing, as well as functional technologies that may lower costs or improve quality.

Other companies seek to innovate according to the specific needs of their market. Ameron invented and makes extensive use of a technology called "T-Lock," which, according to the company's website, is a "polyvinyl chloride sheet lining that protects concrete pipe and cast-in-place concrete structures from the corrosive effects of sewer gases, acids and industrial chemicals." The potential benefit and application of such a technology to water and sewage systems is obvious.

Inputs

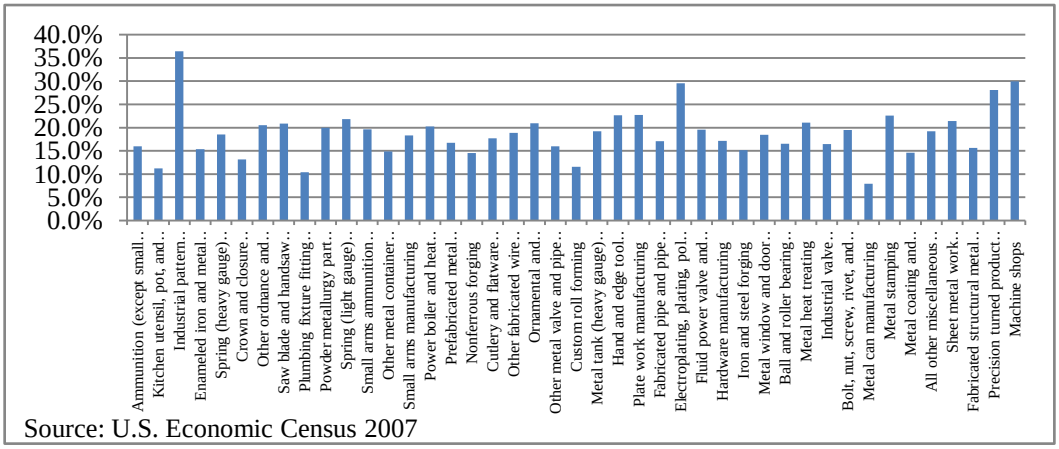
Specific primary materials and other inputs vary between subsectors, but can be broadly considered to include material, labor, and energy (see chart below). Material components include aluminum, steel, and other metals which are then reshaped into the desired shape. The well-being of fabricated metal firms depends heavily on commodities prices: for instance, according to a secondary report, while the price of steel in the U.S. increased 21% in 2008, manufacturers were only able to increase sales prices by 4.7% (IBIS World 2010). Thus, in order to protect their profitability, large firms have found ways to hedge against increases in metal commodities prices, especially crucial as metal prices have fluctuated widely over the past five years.

Figure 20. Material Costs in the U.S. Fabricated Metal Sector



Surprisingly, labor inputs also vary drastically across subsectors. Payroll costs for industrial patterning, for instance, reach 36.5% of total shipments, while payroll costs in metal can manufacturing are a mere 7.9% of total shipments. This may reflect the degree of mechanization and automation present within a subsector (U.S. Economic Census 2007). Based on payroll data, machine shops also appear to be highly labor-intensive—perhaps one of the reasons they have remained so small.

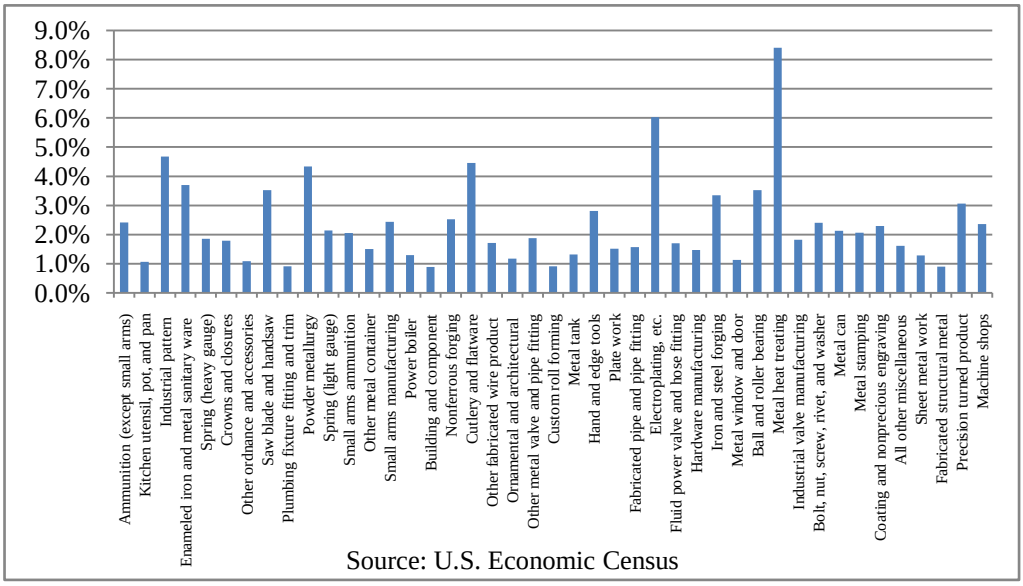
Figure 21. Payroll as a Percentage of Shipments in the U.S. Fabricated Metal Sector



Electricity inputs totaled over 47.5 billion kilowatt hours in 2007 for the fabricated metal industry. As a percentage of total costs, electricity averages only 1.9%; however as with labor costs, this can vary widely by subsector, as can be seen from the chart below. Electricity inputs will be an important point to revisit when looking at ways to "green" individual fabricated metal subsectors. Metal heat treating and electro plating are the subsectors with the highest ratio of

energy costs to material costs, while plumbing fixtures, building components, and structural metal manufacturing have some of the lowest (U.S. Economic Census 2007).

Figure 22. Electricity Costs as Percentage of Material Costs in the U.S. Fabricated Metal Sector



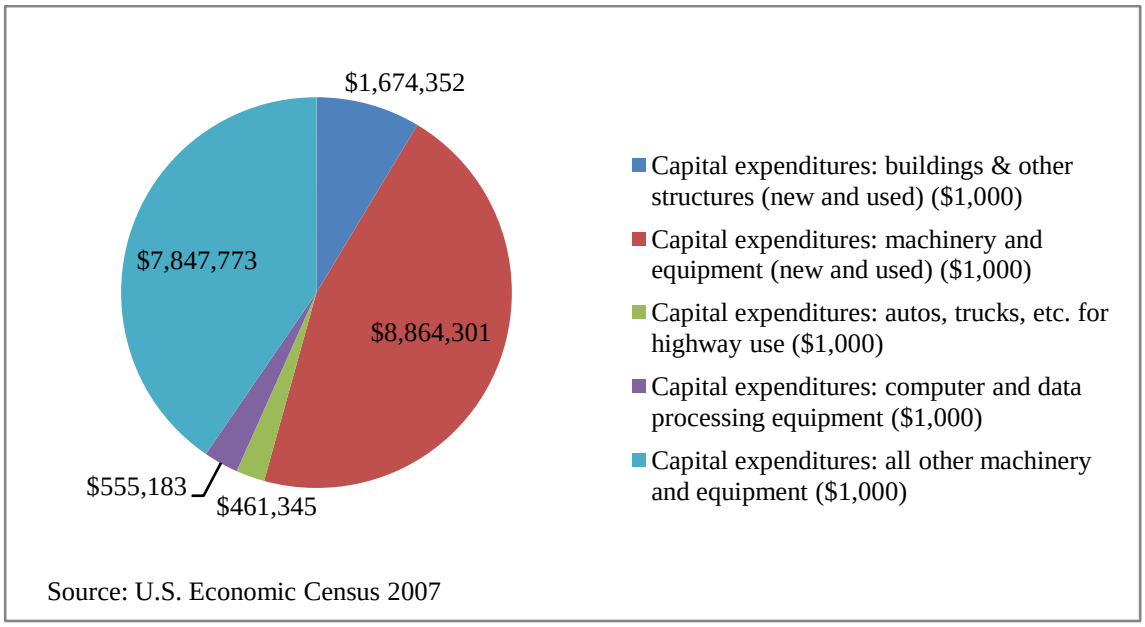
Source: U.S. Economic Census

Capital Expenditures

The fabricated metals sector is highly capital intensive and requires large investments in equipment. For example, in 2009, Ball and its subsidiaries accumulated $174 million in equipment, with a total inventory of $3.17 billion in equipment (excluding depreciation costs). These expenditures represented 2.5% of Ball's total.

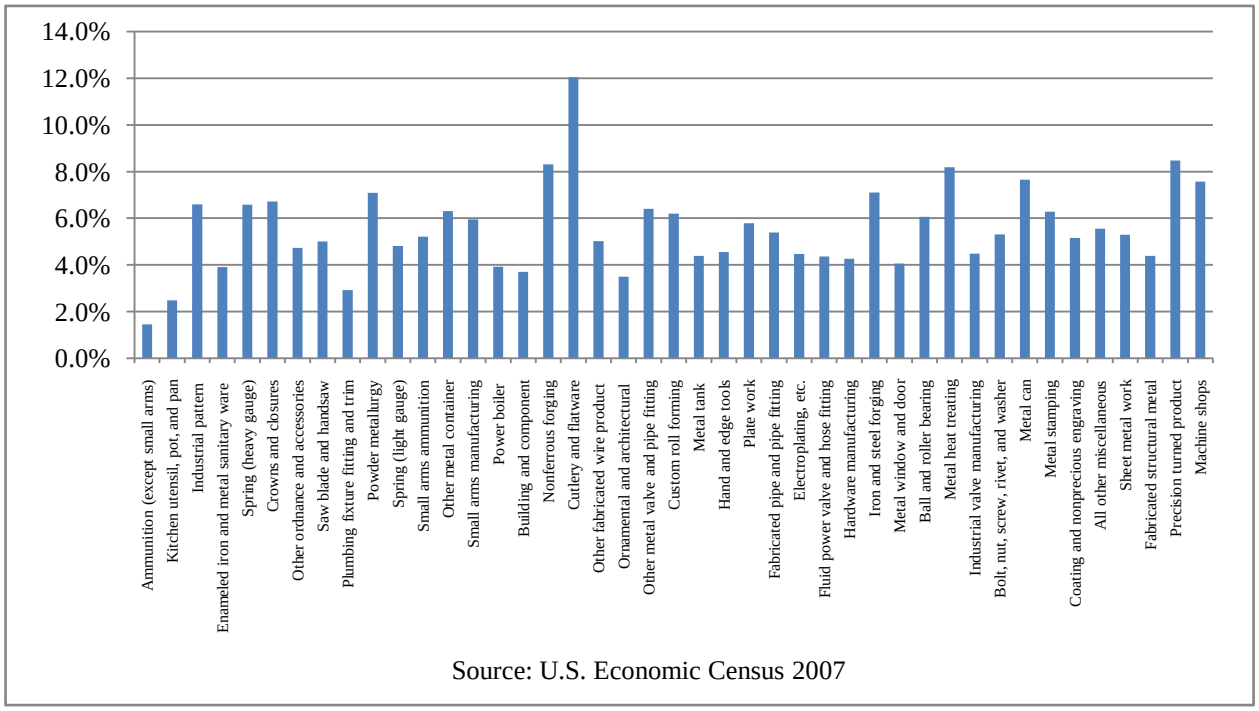
Capital expenditures for the fabricated metal sector include buildings, machinery, vehicle expenses, technology, and other equipment. The largest capital expenditures were for machinery and equipment which totaled 90.4% of all expenditures sector wide (U.S. Economic Census 2007).

Figure 23. Total Capital Expenditures in the U.S. Fabricated Metal Sector



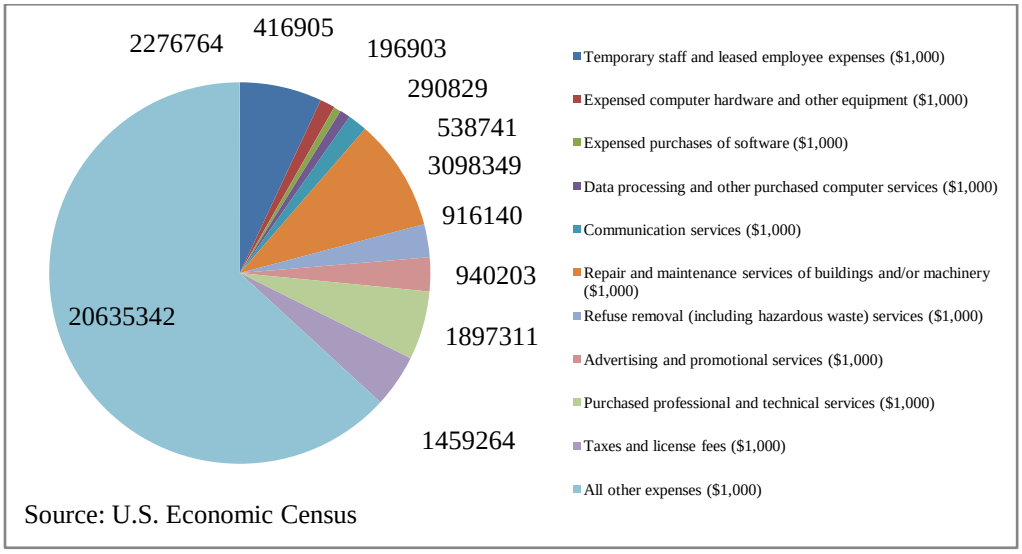
Expenditures varied across subsectors as a percentage of total shipments and averaged 5.7%. Expenditures were highest for cutlery (12%) and precision products (8%) and lowest for ammunition (1.5%) and plumbing fixtures (2.9%) (U.S. Economic Census 2007).

Figure 24. Capital Expenditures as Percentage of Shipments in the U.S. Fabricated Metal Sector



In addition to capital expenditures, the industry faces additional costs in the forms of temporary staff, software, purchased computer services, outsourced repair and maintenance, advertising and taxes.

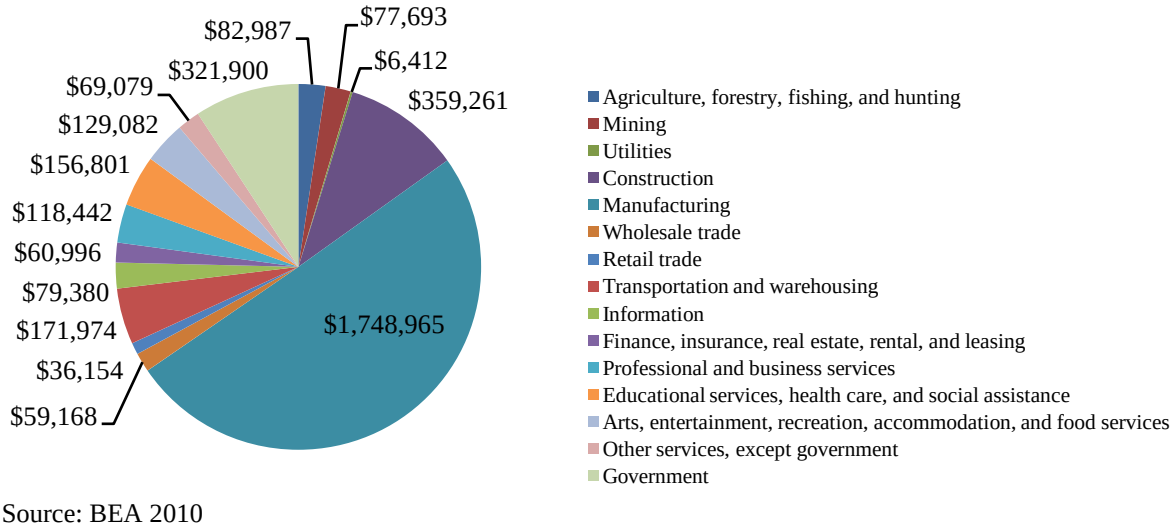
Figure 25. Industry-Wide Expenses in the U.S. Fabricated Metal Sector



Output

Output in the fabricated metal sector is driven by demand in other industries, particularly industrial manufacturing and construction. Almost half of the goods produced by U.S. fabricated metal firms are passed on to other manufacturing sectors (see chart below). This trend varies by subsector. For example, machine shops tend to follow national trends while door and window manufacturers are more closely tied to construction trades.

Figure 26. Customers of Fabricated Metal Products by Industry ($1,000)



New Technologies

New technologies in the fabricated metal sector have been developed to computerize and automate tasks. Computer-aided design (CAD) and computer numerically controlled (CNC) machine tools have been used to lower labor intensity, minimize waste, and increase production speed. Examples of CNC machine tools include computer-controlled saws, lasers, shears, and presses. Other advancements include electrical discharge machining and electro chemical machining. These allow for extremely hard metals (such as titanium and steel) to be molded as long as they are electrically conductive.

Lasers allow machine shops to cut metal to precise specifications. While laser technology is not new, the automation of laser machinery and software interface is. Lasers have greatly reduced the amount of time it takes to fabricate a piece. They also allow Los Angeles machine shops to complete jobs that previously would have to be sent overseas. In addition they allow machine shops to take on an increasingly diverse set of jobs, such as creating custom scaffolding for a Hollywood film shoot (Los Angeles Business Journal 2008).

These technologies have led to a change in skills required of new employees; at the same time, however, these new tools have become increasingly easy to teach as software interfaces have improved (IBIS World 2010).

Traditional techniques such a milling and lathing have remained industry standards. Most improvements in these techniques have been focused on increasing efficiency instead of paradigmatic technological change.

III. Markets and Commodity Chains

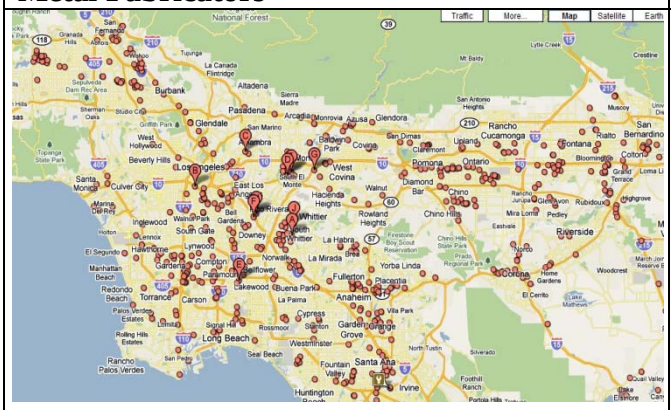
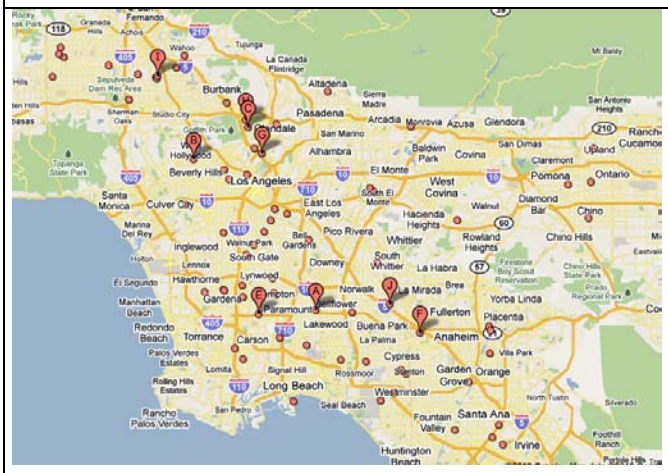
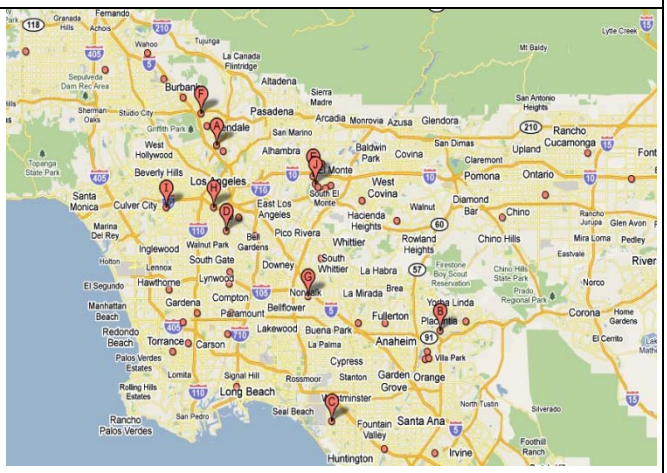
Industry Clustering in Los Angeles

Industry clustering is common in the fabricated metal sector. Many fabricators depend on close proximity to downstream markets due to the specialized nature of their products. Firms tend to locate in urban areas that will support clusters of related activities and provide them with the high skilled labor necessary. This is one reason that California, especially Los Angeles, remains a key cluster of fabricated metal firms.

The Los Angeles Economic Development Corporation provides a list of professional and higher education institutions with programs in fabricated metal production (2010). These institutions are instrumental in providing training to a workforce that demands constant innovation to maintain competitiveness.

Spatially, fabricated metal firms tend to cluster in industrial districts within urban areas. A major threat to the survival of these firms is the conversion of industrial units into other uses.

Figure 27. Fabricated Metals Clustering (Los Angeles)

Metal Fabricators	Machine Shops
	
	

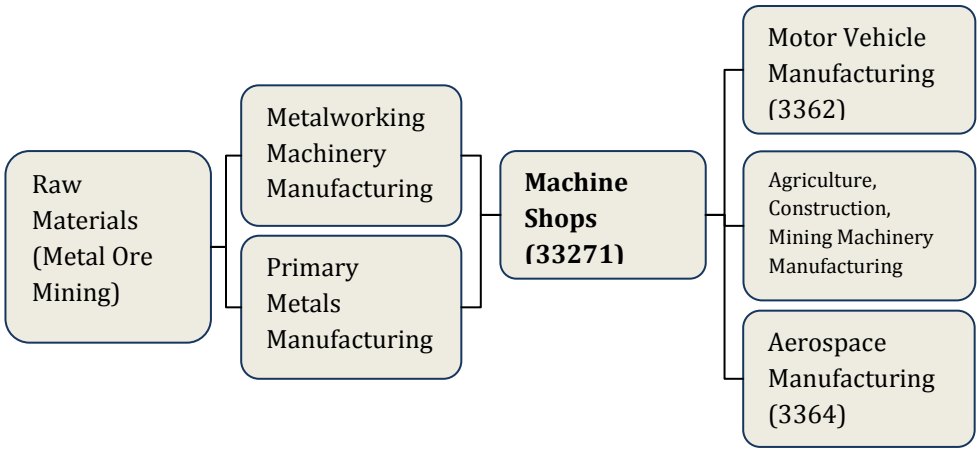
Case Studies

Below are several in depth looks at the largest three fabricated metals subsectors based on employment levels in Los Angeles which all provide evidence of clustering (machine shops NAICS 3327, architectural and structural NAICS 3323, and coating engraving and heat treating NAICS 3328). Below are maps taken from Google that show clear concentrations of firms in different areas of the city. Clusters include parts and tool suppliers, fabricators, and downstream companies.

Machine Shops in Los Angeles

Thirteen percent of all U.S. machine shops are located in California (IBIS World 2010). Of the 2,315 fabricated metal firms in Los Angeles, almost half of these (955 or 41%) are machine shops; Los Angeles machine shops employ 17,000 persons (U.S. Economic Census 2007). Machine shops in Los Angeles provide specialty metal products to local manufacturers in aerospace, defense, engine manufacturing, mining, medical and utility sectors.

Figure 28. Simplified Commodity Chain for Machine Shops



Machine shops are almost exclusively producers of intermediate goods. Raw materials are mined and prepared for processing by primary metals manufacturers, which in turn supply machine shops. Machine shops also make extensive use of metalworking machinery purchased from suppliers of manufacturing machinery. The shops work closely with customers to produce parts for motor vehicle, aerospace, agricultural equipment, construction machinery, and mining machinery manufacturers. Information on suppliers was drawn from IBISWorld reports; information on customers was drawn from firm websites as well as IBISWorld (2010).

Machine shops face fluctuations in pressure from both sides of the supply chain. On one side, their business is subject to changes in downstream demand; on the other, their costs are sensitive to fluctuations in the costs of upstream goods and raw materials. Downstream manufacturing supplies markets for both the finished products of fabricated metal firms as well as intermediate and repair parts for manufacturing equipment (IBISWorld 2010). Historically, demand has been stimulated through heavy defense spending, especially in the aerospace industry. On the supply side, materials are delivered by local producers as well as international firms. High levels of local competition have forced the industry to constantly innovate to reduce costs. Parts, tools, and raw materials for fabricated metal producers can be purchased within Los Angeles from local firms such as the Machinery Trade Center (2010) as well as national suppliers such as Machine Shop Discount Supply (2010). An informal phone interview with a machine shop owner suggests that most shops do purchase machines and metal pieces for machining locally, though many are manufactured in China and elsewhere.

Table 9. Machine Shops Downstream and Upstream Industries

Machine Shops (Related Sectors)									
Upstream	Metal Pipes and Tubes	Aluminum Manufacturing	Copper Rolling, Drawing and Extruding	Ferrous Metal Foundries	Screws Nuts and Bolts	Metal Working Machinery	Tool and Hardware Wholesaling		
Downstream	Engines and Turbines	Tractors and Agriculture	Construction Machinery	Mining and Oil	Screws and Nuts	Power Tools	Motor Vehicle Bodies	Truck, Trailers, and Motor Homes	Aircraft Engines and Parts

Most machine shop establishments are ‘standalone’ shops; only 20% (187) of machine shops in

Los Angeles have more than 20 employees. Operators are largely independent, working with other local manufacturers on specific orders. This means that the range of potential customers for machine shops is limited by distance. Because machine shops provide such highly localized services, they face minimal direct international competition and engage in little international trade; however, they are not immune to the effects of globalization. Trade places significant demand pressure on machine shops, because the relocation of downstream manufacturing represents a loss of business to local machine shops (IBIS World 2010). According to IBISWorld, many downstream operators have chosen to incorporate various aspects of the machine shop production in house and have become more vertically integrated (2010). Some of this integration occurs through the purchasing of machine shops by previous customers.

Basis of Competition

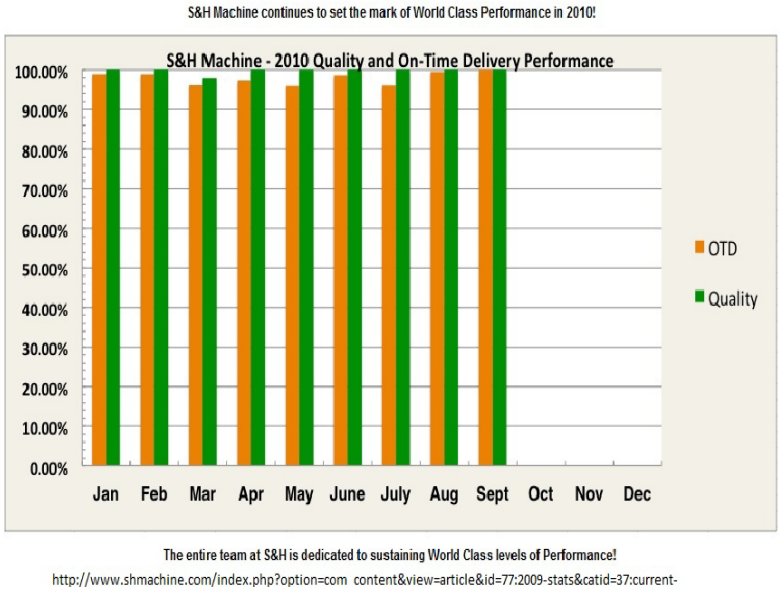
Business relationships are extremely important to machine shops due to their small size. Websites almost always offer histories of the companies which demonstrate the companies' longstanding relationships with their clients and their reliability. Most machine shops have client listings on their websites and depend heavily on long term relationships with their customers.

Table 10. Machine Shop Client List

Representative Machine Shop Client List (Los Angeles)			
7-Up	Boeing	Alliant Techsystems (ATK)	Ralphs
Alberto Culver	Lockheed Martin	General Atomics Aerospace	Raytheon
Baxter Pharmaceuticals	Northrop Grumman	Systems	See's Candy
Bocchi Labs	GKN Aerospace	General Atomics	Southern California Edison
California Medical hospital	KLUNE	Electromagnetic Systems	St. Vincent Hospital
Coca-Cola Bottling Co.	Vought	Hamilton Sundstrand	United Technologies
Dairy Farmers of America	Triumph Group	Lawrence Livermore	Xerox
General Electric	Department of the Navy	National Laboratory	ATS Systems
LA City Sanitation	Department of Defense	Northrop Grumman	Ellison Technologies
Nestles	Machinery Sales	Solar Turbines	Ganesh Machinery
Neutrogena	New West Machine	Selway Machine Tool	Gosiger West
Robinson Pharmaceuticals		Company	

Timeliness and quality are two factors often listed on company websites, with quality being especially important given the specialized nature and high performance demands of many products (see Figure 30 below).

Figure 29. Chart from S&H Machine illustrating importance of on-time delivery and product quality.

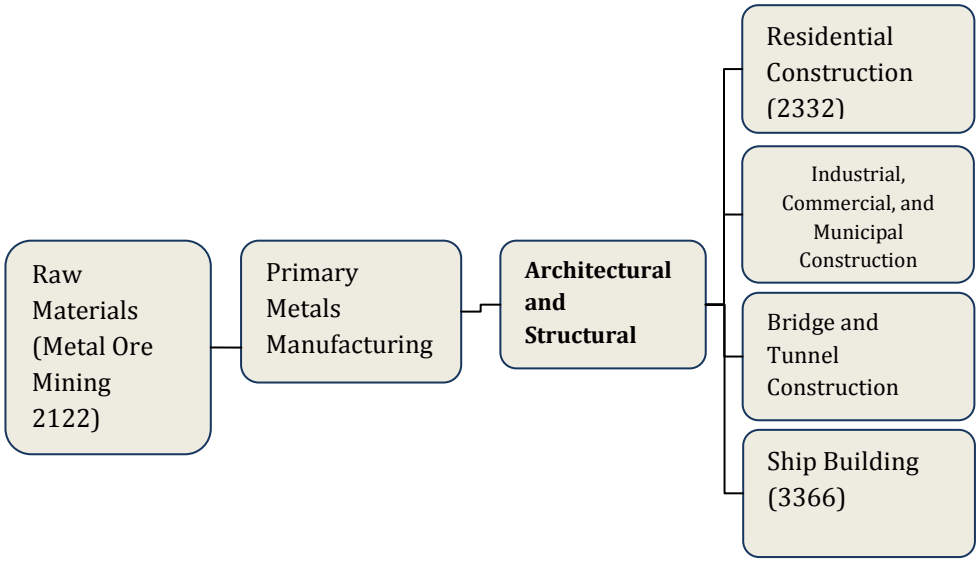


Architectural Metals in Los Angeles

Los Angeles has 421 fabricated metal firms involved in architectural and structural metal fabrication. Of these, only 116 (27.5%) have more than 20 employees. In total there are 9,217 employees in this subsector in Los Angeles (U.S. Economic Census 2007).

Demand for architectural products is primarily driven by the construction sector. On the supply side, the subsector is mostly influenced by the cost of materials coming out of different metal product industries. Products produced by these firms are often used in local construction or transported short distances. Shipping costs have been a key in preventing extensive market penetration by foreign firms. This gives fabricators located close to construction sites an advantage.

Figure 30: Simplified Commodity Chain for Structural Metals



Architectural and structural metal products are intermediate goods. Raw materials are mined and prepared for processing by primary metals manufacturers, which in turn are supplied to manufacturers of architectural and structural metals. Structural metals producers then manufacture materials for use in residential and non residential construction, infrastructure construction, and shipbuilding.

Table 11. Architectural and Structural Metals Upstream and Downstream industries.

Architectural and Structural Metal Products (Related Sectors)								
Upstream	Iron and Steel (U.S.)	Metal Pipe and Tube (U.S.)	Aluminum Manufacturing (U.S.)	Copper Rolling, Drawing and Extruding (U.S.)				
Downstream	Single-Family Home Building	Multifamily Home Building	Industrial Building Construction	Commercial Building Construction	Municipal Building Construction	Bridge and Tunnel Construction	Heating and Air Conditioning	Ship Building

The architectural and structural metal subsector is vulnerable to the business cycle due to heavy reliance on the construction industry, but this is mitigated by the fact that different construction sectors go through economic cycles at different times. Furthermore, recent federal spending on infrastructure through the American Recovery and Reinvestment Act (2009) ($80.9 billion in infrastructure investment) has helped to offset some of the slowdown in residential and commercial construction (IBISWorld 2010). On the other hand, however, the cost of inputs (primary metal products) has risen.

Basis of Competition

In contrast to the machine shop subsector, the architectural and structural metal fabrication subsector benefits from economies of scale instead of specialized production. This means that there is pressure within the industry to consolidate production within larger firms. Unfortunately, this standardization makes the subsector vulnerable to foreign production, especially from Canada and Mexico where economies of scale can offset shipping costs. Chinese producers, benefiting from low wages and a favorable exchange rate, as well as economies of scale, are also enjoying an increasing market share (IBIS World 2010).

Many firms are involved not only in the fabrication of metals but also in the distribution and installation of orders. For example, Madison Industries provides engineering, design, manufacturing, shipping, installation, and maintenance (2010). Other firms provide clients with a standardized product list and focus R&D on improving their products.

Client relationships are equally important within this subsector, with firms constantly striving to attract new clients while meeting the needs of regular clients. Clients range from large corporations, to city projects, to individual homes. Firms offer a variety of services including bundled and broken bundled orders, job site analysis, delivery, material certification, and product testing.

Table 12. Representative Architectural Metal Client List

Representative Architectural Metal Client List (Los Angeles)	
In & Out Burgers	Residential Clients
ARCO	Mission Viejo Audi
ALOFT Hotel	Honda of Carson
COSTCO	Fontana Nissan
Safeway Fuel	Fed Ex
Exposition Line (METRO)	Lexus
Wolfgang Puck	Churches
Museums	Libraries
Schools	Fire Stations
Art Exhibits	

Coating, Engraving and Heat Treating in Los Angeles

This subsector is involved in metal coating, engraving and allied services; electroplating, plating, polishing, anodizing and coloring; and metal heat treating (IBIS World 2010).The coating, engraving and heat treating subsector in Los Angeles consists of 373 firms of which one third have more than 20 employees. Total coating, engraving, and treating employees in Los Angeles numbered 7,697 in 2007 (U.S. Economic Census 2007).

In contrast to the machine shop and architectural metal subsectors, the coating, engraving and heat treating subsector is more involved in supplying other subsectors within the fabricated metal sector. The work of the coating, engraving and heat treating subsector is an intermediate step necessary for many of the finished goods provided by other metal industries. For example, coating metals with zinc prevents rust and is often done for both finished and unfinished products during different parts of the manufacturing process. Due to the intermediary aspect of this work, coating firms are often located within industry clusters.

Coating, engraving, and heat treating requires extensive use of chemicals, including paint, plastics, abrasives, and other chemicals, in addition to zinc. Firms within this sector supply their services as a step in the production of structural metals, which are in turn used in construction (as described previously in the section on structural and architectural metals); in boiler, tank, and shipping container manufacturing; and in stamping and forging, which are in turn used in a wide variety of manufacturing applications, including engines and valves (IBISWorld 2010).

Table 13. Coating, Engraving and Heat Treating Downstream and Upstream Industries

Coating, Engraving and Heat Treating (Related Sectors)									
Upstream	Plastic Resin and Rubber	Paint	Chemical Product Preparation	Abrasive and Sandpaper	Nonferrous Metal Foundry Products		Guns and Ammunition	Ball Bearings	
Downstream	Steel Structure Contractors	Metal Stamping and Forging	Structural Metal Products	Power Boiler and Heat Exchangers	Metal Tanks	Metal Cans	Guns and Ammunition	Ball Bearings	Heating and Air Conditioning

The intermediary aspect of this sector makes it highly reliant on demand focused on other subsectors such as machine shops or architectural metal products. It is therefore necessary for firms in this business to be highly adaptable to the needs of other metal working shops in order to process goods in a timely manner. This subsector is also highly reliant upon zinc and steel producers to provide low cost materials. Originally much of this work was done in-house; however, due to rising costs, it has become cheaper to subcontract coating work to specialized firms (IBIS World 2010).

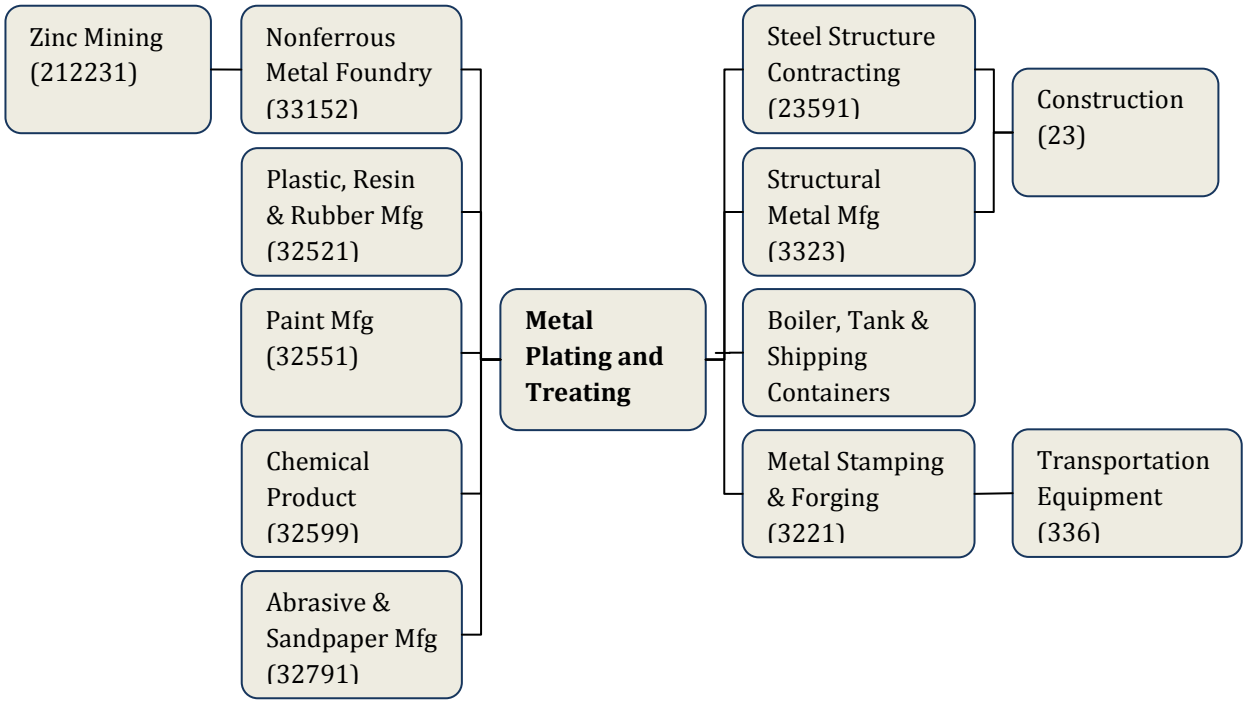
Basis of Competition

Due to small margins, quick turnover and an emphasis on business to business products coating, engraving and heat treating companies work hard to provide their clients with quality customer service. Many of these firms offer delivery service as well as small amenities such as “easy, pull-through access for trucks of all sizes” ((B, D & G Sandblasting, Inc. 2010). A high degree of flexibility allows coating firms to work on individual parts or large batches of products with turnarounds as short as a few days or even hours. Experience and quality are repeatedly mentioned on corporate websites, with emphasis being placed on the number of years firms have been in business.

Table 14. Coating, Engraving and Heat Treating client List

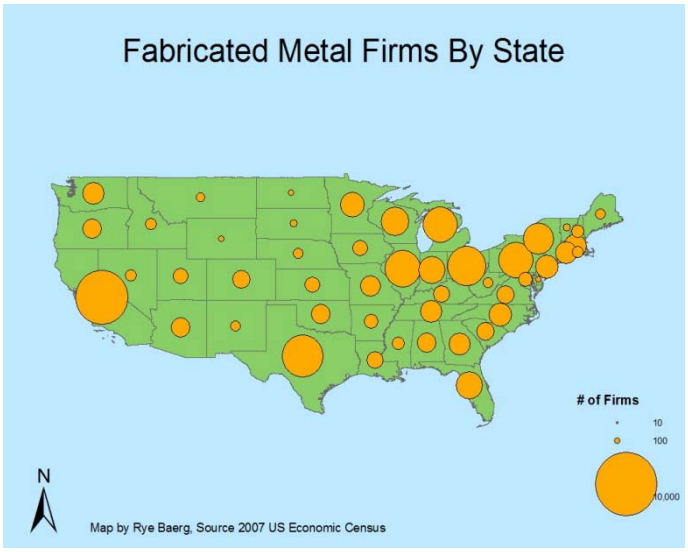
Representative Coating, Engraving and Heat Treating Client List (Los Angeles)		
Aerospace	Chrome Plating Wheels & Full Car,	Scrap Metal
Defense	Truck , Marine and Motorcycle	Vehicle Restoration
Foundries	Accessories	Art/Décor
Industrial Repair	Luxury & Performance Vehicles	Boeing
Lighting designers	Marine	Raetheon
Daico Systems	Motorola	Goodrich

Figure 31. Simplified Commodity Chain for Coating and Engraving



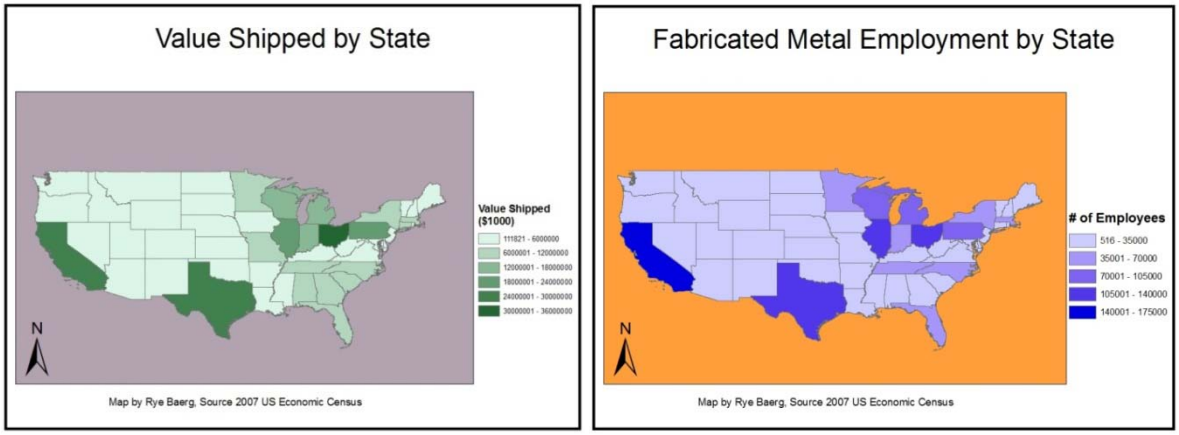
IV. Geography

Metal fabrication firms are located in distinct patterns across the United States. The vast majority of them are located within the old northeastern manufacturing belt in New England and the Great Lakes states. These firms represent the historical significance of this region in American manufacturing in industries like automobile manufacturing. The second and smaller pattern is the growing number of firms in the south and Texas, reflecting the overall southward migration of Americans. The last group is located along the West Coast with the large majority being located within California. Industries including aerospace have fostered this development. The included maps show the concentrations of three subsectors across the US—these include architectural metals, coating facilities, and machine shops.

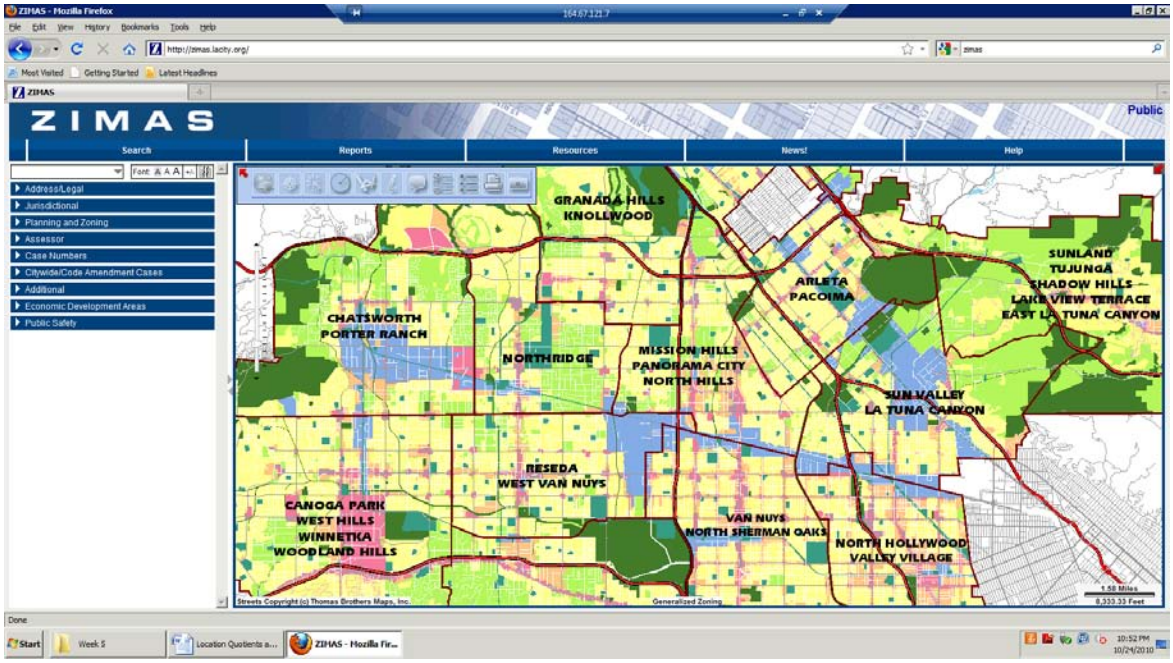


Within California metal fabrication is largely located within the southern half of the state with Los Angeles County having the highest number of firms. The counties with the most firms according to the 2007 economic census include Los Angeles, Orange and Santa Clara followed by San Diego, Riverside and Alameda counties.

The trend for fabricated metals holds true for each of the subsectors that we have analyzed. Los Angeles represented the largest concentration of firms for architectural metals, coatings and machine shops. Other significant counties for architectural metals included San Diego, San Bernardino and Orange counties. Their location there is largely due to the high levels of construction seen in these counties over the last decade. Coating firms were also represented in high numbers in Orange County and may provide some competition for LA based firms. Large numbers of machine shops are also located in Orange, Santa Clara, and San Diego Counties.



Within LA County, firms originally located outside of dense urban areas, however, as Los Angeles grew many of these areas were surrounded by other land uses. Today decisions to move or start new facilities are shaped by land use codes, with almost all the firms falling within industrial or manufacturing designated areas. For instance, within Los Angeles all industrial and manufacturing is located within CM, MR1 or MR2 zones as illustrated in the map below taken from LA's zoning maping system ZIMAS (blue represnts industrial districts in the San Fernando Valley). In Burbank, machine shops, metal stamping, and metal processing are only allowed to be located within M2 zones, however, general metal fabrication can be located in C2 as well as M1 zones. All uses require conditional use permits to locate within these zones. In addition these uses can all be located in RR and AP zones with permits (See Apendix 2).



Location Quotients

Economic base theory is a model of regional economic growth based on the notion that growth is driven primarily through exports by local companies. The theory distinguishes between basic and nonbasic industries. Basic industries are those which are produced for export, and nonbasic for local consumption. Growth in basic industries is thought to stimulate production in nonbasic as well as basic industries (Edwards 170). Though this theory is today used in a limited context, economists still make frequent use of one of its contributions: the location quotient. The location quotient is a simple calculation used in economic base theory to determine basic industries; in general it can be used to get a rough idea of whether a given industry is exporting or intended for local consumption. It is calculated by dividing the industry's share of total employment in the region by its share within the nation. That is, the location quotient LQ of industry i in a given region is

$$LQ_i = \frac{\frac{e_i}{e}}{\frac{E_i}{E}}$$

where e is total regional employment, e_i is regional employment in industry i, E is total national employment, and E_i is regional employment in industry i. Location quotients greater than 1 suggest basic, or exporting industries (Edwards 171).

Table 15. Fabricated Metal Locations Quotients for California

California	Location Quotient
Fabricated Metals (NAICS 332)	0.79
Architectural Metals	0.70
Machine Shops	1.09
Coatings	1.05

Source: BLS Website <http://data.bls.gov:8080/LOCATION_QUOTIENT/servlet/lqc.ControllerServlet>

Table 16. Fabricated Metal Locations Quotients for Los Angeles

Los Angeles	Location Quotient
Fabricated Metals (NAICS 332)	1.05
Architectural Metals	0.68
Machine Shops	1.42
Coatings	1.82

Source: BLS Website <http://data.bls.gov:8080/LOCATION_QUOTIENT/servlet/lqc.ControllerServlet>

These results are not surprising. Los Angeles employs approximately enough fabricated metal workers overall to meet local demands. Since fabricated metals mostly lie upstream of manufacturing sectors concentrated in the region, this suggests that downstream manufacturers frequently import fabricated metals from out of state when feasible. In the cases of machine

shops and coatings and engravings, however, it is difficult and costly to source non-locally; hence these subsectors' export levels reflect those of the sectors they supply (e.g. aerospace product manufacturing, *LQ*=2.44).

Our data lead to several suggestions regarding location decisions among Los Angeles metal fabrications firms. The two main determinants for many fabricated metals firms seems to be whether there is local demand for the product and whether the product can be inexpensively imported. Therefore, fabricated metals firms are most likely to locate in Los Angeles if they 1) provide highly localized services to other local manufacturers, or 2) provide highly specialized services to local firms, requiring a high level of skill or collaboration with firms. This implies that the best strategy to encourage local growth in fabricated metals may be to attract growth in industries that require specialized or localized metals products and services. Developing a skilled workforce is also essential—this should include high quality high school graduates with vocational training as well as engineers. These factors must be complemented by adequate zoning—as discussed above—and access to utilities and transportation. We have spoken with an industry representative who has corroborated these findings; we will seek to develop them in greater detail in the coming week through interviews with businesses and site visits.

V. Labor

Employment Projections

The BLS projects employment for a number of different occupations for the coming decade. Their projections for fabricated metals show the continuing trend towards automation and a demand for skilled labor. The table below shows that machine setters, tenders, and operators are expected to shed over 13,000 jobs by 2018 but that computer control programmers and operators will expand by almost 7,000 jobs.

Table 17. Projections Data BLS 2010

Projections data from the National Employment Matrix Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-18	
				Number	Percent
Computer control programmers and operators	51-4010	157800	164500	6700	4
Computer-controlled machine tool operators, metal and plastic	51-4011	141000	150300	9300	7
Numerical tool and process control programmers	51-4012	16800	14200	-2600	-15
Machine setters, operators, and tenders—metal and plastic	—	1028400	899000	-129400	-13
Forming machine setters, operators, and tenders, metal and plastic	51-4020	153200	137700	-15500	-10
Machine tool cutting setters, operators, and tenders, metal and plastic	51-4030	444300	368400	-75900	-17

Metal furnace and kiln operators and tenders	51-4050	34100	31000	-3100	-9
Model makers and patternmakers, metal and plastic	51-4060	17100	16100	-1000	-6
Molders and molding machine setters, operators, and tenders, metal and plastic	51-4070	158800	150700	-8200	-5
Multiple machine tool setters, operators, and tenders, metal and plastic	51-4081		73400	-12600	-15
Miscellaneous metalworkers and plastic workers	51-4190	134900	121800	-13100	-10
All other metal workers and plastic workers	51-4199	45000	41700	-3300	-7

Major Occupations

Workers within the Fabricated Metals sector have a variety of different skill levels and educational backgrounds. Generally they can be classified as skilled and unskilled labor with the duration of work experience being the differentiating factor. Main production-related occupations in the fabricated metal sector include the following:

Operator/tender – Monitor machines during production. Perform loading and unloading tasks and minor adjustments. May periodically measure parts to ensure quality. May oversee multiple machines at the same time.

Setter – Set up machines for operation, run initial test runs, and perform minor repairs. Setup includes replacing or sharpening different tools within machines.

Computer Control Programmer/Operator – Uses computer numerically controlled (CNC) machines. CNC machines include tools such as lathes, laser cutting machines, roll forms, press brakes and printing presses. Many old-fashioned machines can be retrofitted with a computer control, which can greatly improve the productivity of a machine. Computer control programmers and operators normally produce large quantities of one part, although they may produce small batches or one-of-a-kind items. These machines are most commonly used in metalworking industries where precision is imperative, because computers can be more accurate than humans in this work. Programmers turn plans into a set of commands. Operators set up the machines and run test runs. Operators may also possess some programming skills to make small adjustments. Operators may also include less skilled workers which load pieces into a machine.

Welder – Combines metals through the application of heat. Arc welding is the most common, however, there are over 100 processes.

Soldering and Brazing – Combine metals using a metal with a lower melting point than the two metals that are joined.

Boiler Makers – Make, repair and install boilers.

Tool Makers – Make highly specialized tools, jigs, and forms for other manufacturers.

Die Makers – Make forms that are used in stamping or forging. They may also make metal molds used in plastics production.

Drafters – Create blueprints and schematics for parts and architectural metal products. Most use computer aided/automated design.

Skill Requirements

Skills range from manual dexterity for loading and adjusting machines to advanced knowledge of computer numerically controlled devices. Some workers may specialize in one machine, however, with the increasing automation in the industry most workers must have the skills to operate multiple machines. Skills are often divided into roles with programmers/setters doing the higher skilled tasks and operators running the actual machines.

Knowledge of how to create the specified pieces demanded by customers is one of the most important skills. Historically this meant reading blueprints and schematics. However, this has been increasingly replaced by computer aided/automated design (CAD) and computer aided/automated manufacturing (CAM) which have become industry standards.

Knowledge of metals and their specific properties is also very important. Welders need to know which metals can be arc welded and which cannot. Likewise, die casters need to know about the properties of specific metals, such as their heat tolerances and hardness.

Teamwork is important due to the need to move products through multiple machines in a coordinated manner. Many of the job advertisements listed for metalworkers stress the need to work well as a team.

Education Levels

The education level required for metal working occupations varies by subsector. For example: a survey of setters, operators and tenders finds that 54% had some college education but no degree, 34% had only a high school degree, and 7% had an associate's degree. This compares to pattern makers, of whom 72% had some college education, and grinders, of whom only 14% attained some college education (O Net Online 2010).

On the job training is the norm in many subsectors. For example, most setters and operators begin by observing more experienced workers and performing basic tasks such as feeding machines. As they advance, they learn how to replace tools, adjust speeds and eventually set up machines. Advancing to the level of operator may take only a few weeks, while becoming a setter may require a year or more of experience. Setters may eventually advance to maintenance, die setting, or machinist positions. These jobs face replacement by automated machines and workers who have specialized in computer control programming. In contrast, CNC programmers may pursue multiple years of training to learn programming languages. However, even these workers are usually required to have some experience working with tools on the shop floor and have usually worked for several years in the industry before returning to school.

Certification can be important for advancement but is often not necessary. It can however, play an important role in proving skills to new employers. Higher wages are usually a representation of skill level and seniority/responsibility. As the industry faces stiffer competition and more manual positions are replaced with higher skilled computer control programming, math and reading skills are becoming more important

Certification is often sought by more advanced workers and is provided through certification programs at community colleges and state accredited certification boards. In an interview with Eric Carlson at El Camino College we learned that the average age of workers in the certification program was 35. Mr. Carlson also emphasized that workers try to be certified on as many machines as possible. This allows them to be more competitive since they can work for a wider variety of firms, including small firms which may only be able to hire one programmer.

Occupational Ladders

Most workers begin in an apprenticeship program from which they advance to more specialized and technical positions. They may return to school at any point along these ladders to achieve a higher degree of proficiency in their tasks or to move into another position higher up along the ladder. Many ladders end with the option of self employment; however, startup costs for machinery can be prohibitive.

Figure 32. Machine Operator Career Ladder: Source – BLS

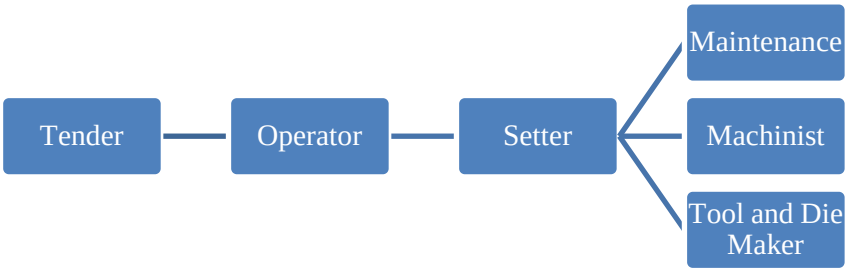


Figure 33. Welder Career Ladder: Source – BLS

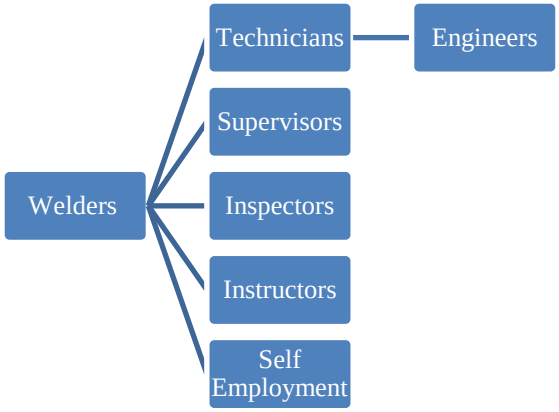
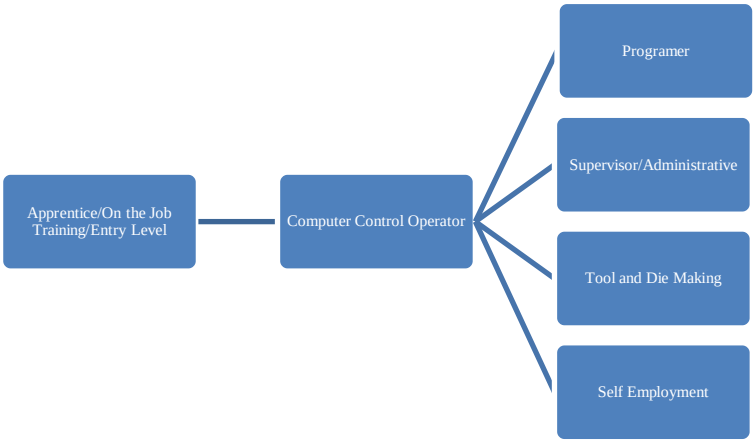


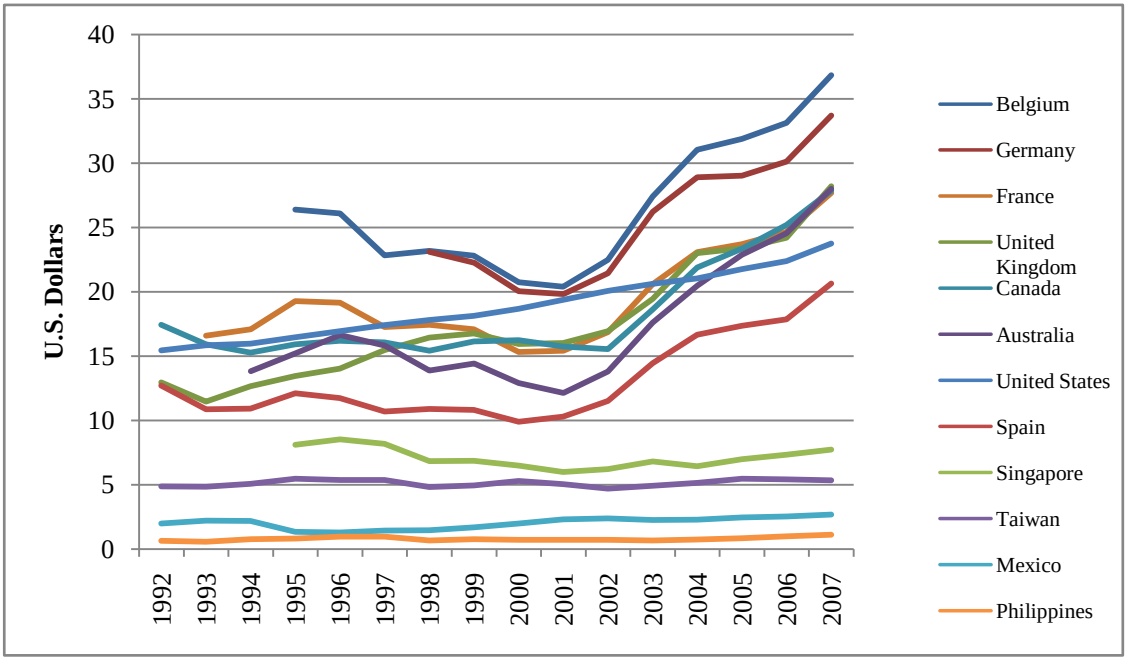
Figure 34. Computer controlled Career Ladder: Source – BLS



Wages and benefits

Total compensation for U.S. fabricated metal production workers rose slightly faster than inflation over the last 20 years, from a mean of $15 an hour in 1992 to $23 an hour in 2007 in real dollars. However, while compensation in the fabricated metal sector has increased steeply in European countries since 2000, compensation in the U.S. fabricated metal sector has grown less quickly. In comparison to international hourly compensation costs, according to Bureau of Labor Statistics estimates, U.S. fabricated metal production workers earn less than those in most European countries, but more than those in Asian and South American countries.

Figure 35. Hourly Compensation for Fabricated Metal Production Workers

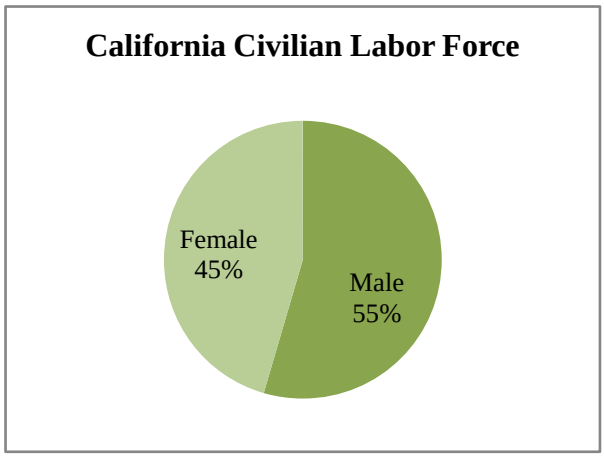


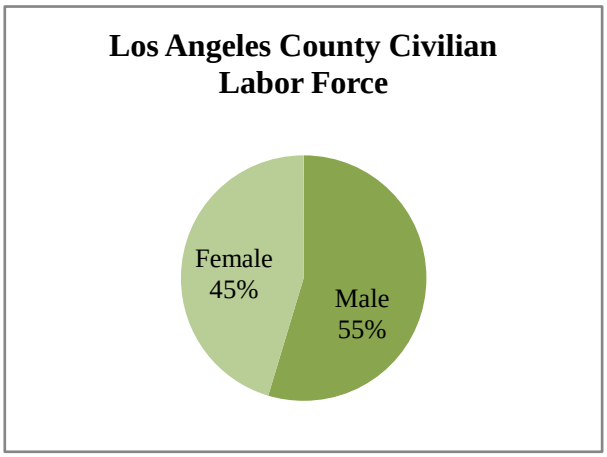
Source: BLS.

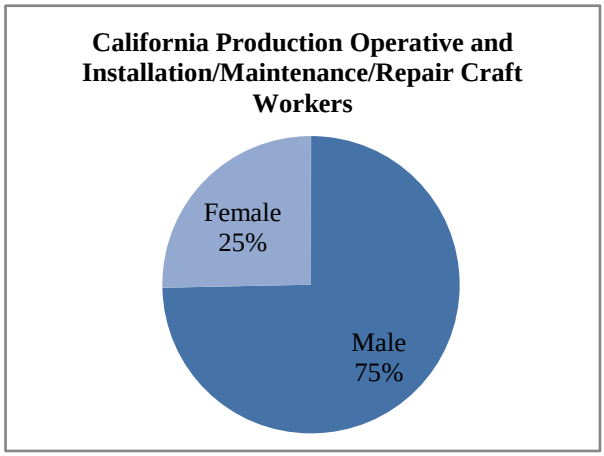
A survey of large fabricated metal firms' websites finds that health and disability insurance and retirement savings accounts are very common, particularly for higher-skilled jobs and administrative and management positions. At smaller fabricated metal firms that employ less than 20 employees, however, it is unclear how common such benefits are. A comparison of average hourly compensation and hourly wages from the BLS finds a difference of approximately $10 for production and maintenance workers, suggesting that employers pay significant costs in non-wage benefits. Further investigation should be undertaken to determine how much of these benefits are non-mandatory.

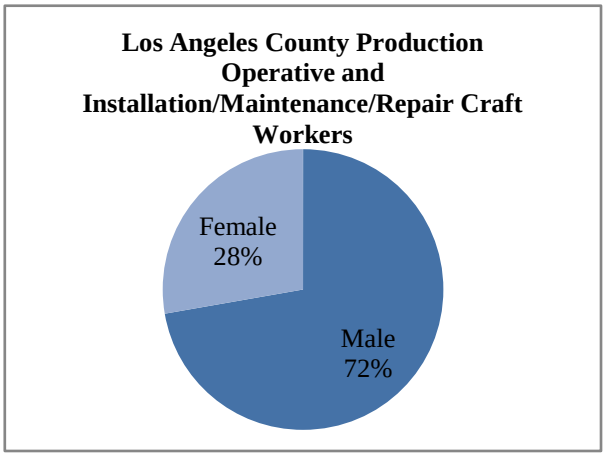
Gender. The gender split in the overall civilian labor force and in production-type operations is approximately the same in both Los Angeles County and California. In the civilian labor force, 55% of employees are men, while 45% are women; in production-type operations, however, roughly three-quarters of all workers are men, while only one in four is a woman (see figures below). In Los Angeles County, a slightly higher percentage of production and machine maintenance workers are women (28%) compared to the entire state (25%). A sector analysis rather than occupation analysis finds that the 1:3 ratio also holds for the overall fabricated metal sector at both the county and state levels. This is probably due to the labor-intensive nature of fabricated metal work, as well as other social and historical factors.

Figure 36-41.

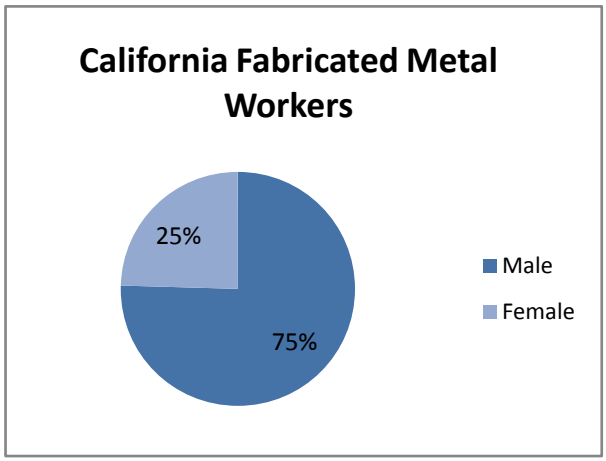


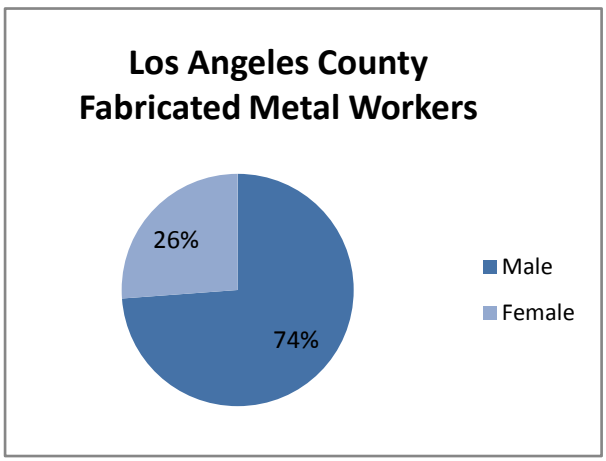






Source: California EDD, 2000 (above). Source: U.S. Census QWI (below).



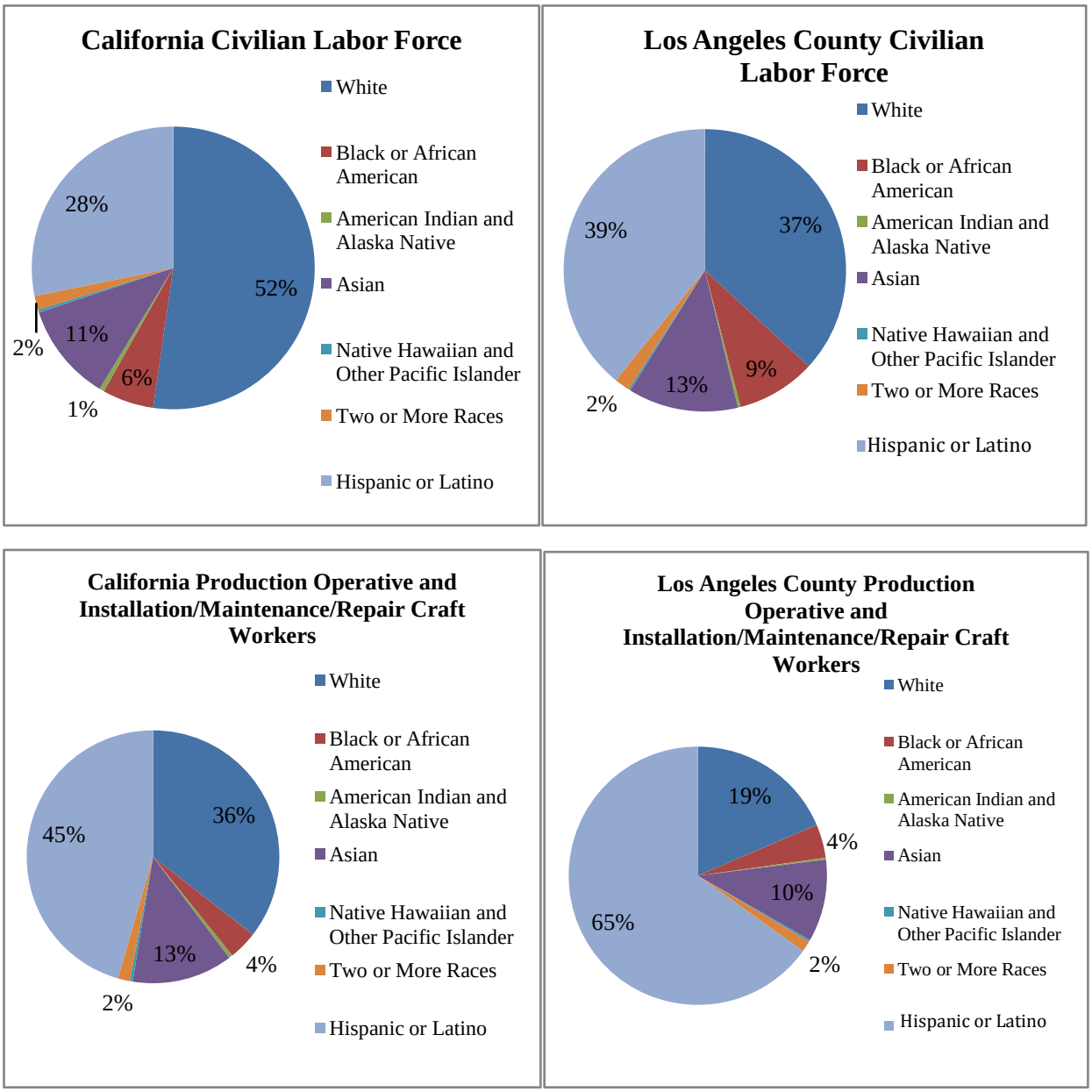


Ethnicity and Immigrant Origins

A comparison of the ethnic composition of the California and Los Angeles County labor forces shows that Los Angeles has higher percentages of Hispanics, Asians, and blacks relative to the state. Within production-type occupations, however, a much higher proportion of Los Angeles

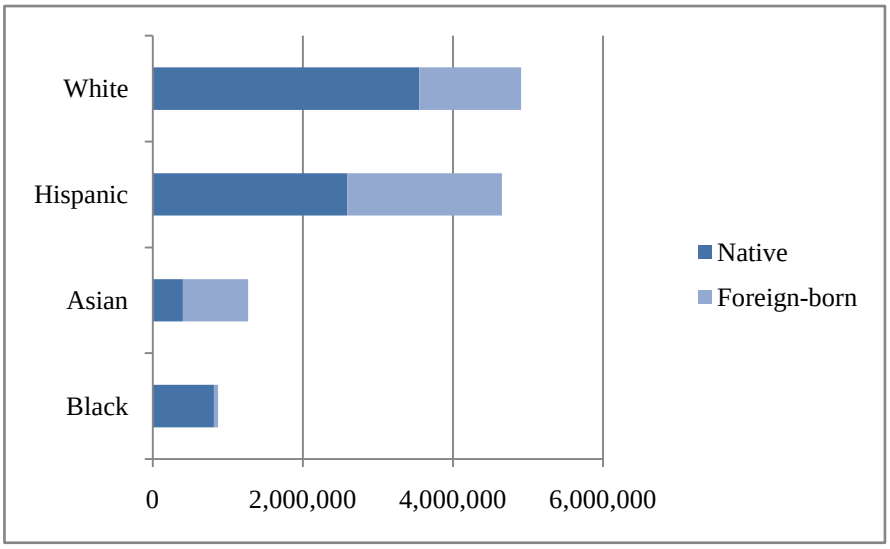
workers are Hispanic (65% vs. 45% in California overall), while a slightly smaller percentage are Asian (10% vs. 12% in California overall).

Figure 42-45. Source CA EED.



Specific data on the number of immigrants working within the fabricated metal sector is not available, but overall, Los Angeles County has a large foreign-born population. According to the 2006-2008 American Community Survey, 28% of white persons living in Los Angeles County are immigrants, as are 44% of Hispanics and 68% of Asians. The most common place of birth for immigrants in Los Angeles County is Central America, followed by East Asia, Southeastern Asia, and South Central Asia; the most common foreign countries of birth are Mexico, El Salvador, the Philippines, Guatemala, and Korea.

Figure 46. Native and Foreign Born Population in Los Angeles County



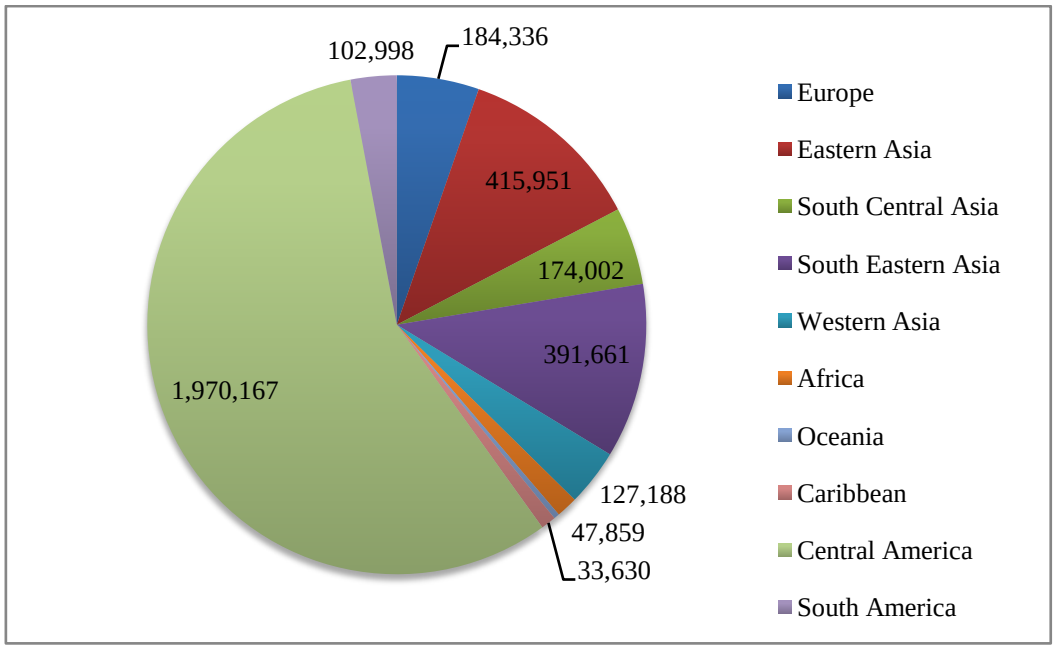
Source: 2006-2008 American Community Survey.

Table 18. Country of Origin for Immigrants in Los Angeles County.

Country of birth	Number of immigrants in Los Angeles County
Mexico	1,455,492
El Salvador	265,668
Philippines	225,650
Guatemala	162,223
Korea	155,077
PRC (excluding Hong Kong)	125,028
Iran	107,592
Vietnam	91,055
Taiwan	66,425
Armenia	56,831
India	41,791

Source: 2006-2008 American Community Survey.

Figure 47. Place of Birth of Immigrants in Los Angeles County



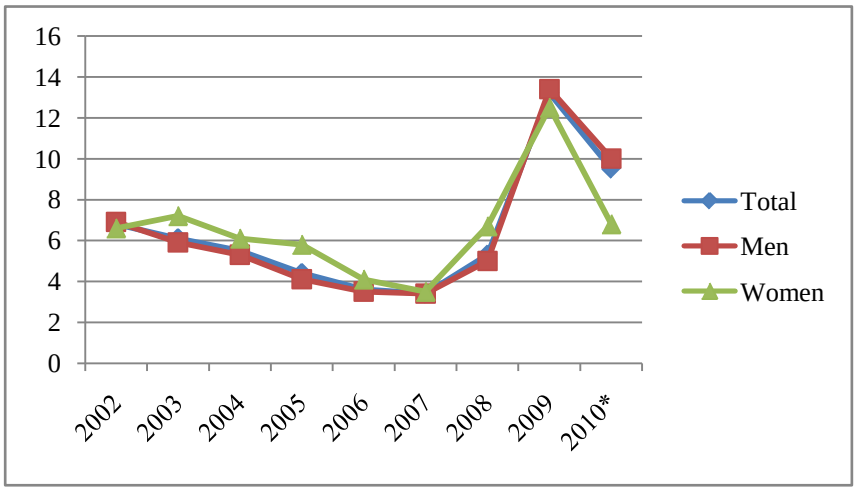
Source: 2006-2008 American Community Survey

Unemployment

National unemployment in primary and fabricated metals manufacturing closely has followed the trends of the national business cycle, though on a magnified scale. The recent recession resulted in a sharp production drop as businesses waited to see how recovery would proceed. Though recovery has been gradual, it appears to have been sufficient to restore enough confidence to resume a level of manufacturing employment comparable with the rest of the economy.

An interesting trend to note is that female unemployment in the sector seems to drift above that of male unemployment; however, in the recent recovery, women have either been rehired at significantly higher rates, or have become discouraged much faster. Female employment is much lower in this sector, but the trend may be significant nonetheless.

Figure 48. US Unemployment Rate in Primary and Fabricated Metals Mfg (Annual Mean)

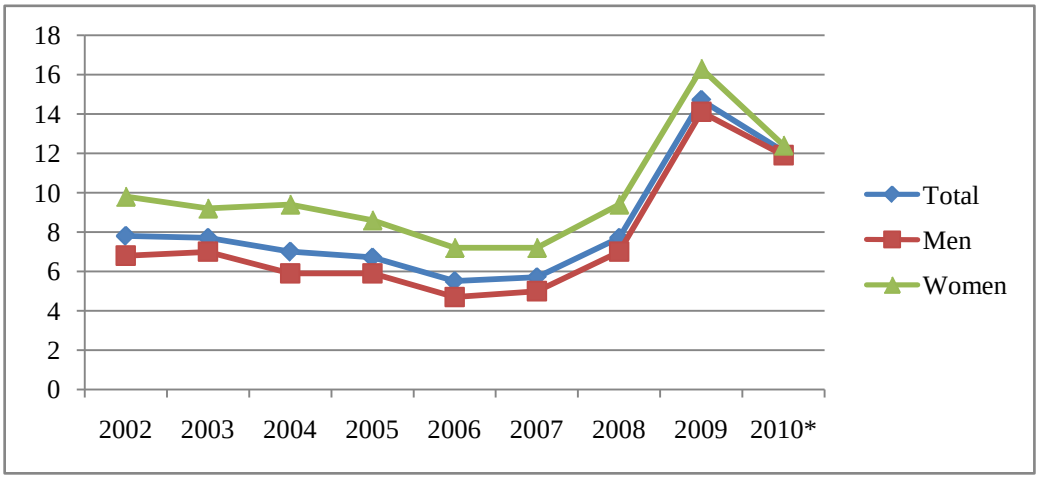


Source: BLS 2010

Over 70% of employment in fabricated metals is in the "production occupations" category (using BLS classifications). This occupation classification is of particular interest because it is the defining occupation of the industry. Other occupations are scattered among business, management, sales, clerical, and transportation, which vary less between industries.

Unsurprisingly, unemployment in production occupations also closely tracks recent business cycle movements. Gender differences in unemployment in these occupations is more pronounced than in the overall primary and fabricated metals sectors, and the occupation as a whole seems to be less heavily concentrated with men than the industry as a whole (since differences between men and women lead to major differences in the totals).

Figure 49. US Unemployment Rate in Production Occupations (Annual Mean)



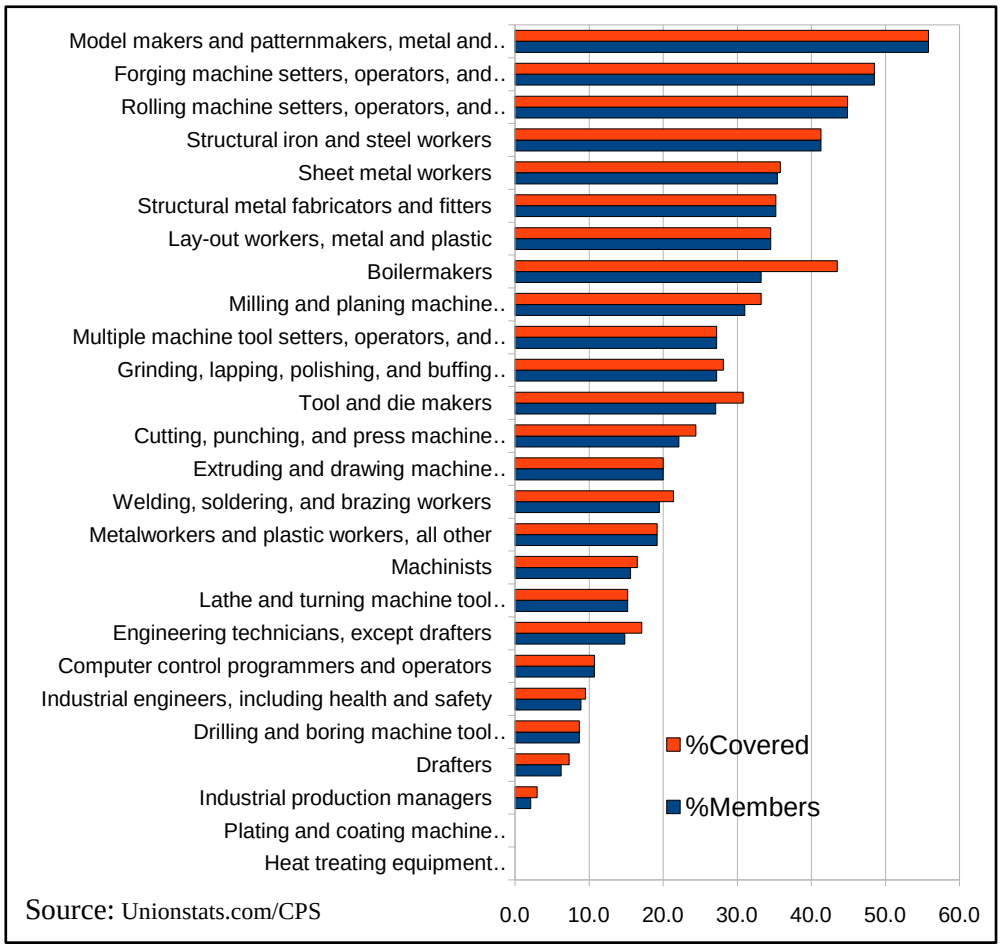
Source: BLS 2010

Unionization

Unionization in the fabricated metal sector varies by occupation and subsector. It has also varied greatly over time. Differences between the occupational data and sector data may be due to differences in data collection methods or may represent the percentages of occupations found within the fabricated metals sectors.

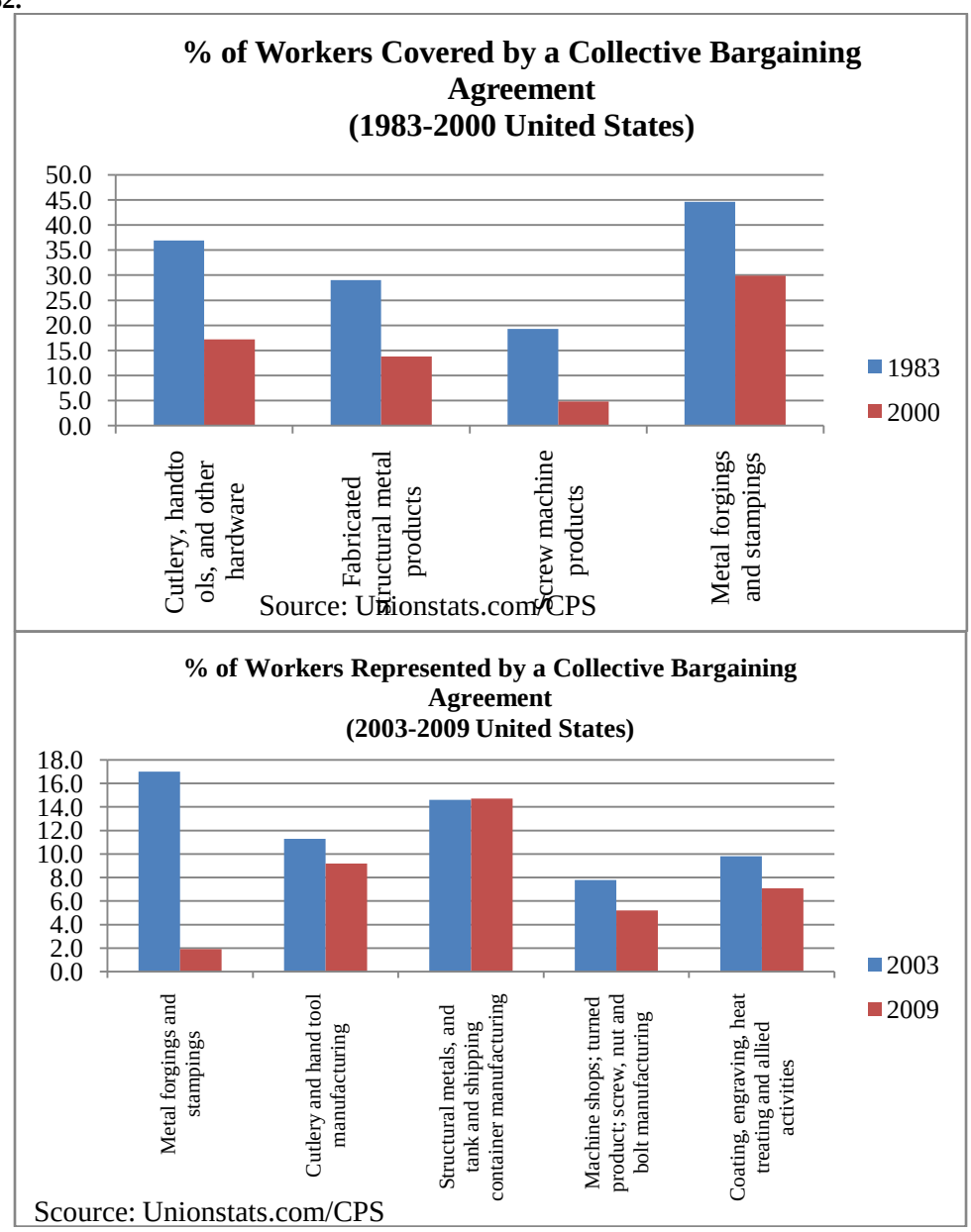
National statistics taken from the BLS and CPS (Current Population Survey) database indicate that a large percentage of occupations found in the fabricated metal sector are unionized. CPS data shows that over 50% of metal patternmakers were unionized in 2008. Given that only 12.6% of durable manufacturing jobs were unionized according to the BLS during this time the CPS data seems quite high. However, since the CPS data is based on occupation and not on industry it may merely show that certain manufacturing jobs are more unionized than others.

Figure 50. Percentage of Occupations that are Union Members and Covered by a Collective Bargaining Agreement (2008 United States)



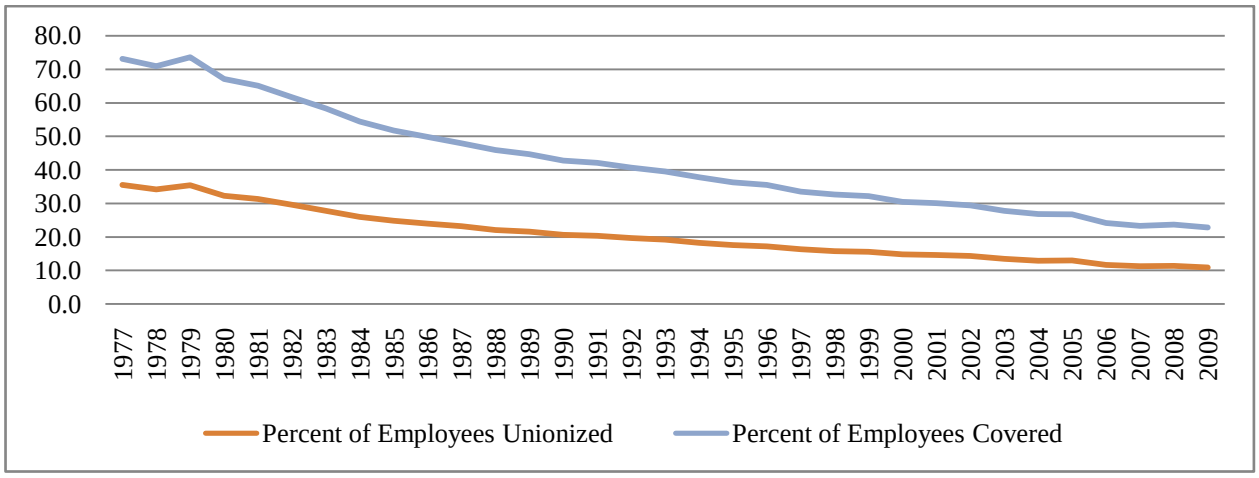
Further CPS data shows that subsectors within the fabricated metals sectors are consistent with national data for manufacturing. The second chart below shows a range of values for workers represented by a collective bargaining agreement from 2% to around 15%.

Figure 51-52.



Rates of unionization within manufacturing and the fabricated metals industry have changed dramatically over the years. The two graphs above show unionization from 1983-2000 and 2003-2009 within the fabricated metals sector. Changes in classification mean that a single comparison cannot be made with this data, however, the trends are still clear. From 1983-2000 the rates of unionization in all four subsectors listed above fell dramatically. This trend continued in the four of the five categories from 2003-2009. Structural metals are the only category that actually saw .001% increase in unionization rates over this time. The drastic drop in metal forgings and stampings may be due to jobs shipped overseas. Union membership and coverage has dropped significantly among manufacturers over the last three decades. As of 2009, according to the Current Population Survey, just over 10% of employees in the manufacturing sector were members of unions.

Figure 53. Union Membership and Coverage among Private Sector Manufaturers



Source: CPS

The recent economic slowdown lowered the overall number of unionized workers but did not have a dramatic effect on the percentage of unionized workers within the manufacturing subsector as can be seen in the graph below.

Figure 54. Percentage Change in Workers Represented by Unions (United States)

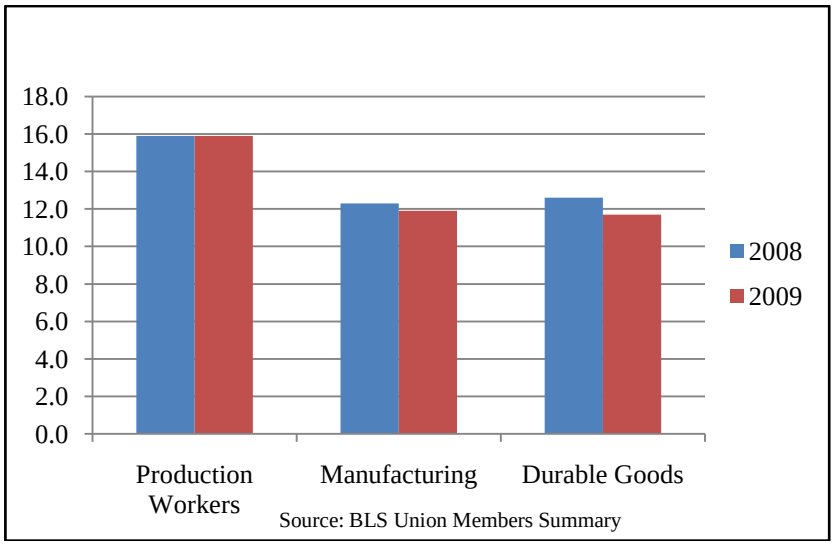
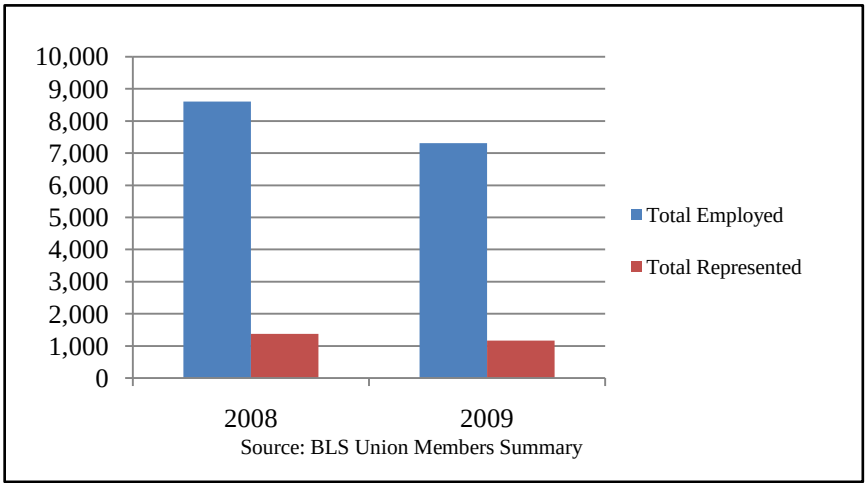
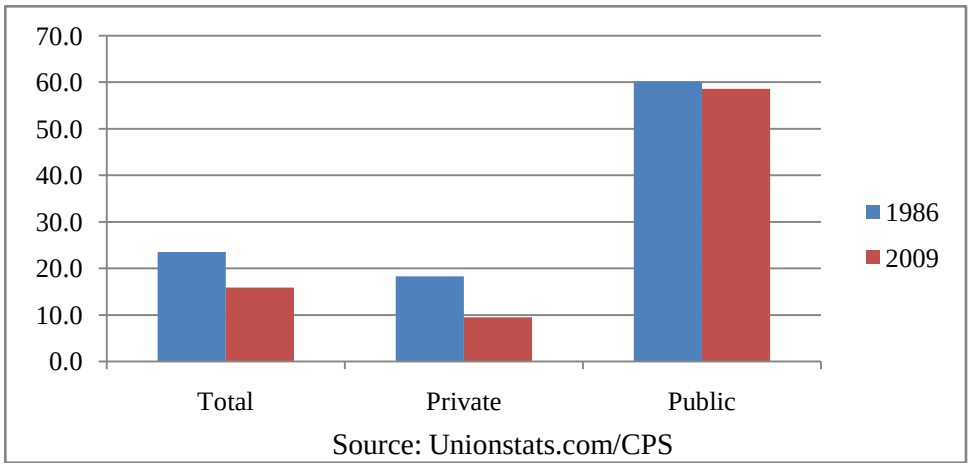


Figure 55. Total Number of Production Workers Employed and Represented by Unions (1,000s) (United States)



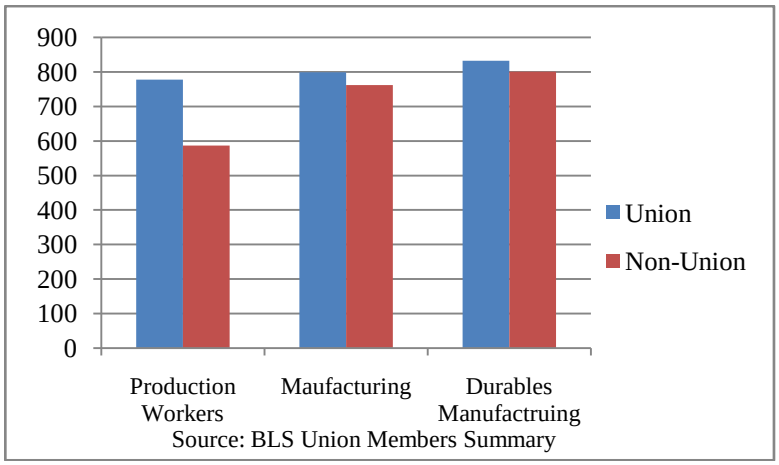
No statistics for unionization for the fabricated metals sector within Los Angeles were found, however, since rates of unionization in Los Angeles match those found across the country for manufacturing we believe the trends will hold for Los Angeles.

Figure 56. Percentage of Workers Represented by a Collective Bargaining Agreement (1986-2009 Los Angeles)



Workers in unions receive higher weekly wages within the manufacturing sector in the United States. This trend is particularly noticeable in production workers who earn an average of $196 more per week.

Figure 57. Weekly Average Salary 2009 (United States)



Working Conditions

Working conditions vary between subsectors. For example, machine shop work is done at stationary machines indoors, while welders may assemble metal pieces outdoors. Despite overall attention to safety there are still many hazards associated with this work. These include high-speed machines, heavy objects, fumes, dust, sharp edges, heat and intense light. Protective equipment such as safety glasses, earplugs, steel-toed boots, hard hats, welding goggles/masks and heavy gloves help to prevent minor injuries. Automation has also helped to enclose many processes in machine shops and welding facilities.

Physical stamina is required of workers. Heavy lifting, long periods of standing, working in awkward positions, and stooping are common. Automation has lessened some of this work, however, even CNC programmers will often partake in tasks on the shop floor. Some firms have innovated new procedures such as stacking finished parts at waist height to remove the need for stooping. Others have taken pains to put raw materials with sharp edges through tumblers before workers handle them to remove sharp edges. A brief survey of 20 OSHA filings for California between May and October of 2010 found only one of these firms to be unionized. In addition many firms that had a filing against them had multiple violations.

Shift Length and Overtime

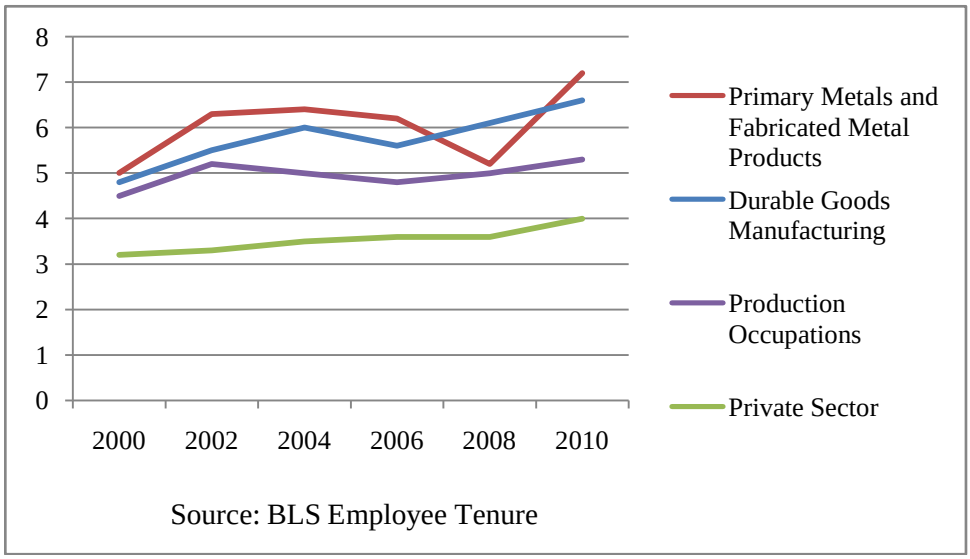
Most fabricated metal workers work at least 40 per week. Overtime is common during busy periods or when there is fluctuation in demand that would make hiring new workers risky. Many machine shops and welding operations work more than one shift daily and some run around the clock. Operations are often run at night to capitalize on cheaper electricity and working on weekends is also common depending on demand. For example at CMX, workers currently work from 8 PM to 8AM five days a week because management has determined that paying overtime is more cost effective than hiring new workers do to fluctuations in demand.

According to the BLS 85% of durable manufacturers worked regular day time shifts while only about 10% worked evening and night shifts (2004). This suggests that many fabricators will operate during the day with only those that depend on large amounts of electricity working at night.

Seniority

From the BLS data below we can see that fabricated metal workers tend to stay with a single firm longer than both the private sector in general and other production occupations. This is most likely due to a tradition of job security and high wages. Since these workers stay at one job for several years and much training is done on the job there tend to be multiple levels of seniority. In addition, shops that are unionized will tend to have stricter career ladders based on seniority than non union firms.

Figure 58. Median Length of Employment (United States)



Source: BLS Employee Tenure

Incentives

In an attempt to determine what incentives might be offered to new employees a brief survey of job postings was conducted. Unfortunately, they offered us little help in determining what employers might offer in terms of incentives beyond good wages. From our interviews with business owners however, we learned that some firms offer profit sharing during periods of high demand to help augment wages.

Organization of Work Units

The organization of work units depends greatly on the particular work done by a company. Workers are usually trained to tend several machines in order to maximize flexibility. Most tend machines by feeding material into them and by moving materials and ingots within the shop (mostly by forklift).

Worker Recruitment

Based on survey responses, it appears that most metals firms recruit workers primarily through current workers, by word of mouth, and through temporary and placement agencies. Firms generally seek legal workers who have not completed high school.

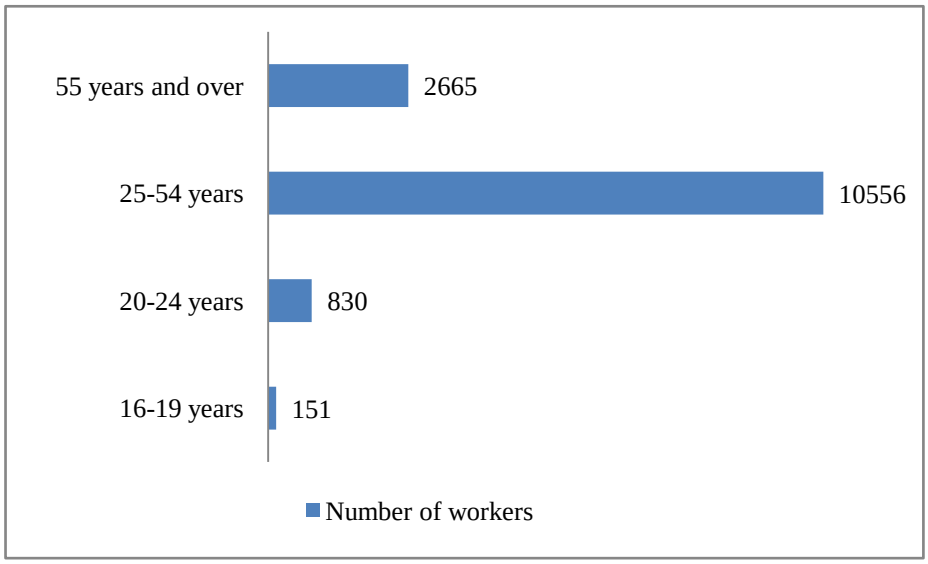
Terms of Employment

The availability of work at any given time depends on the volume being processed by the company. Because most competitive firms offer specialized goods or localized services with short turn-around time, it can be difficult for many companies to even out work demands by stocking up. Stocking up is also cost ineffective for some firms because of volatility of prices (Maclovio Martinez, interview, 11/04/2010). Therefore, Los Angeles firms tend to emphasize flexibility in their hiring arrangements. For example, California Metal-X maintains a severely reduced staff of 35 (down from 70 pre-recession), but gives them 12 hour night shifts five days a week (Maclovio Martinez, interview, 11/04/2010). Other firms, such as Custom Alloy Light Metals of City of Industry, CA, achieve flexibility by hiring on a temporary basis (Nick Drackos, survey response, October 2010).

Age

According to the Bureau of Labor Statistics, almost 1 out of every 5 workers in the manufacturing sector is over the age of 55. While data for specific fabricated metal subsectors varies somewhat, the Bureau predicts that overall the aging workforce will create a shortage of workers in skilled metalworking occupations.

Figure 59. Age Distribution of Manufacturing Workers in 2009



Source: BLS

Production Labor Hours and Overtime

In the past three years, production workers in the fabricated metal sector have worked an average of 39 to 42 hours per week, one hour more than the average number of hours worked by all employees. In general, production workers also appear to work more overtime hours compared

to the average employee. In 2009, the number of hours (both overtime and normal) worked by production employees dropped significantly in comparison to previous years.

Table 19. Average Weekly Labor Hours of Production and Nonsupervisory Employees (BLS).

Sector	2007	2008	2009
Fabricated Metals (332)	41.6	41.3	39.4
Structural and Architectural Metals (3323)	41.3	41.4	39.8
Machine Shops and Turned Products (3327)	41.5	41.3	39.6
Machine Shops (33271)	41.3	41.2	39.5
Coating and Heat Treating (3328)	41.5	41.3	38.9

Table 20. Average weekly labor hours of all employees (BLS).

Sector	2007	2008	2009
Fabricated Metals (332)	40.3	40	38.4
Structural and Architectural Metals (3323)	39.7	39.3	38.1
Machine Shops and Turned Products (3327)	40.3	39.8	38.5
Machine Shops (33271)	40.2	39.7	38.1
Coating and Heat Treating (3328)	39.9	39.3	37.6

Table 21. Average weekly overtime of production and nonsupervisory employees (hours) (BLS).

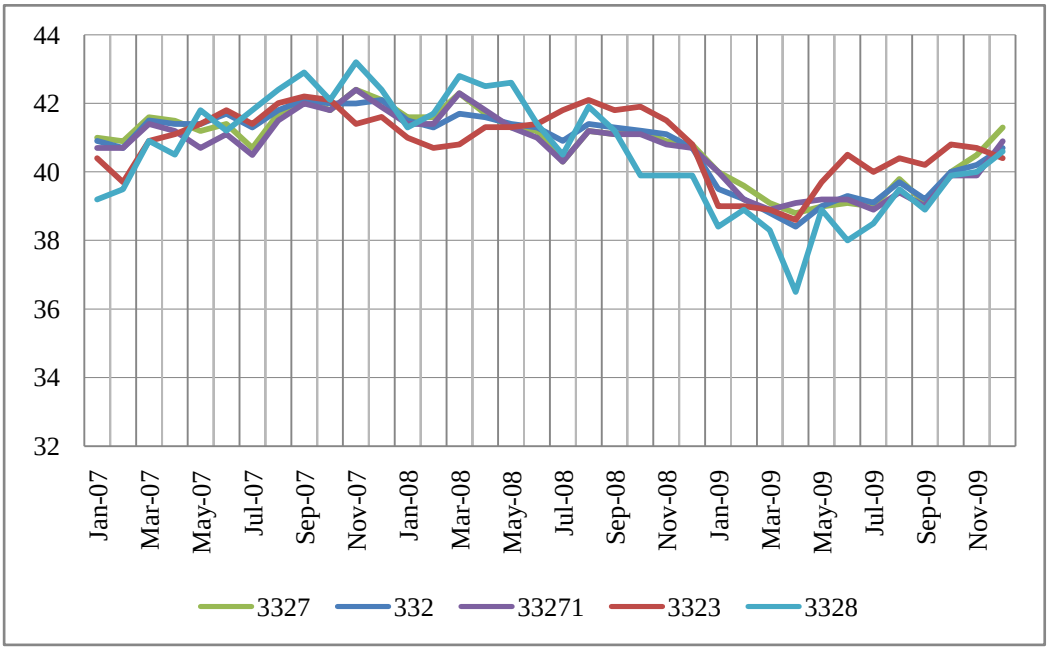
Sector	2007	2008	2009
Fabricated Metals (332)	4.4	4.1	2.5
Structural and Architectural Metals (3323)	4.3	4.3	2.5
Machine Shops and Turned Products (3327)	5	4.4	2.4
Machine Shops (33271)	5.2	4.6	2.6
Coating and Heat Treating (3328)	3.4	3.5	2.3

Table 22. Average weekly overtime of all employees (hours) (BLS).

Sector	2007	2008	2009
Fabricated Metals (332)	3.5	3.2	3.1
Structural and Architectural Metals (3323)	3.4	3.2	2.4
Machine Shops and Turned Products (3327)	4	3.5	2
Machine Shops (33271)	4.1	3.6	2.1
Coating and Heat Treating (3328)	3	2.7	1.5

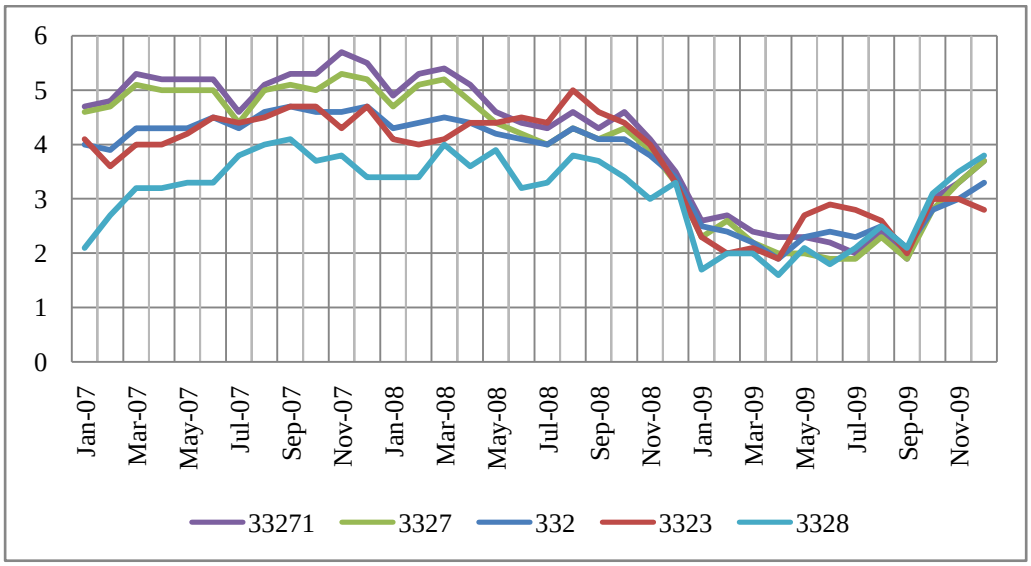
There appear to be some seasonal trends to production hours in the metal fabricated sector. Production hours are generally lower in the spring and summer and higher in the fall. However, according to employment data from the Bureau of Labor Statistics, the number of employees in the fabricated metal sector has also dropped steadily over each calendar year for the last three years.

Figure 60. Trends in Weekly Production Hours



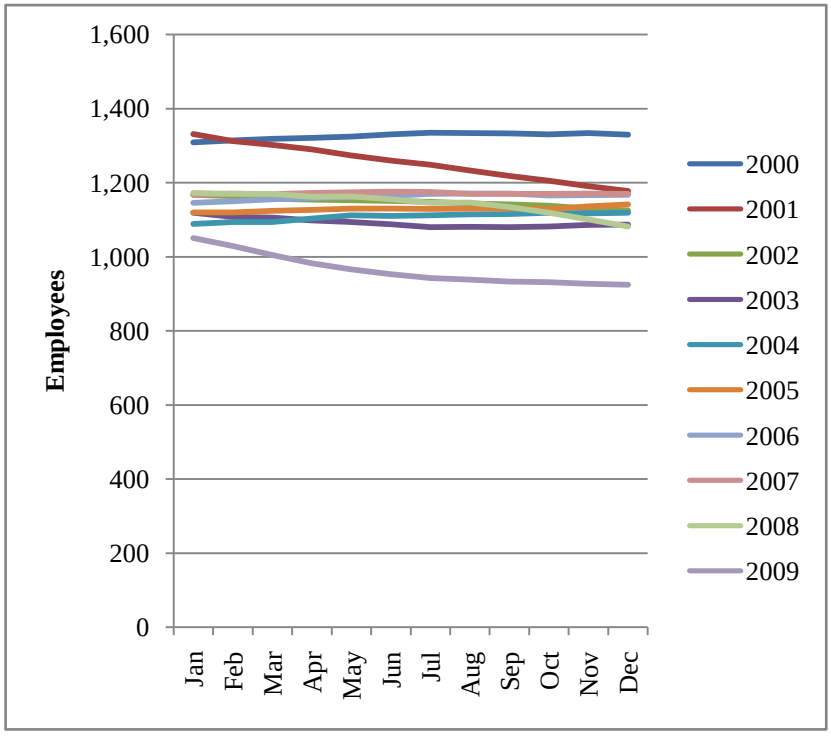
Source: BLS

Figure 61. Trends in Weekly Production Overtime



Source: BLS

Figure 62. Seasonal Changes in Fabricated Metal Production Employment



Source: BLS

The manufacturing sector has a lower percentage of contingent workers compared to other sectors. According to Bureau of Labor Statistics data from 2005, between 1% and 2% of workers in the manufacturing sector had been employed at their current workplace for one year or less and expected their jobs to last an additional year or less. These estimates of contingent workers exclude those who expect to leave work for personal reasons, such as retirement or returning to school.

VI. Trends

Recent Turning Points

Different subsectors of the fabricated metals industry have expanded and contracted at different times and for different reasons. The metal coatings subsector, for instance, primarily serves the aerospace and vehicle manufacturing industry, while the architectural and structural metals subsector primarily serves the construction industry. As fabricated metal firms are typically small, data on individual firm closings and relocations is difficult to find; estimates of local sector growth and decline in large part must be based on knowledge of economic activity in these downstream sectors. In general, the construction industry in Los Angeles moves with the larger economy, falling and rising with global and national business cycles. The aerospace and vehicle manufacturing industries, however, have more distinct histories in Los Angeles.

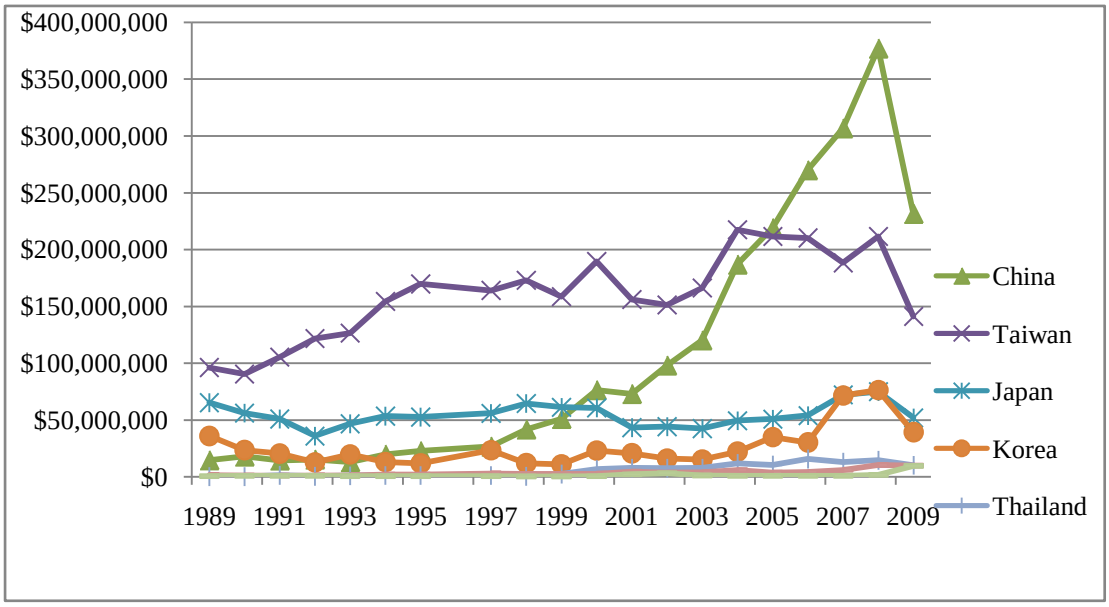
The auto manufacturing industry has a long history in Los Angeles, beginning with the opening of a Ford factory in 1914. After World War II and through the 1960s, Los Angeles had the second largest concentration of auto manufacturers in the U.S. after Detroit. Unionized factory jobs supported a large middle-class population. However, as foreign competition increased and the American auto industry restructured itself in the 1980s, automakers began to leave the Los Angeles region. Some automakers have also cited the increasing burden of complying with strict environmental legislation in Southern California. In 1992, General Motors, the last major automobile manufacturer in Southern California, closed its plants in Van Nuys.

The growth of the aerospace and defense industries after World War II and during the Cold War also spurred economic development in Southern California, which was poised on the edge of the Pacific theater. Since the end of the Cold War two decades ago, however, the aerospace and vehicle manufacturing industries have contracted sharply in Los Angeles, almost concurrently with the exodus of auto manufacturing. Former defense contracting giants have relocated corporate headquarters away from Los Angeles as they undergo mergers and reorganization. In 1995, Lockheed Corporation merged with Martin Marietta and left its headquarters in Calabasas and plant in Burbank to move to Bethesda, Maryland. Over the next two years, McDonnell Douglas and the aerospace/defense divisions of Rockwell International were acquired by Seattle-based Boeing. In 2010, Northrup Grumman, the last major aerospace corporation in Los Angeles, announced that it would move its headquarters to Washington, D.C. in order to be closer to federal policymakers, rather than former military bases. Although manufacturing

operations are often left intact after these moves, over time, plants have slowly been downsized as well.

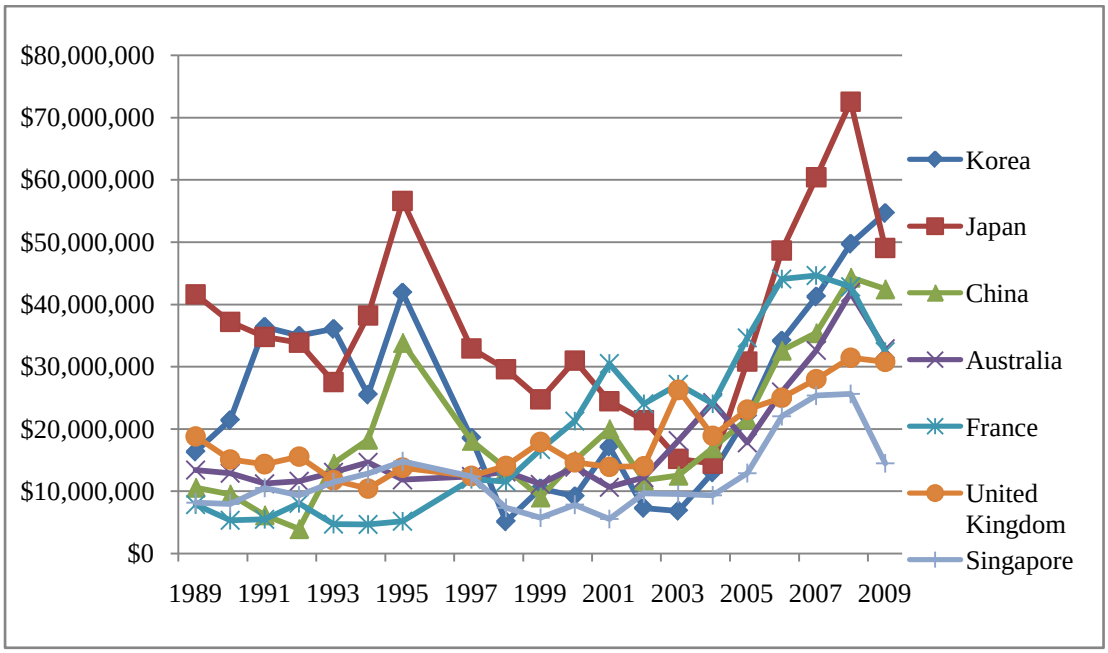
Despite these trends, an analysis of exports out of Los Angeles County of fabricated metal products shows that total exports have increased significantly over the last ten years prior to the financial crisis (see chart below). Historically, Japan has been the largest consumer of Los Angeles County fabricated metal exports, although Korea has recently passed Japan; China, Australia, and France are close runners-up. At the same time, Los Angeles County imports almost ten times the value of fabricated metal products that it exports. China and Taiwan are the largest sources of fabricated metal imports for L.A., although Japan and Korea are close thirds. The charts below suggest that firms downstream of the metal fabrication sector have expanded their supply chain to rely on cheap Asian exports.

Figure 63. Los Angeles County Imports of Fabricated Metal (Architectural and Machined Products)



Source: BEA

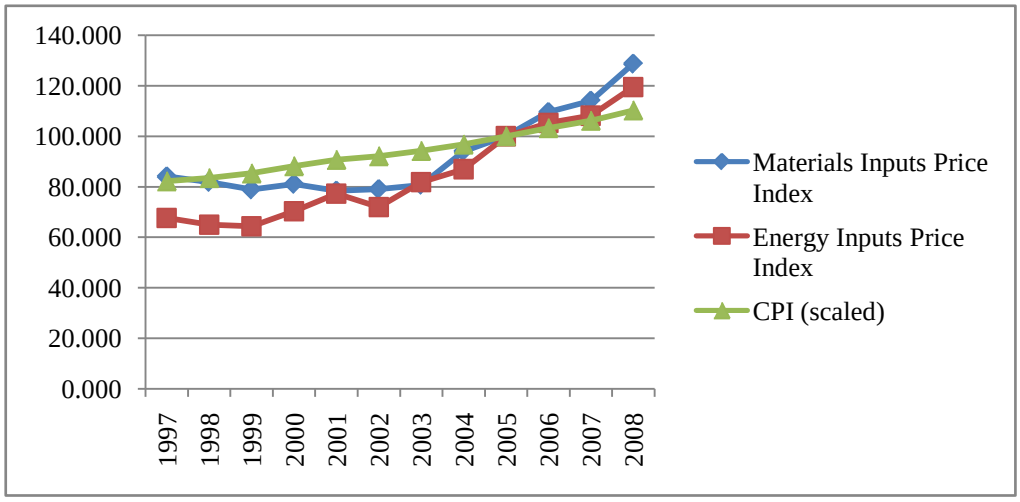
Figure 64. Los Angeles County Exports of Fabricated Metal (Architectural and Machined Products)



Source: BEA

Cyclical trends in fabricated metals, where they exist, depend largely on demand-side cyclical variation. Bureau of Economic Analysis (BEA) data shows generally steady increases in the price indices for energy and materials inputs for fabricated metals over the last decade; what fluctuations do occur do not appear to correspond with business cycles. Therefore, we discuss the cyclical variation of fabricated metals sectors in the context of the downstream markets of particular subsectors.

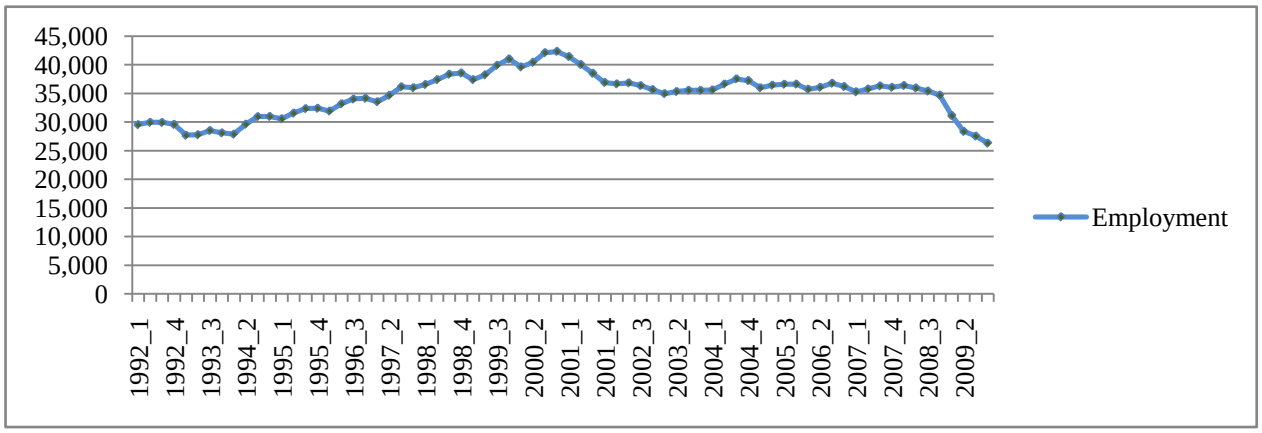
Figure 65. Inputs Price Indices (Indexed to 2005)



Source: BEA Industry Economic Accounts and BLS 2010

In brief, because structural metals depend on demand from the highly cyclical construction sector, they are highly cyclical. In fact, structural metals activity demonstrates seasonal as well as business cycle variation. This may be the result of corresponding cyclical variation in the construction sector (Figure 2).

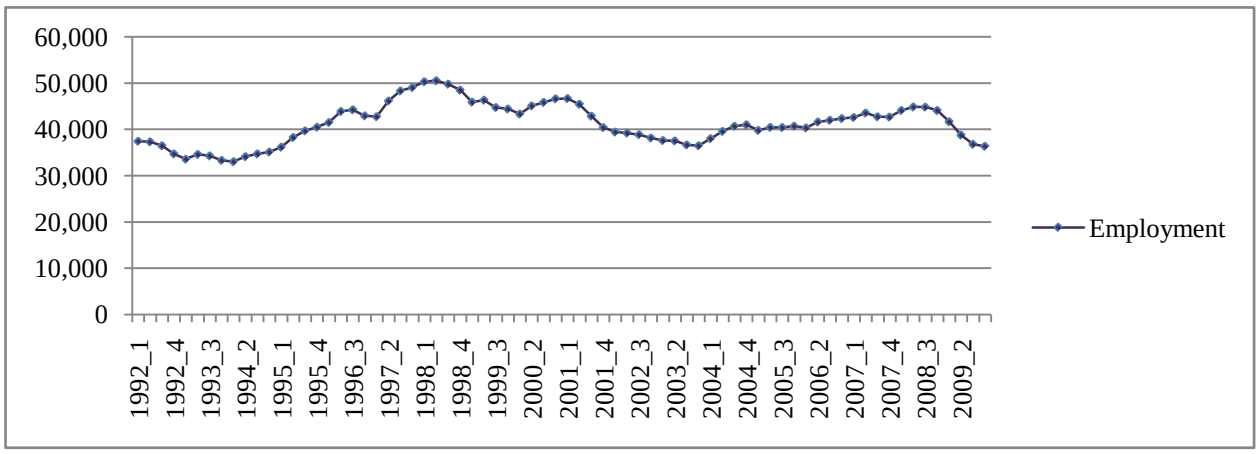
Figure 66. California Structural Metals Employment by Quarter



Source: Quarterly Workforce Information 2010

Machine shops depend on demand from the automotive industry, which is cyclical, the aerospace industry, which is less cyclical, and the machinery manufacturing industry, which is moderately cyclical. The result, as illustrated in the figure below, is that machine shops generally follow the business cycle also.

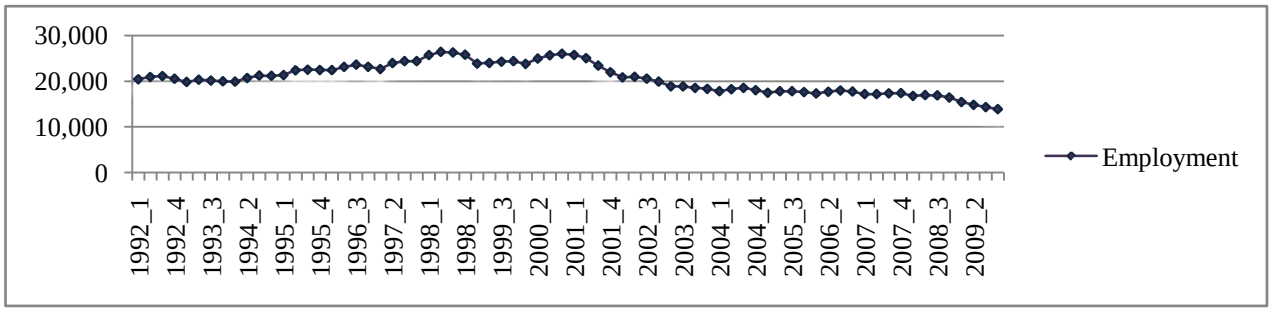
Figure 67. California Machine Shops and Turned Product Employment by Quarter



Source: Quarterly Workforce Information 2010

Metal plating and engraving indirectly depend on strong demand in the construction supersector and transportation equipment industry, both of which are highly cyclical. This results in a cyclical trend in the metal plating, coating, and engraving sector. Employment data again confirm this though the drop in employment from the current recession is surprisingly small (figure below).

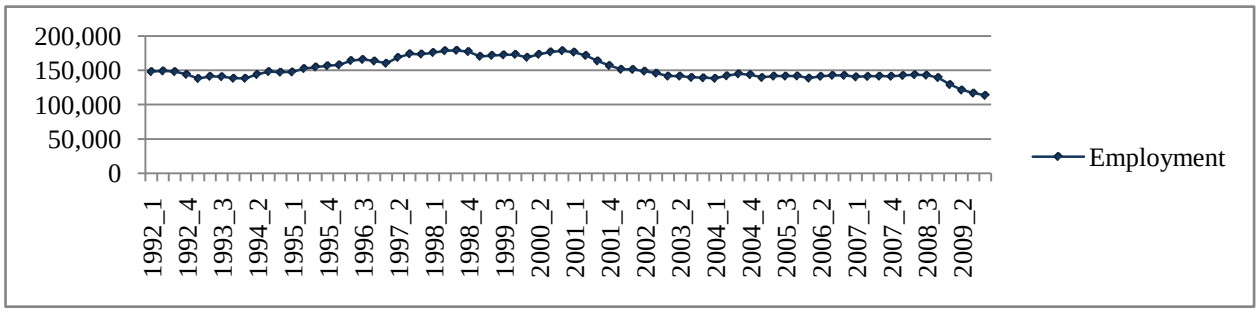
Figure 68. California Metal Plating, Coating, and Engraving Employment by Quarter



Source: Quarterly Workforce Information 2010

With each of these sectors there is the same pattern: erratic but increasing input prices, paired with cyclical variations on the demand side, result in cyclical trends in the sector. This result is reflected in overall employment in the fabricated metals sector, as seen in Figure 10.

Figure 69. California Fabricated Metals Employment by Quarter



Source: Quarterly Workforce Information 2010

NAFTA Impact

The North American Free Trade Agreement (NAFTA) eliminates most duties and quotas on imports and exports between Canada, Mexico, and the United States. Since NAFTA took effect in 1994, the value of U.S. exports to Canada and Mexico has more than doubled to $334 billion (U.S. Census Bureau). Canada and Mexico are now the largest export markets for U.S. goods. As of 2009, Canada and Mexico account for almost one third of all U.S. exports. The largest export categories in 2009 were machinery, electrical machinery, and vehicle parts, all three of which involve the manufacture of fabricated metal products.

Table 23.

Top Five U.S. Exports to Canada and Mexico in 2009	
Machinery	$52 billion
Electrical machinery	$44 billion
Vehicle parts	$41 billion
Agricultural products	$29 billion
Plastic	$19 billion
Mineral fuel and oil	$17 billion
(U.S. Office of the Trade Representative: http://www.ustr.gov/trade-agreements/free-trade-agreements/north-american-free-trade-agreement-nafta)	

The goal of NAFTA was to improve competition between North American firms by increasing free trade; critics, however, believe that the trade agreement has eroded national production in certain sectors. While NAFTA-related practices continue to be disputed in certain sectors, with respect to the U.S. manufacturing sector, NAFTA appears to have been a boon: contrary to claims made by NAFTA critics, prior to the financial crisis, in 2007 U.S. manufacturing exports were at an all-time peak (U.S. Office of the Trade Representative). Since then, manufacturing activity has declined slightly, but Canada and Mexico remain the largest export markets for U.S. products overall, as well as the largest markets for fabricated metal goods.

NAFTA has also increased the total value of Canadian and Mexican imports to the U.S. After China, Mexico and Canada are the second and third largest sources of imported fabricated metal goods, each holding 11% of the U.S. import market. According to 2009 imports and exports data from the U.S. Census Bureau, while the U.S. runs an overall trade deficit in the fabricated metals sector due to imports from China, the U.S. currently has a trade surplus with Canada and Mexico (see charts below).

Trade Patterns

As of 2009, the largest U.S. export markets for fabricated metal goods are Canada, Mexico, the United Kingdom, China, and Japan; the largest U.S. import markets for fabricated metal goods are China, Canada, Mexico, Japan, and Germany. Together China, Canada, and Mexico account for half of the U.S. import and export markets for fabricated metal goods.

In order to examine whether the U.S. fabricated metal sector is exporting domestically produced goods or foreign imports, we compared the difference between imports for consumption and general imports. Across fabricated metal imports from all countries, we found a difference of $333 million between consumption and general imports—that is, $333 million of imported metal fabricated goods are directly re-exported to other countries. However, this is a fairly small percentage (approximately 1% or less) of overall imports and exports. On the other hand, due to the data collection method used by the U.S. Census, this does not account for the amount of imported fabricated metal goods that are used as inputs for domestically-produced fabricated metal products.

Table 24.

Top 15 U.S. Export Markets for Fabricated Metal Products in 2009 (U.S. Census Bureau)		
	U.S. Exports* ($ thousands)	% of Fabricated Metal Exports
Canada**	$8,619,818	28.54%
Mexico	$4,963,503	16.43%
United Kingdom	$1,311,730	4.34%
China	$1,273,800	4.22%
Japan	$1,059,670	3.51%
Germany	$856,598	2.84%
Korea	$780,537	2.58%
Australia	$727,308	2.41%
Singapore	$657,051	2.18%
France	$581,911	1.93%
Brazil	$521,689	1.73%
Israel	$488,927	1.62%
Saudi Arabia	$417,092	1.38%
United Arab Emirates	$405,903	1.34%
Netherlands	$308,886	1.02%
World	$30,205,787	100%
*Customs Import Value	**Calculated from Canada imports data	

Table 25.

Top 15 U.S. Consumption Import Markets for Fabricated Metal Products in 2009 (U.S. Census Bureau)		
	U.S. Consumption Imports* ($ thousands)	% of Fabricated Metal Imports
China	$11,393,505	28.64%
Canada**	$4,396,415	11.05%
Mexico	$4,394,772	11.05%
Japan	$2,719,040	6.84%
Germany	$2,580,297	6.49%
Taiwan	$2,377,058	5.98%
Italy	$1,629,699	4.10%
Korea	$1,369,548	3.44%
United Kingdom	$1,225,693	3.08%
India	$889,677	2.24%
France	$825,511	2.08%
Thailand	$537,637	1.35%
Brazil	$439,958	1.11%
Austria	$421,717	1.06%
Spain	$393,639	0.99%
World	$39,779,621	100%
*Customs Import Value		

Table 26.

Top 15 U.S. General Import Markets for Fabricated Metal Products in 2009 (U.S. Census Bureau)			
	U.S. General Imports* ($ thousands)	Difference between General and Consumption Imports ($ thousands)	Difference as % of General Imports
China	$11,428,122	$34,617	0.30%
Canada**	$4,397,133	$718	0.02%
Mexico	$4,392,174	($2,598)	(0.06%)
Japan	$2,798,497	$79,457	2.84%
Germany	$2,672,617	$92,320	3.45%
Taiwan	$2,384,669	$7,611	0.32%
Italy	$1,657,932	$28,233	1.70%
Korea	$1,391,954	$22,406	1.61%
United Kingdom	$1,243,849	$18,156	1.46%
India	$885,798	($3,879)	(0.44%)
France	$824,546	($965)	(0.12%)
Thailand	$542,591	$4,954	0.91%
Brazil	$441,085	$1,127	0.26%
Austria	$423,309	$1,592	0.38%
Spain	$394,542	$903	0.23%
World	$40,113,442	$333,821	0.83%
*Customs Import Value			

Sources of Competition

Overall, the U.S. runs a $9.5 billion trade deficit in the fabricated metals sector. The primary sources of competition are fabricated metal firms in China and Mexico that are able to produce goods cheaply and quickly. Many U.S. firms, both large and small, have adapted to the competition by taking advantage of foreign advantages in fabricated metal manufacturing and either using foreign products as inputs or by locating plants abroad.

According to the U.S. Census in 2008, 22% of jobs in the fabricated metal sector are related to or supported by exports. This is a low percentage compared to other manufacturing sectors, such as the textile industry (37%), computers and electronics manufacturing (38%), and the chemicals industry (26%), indicating that the majority of fabricated metal output remains domestic.

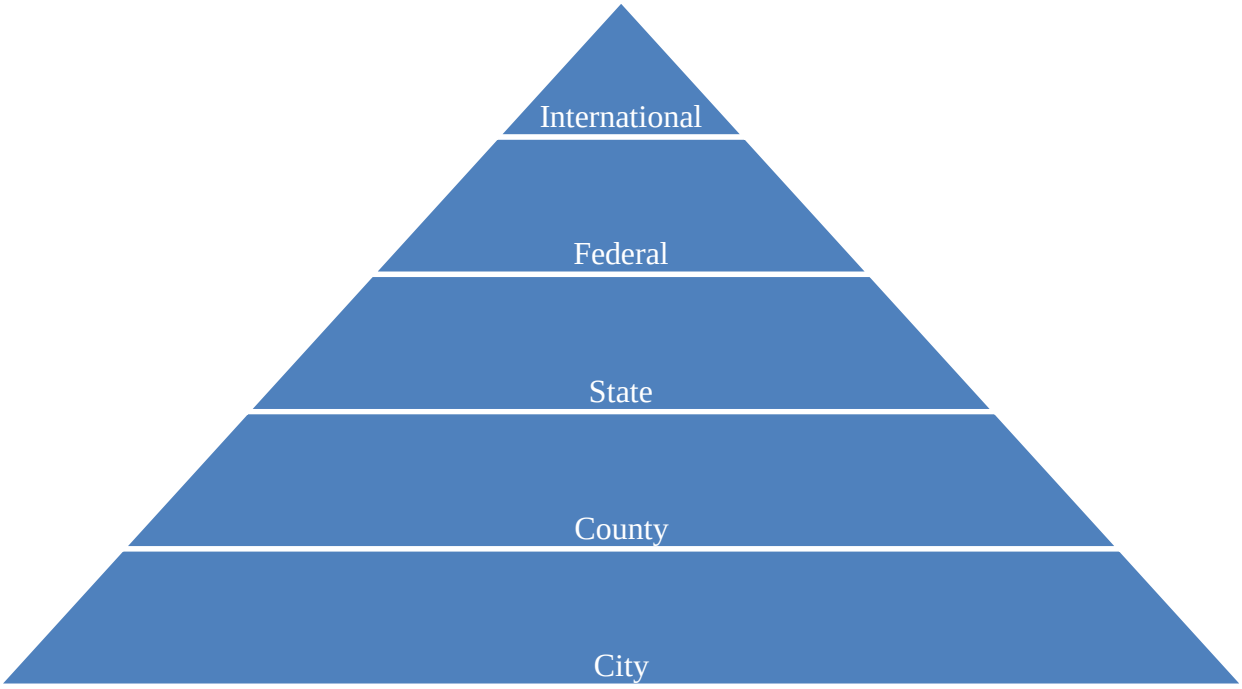
VII. Community and Government.

Government Relations

From our discussion with business owners, labor unions, and our research into the field we have found that government intervention in the fabricated metal industry is of primary importance. There are a host of environmental and labor regulations that govern the day to day operations and economic decisions of fabricated metal firms. Many firms are regulated by as many as 30 different agencies at the federal state and local level. Firm representatives stress that these regulations have made profitability harder and harder to achieve over the years and they often feel that regulations are arbitrary and that their voices are not heard when legislation is drafted.

Some firms that have already begun to transition to a green economy see the regulations as incentives to transition their businesses, however, this enthusiasm is quickly tempered by the existence of foreign firms that can produce the same products free of labor and environmental regulations for much cheaper.

Figure 70. Government Regulations

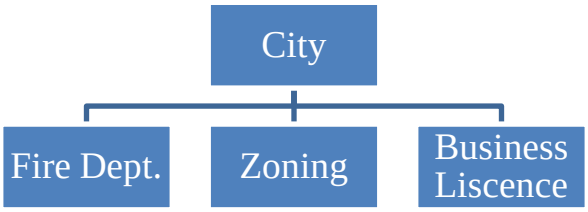


Almost every aspect of the fabricated metal industry is regulated by some regulation. However, the extent of the regulation depends on the actual products that a given firm produces. Environmental regulations dictate processes that are deemed environmentally harmful while simultaneously dictating the composition of many alloys. Labor standards for public construction projects dictate wage rates and local hiring requirements, while safety standards are regulated industry wide. The web of regulation forces businesses to adjust constantly which can have a variety of negative economic consequences. Below is a brief summary of the major governing bodies and legislation that govern fabricated metal firms and how they can affect different aspects of the industry.

Regulatory Agencies and Legislation

From surveys and site visits of various businesses in Los Angeles we were informed that the following regulatory agencies and legislation have direct impacts on the fabricated metal industry in Los Angeles.

Figure 71. City Regulations



At the city level each firm must meet zoning code regulations, fire safety regulations, and maintain their business license. Zoning regulations have developed historically and are often composed of repeated amendments that govern such things as parking, building height, and site layout. For example sheet metal manufacturers are regulated to M1 zones in the city of Los Angeles. Code section 12.17.5 of Chapter 1 of the Los Angeles Municipal Code specifies that:

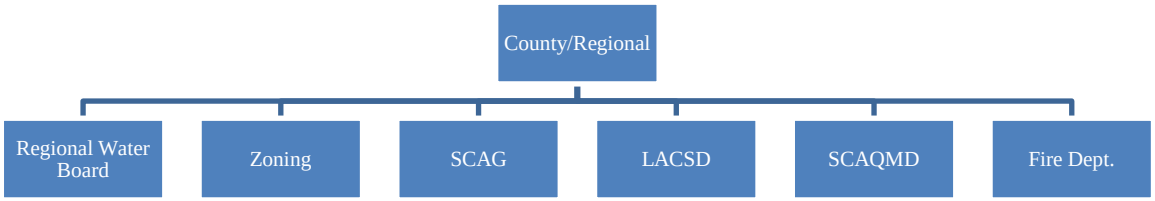
> "All required buildings and enclosing walls or fences shall be so constructed, the machinery and equipment shall be so installed and maintained, and the activity shall be so conducted, that all noise, vibration, dust, odor and all other objectionable factors, shall be confined or reduced to the extent that no annoyance or injury will result to persons residing in the vicinity."

Of note is that even if a manufacturing business has existed for many years within an industrial district, they are often forced to move when land uses around them change to allow residential uses due to resident complaints of noise or smell.

Fire and Safety Regulations occur in the form annual fire inspections by both city and county fire departments. Firms must ensure that all of their production facilities meet fire and safety codes to obtain permits. For example, firms that produce magnesium parts must meet requirements for heat treating ovens, dust collection, duct construction and power supply interlock (which requires that machines shut down if their environmental controls stop functioning).

Business licenses are required to operate within a given city. To obtain a business license firms must prove that they have met all the requirements of each city agency and all state and federal agencies. The list of requirements can be quite extensive. For example to obtain a business license in Long Beach a firm owner must prove that they meet/have all city zoning regulations, state license requirements, state sales tax permits, federal/state employer requirements, and fire requirements. Within the City of Long Beach itself all applicants must receive approval from 8 separate departments for any new construction or remodeling of their facilities (Appendix B).

Figure 72. County Regulations



At the county level firms must meet the standards set forth by the county fire department (same as the city fire departments discussed above), the LA County Sanitation Districts, SCAQMD, county regulations, and the regional water board. The Los Angeles County Sanitation Districts (LACSD) "protect public health and the environment through innovative and cost-effective wastewater and solid waste management, and in doing so convert waste into resources such as recycled water, energy and recycled materials" (LACSD 2010). The LACSD accomplishes this by enforcing the requirements set forth by the EPA. The LACSD serves over 2,600 industrial users within the LA county region. They have numerous different categories which divide users by the type of waste that they produce. Measurements are taken on PH, a variety of metals, and chemicals used in the manufacturing process. To ensure compliance pretreatment and monitoring are required. Each industrial user is required to obtain an "Industrial Wastewater Discharge Permit." These often require treatments such as spill containment, flow monitoring, rainwater diversion, and combustible gas monitoring. Firms are routinely monitored and those that are found not to be in compliance are subject to "aggressive enforcement." The LACSD have an industry council made up of 15 members from different industries around the county. These members work with the LACSD on implementing and reviewing federal and state EPA mandates and Superfund legislation. Below is a sample listing of several metal finishing companies and the chemicals/materials they are monitored for.

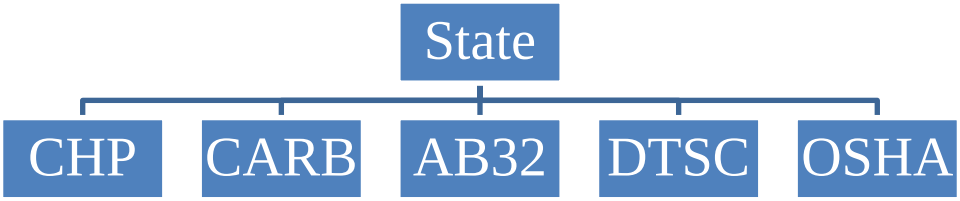
Several firms mentioned the Southern California Air Quality Management District (SCAQMD as being an important regulating body. The SCAQMD has numerous responsibilities including tracking annual emissions from a variety of permitted sources, drafting EIS/EIR documents under CEQA, certifying industrial products (e.g. boilers, coatings, etc.), responding to air quality complaints, and providing permits. Several of our site visits informed us of the difficulties of complying with all of the SCAQMD legislation. Manufacturers complained that more competitive processes were unacceptable under the rules and that they were at a unique disadvantage when they tried to compete with their international counterparts due to having to comply with these standards. Other manufacturers said that they lost business due to the long permitting processes that are required for the certification of new processes.

The County of Los Angeles regulates businesses that are located in unincorporated areas of the county much like individual cities. Special zoning, safety, and environmental regulations must

be met before firms may obtain a business license. There may be additional county regulations that apply above what cities require, however, our research has not yet been able to identify any such regulations.

The Regional Water Board for Los Angeles county is one of nine state boards that is charged with setting state wide policies to ensure water quality. The board is in charge of implementing a number of state and federal laws such as the Clean Water Act and the Californian Porter-Cologne Water Quality Control Act (CRWQCB 1994). The Californian Porter-Cologne Water Quality Control Act requires the state to review policies for all waters in the state and develop Basin Plans. Under the Clean Water Act the Board requires waste treatment plans for the control of pollution. The Los Angeles Region encompass all the waters that flow into the Pacific Ocean within its boundaries (see map below). As such any waste water or runoff that makes its way into the ocean needs to be tested and accounted for. This requires that both point and not point sources be regulated. The Board oversees a number of different programs that regulate and control discharges, investigate abuses, and mediate cleanup.

Figure 73. State Regulations



At the state level the Department of Toxic Substance Control (DTSC), the California Air Resources Board, AB32 and the California Highway Patrol also regulate specific aspects of the metal fabrication industry. In addition it should be kept in mind that many of the federal regulations that will be discussed later are implemented at the state level such as the Clean Water Act, the Clean Air Act and OSHA.

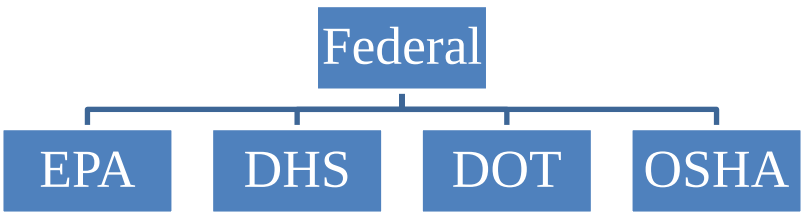
The Department of Toxic Substance Control requires regular permitting for many of the chemicals used in the fabricated metal industry. Firms are required to provide verification of "cradle to grave" disposal of waste. Reporting is required of any Resource Conservation and Recovery Act (RCRA) designated firms that produce more than 1,000 kg or more hazardous waste or generate more than 100 kg spill material contaminated by such waste. One of the firms we received a survey from reported that they limit their production specifically to avoid this designation and the "more onerous requirements" levied against these "Large Quantity Generators."

The California Air Resources Board sets and enforces air quality and sets control measures for toxic air contaminants. CARB has a governing board of eleven members which are appointed by the Governor. Five are experts in a variety of fields and five others are elected officials from each of the five regions of California. CARB has a number of Air Toxics Control Measures that

apply to over 7000 businesses and all motor vehicles. Of particular interest are measure 17 CCR 93102-93102.16 which regulates Hexavalent Chromium which is used in plating and measure 17 CCR 93107 which regulates the emissions of toxic metals from non-ferrous metal melting. Both of these measures require specific pollution control equipment and techniques. They also regulate which processes are allowable and what levels of emissions are permitted. These regulations and their implementation can be extremely unpopular with businesses. As one business owner complained, "In attempting to work with them to develop a reasonable solution to their unyielding demands to regulate the use of SF6, I discovered cooperation only produced a more restrictive regulation. Specifically, when an existing SCAQMD regulation was shown to the CARB providing relief of the regulation in support of national defense, the draft regulation by CARB was amended to specifically disallow such relief."

Several of our surveys noted that firms are worried about the implementation of AB32. AB32 requires that CARB implement greenhouse gas reductions. AB32 requires mandatory reporting of greenhouse gas emissions from industrial sources that produce more than a base level of 25,000 metric tons of carbon dioxide (CO2)and identifies discrete early actions that could be enforceable by 2010. However, the majority of the requirements set out by AB32 will not take effect until 2012, and even then it is doubtful how many of the firms within the fabricated metal industry would be negatively affected due to their small size. A list of firms that were required to report their GHG emissions in 2008 did not contain any firms with NAICS 332 although it did list several primary metal firms (CARB 2010). Of note however, is the fact that many of the gases regulated by AB32 are used in the fabrication of metals and according to an industry representative there is a discrepancy between federal mandates and the restrictions of AB32. This can lead to businesses loosing federal contracts because federal product standards require the use of these gasses in production processes but AB32 forbids their use. To avoid these problems businesses have opened branches in Mexico where the standards do not apply.

The California Highway Patrol (CHP) regulates the use of commercial vehicles within California. CHP enforces maintenance inspections, hazardous materials transportation, controlled substance testing, insurance requirements, and size and weight restrictions. Therefore any fabricated metal firms that own or operate their own trucks will be subject to CHP regulations.



At the Federal level there are several pieces of legislation and agencies which affect the fabricated metal sector. These include OSHA, the Environmental Protection Agency (EPA) (Clean Air and Water Acts), the Department of Transportation, and the Department of Homeland Security.

The Occupational Safety and Health Administration (OSHA) regulates safety standards at workplaces. Enforcement is accomplished through inspections of individual firms or by reporting of dangerous work environments by employees. Firms found to not be in compliance are subject to fines and further inspections to ensure compliance. Firms we surveyed reported that OSHA also requires safety training, regular inspections, and that safety records be made available on demand. They also reported that OSHA inspectors mandated infrastructure modifications at will, regardless if the change makes the machine or operation unusable or in some instances more dangerous.

The EPA was also listed a regulatory agency by several surveys. The EPA is charged with protecting the environment and has enacted several powerful acts such as the Clean Air and the Clean Water Act to do so. The Clean Water Act regulates runoff, groundwater contamination, and other byproducts, chemicals, and toxins from industrial production. The Clean Air Act regulates GHG emissions and monitors air pollution to ensure health and safety. While many of the results of these acts have been highly beneficial to Americans as a whole, their effect on industry has been more controversial. As one of our survey respondents said, "The EPA can and has imposed a draconian regulatory burden on the […] industry. Their early action to regulate [...] a pollutant has singlehandedly driven more […] work from the US than any other action to date" (specifics removed to maintain survey respondent privacy).

The US DOT is responsible for ensuring that all vehicle traffic upon federal highways and interstates meets regulations. The DOT enforces size, weight, length, width and noise regulations as well as regulations for hazardous waste. Like the CHP above, only firms that conduct their own shipping operations would be governed by these regulations.

The US Department of Homeland Security has two interests in the fabricated metal sector. The first is the regulation and monitoring of sensitive chemicals. The second is the need to keep defense contracting secrets from escaping since many of the metal manufacturers provide parts directly to the aerospace industry. This second interest would only affect firms in the industry that work directly with the aerospace industry and even with these firms it would only affect a small percentage of their business. For example at one of our site visits we learned that the firm produced almost 85% of their products for commercial airlines such as Boeing, and only 15% for defense contractors. We also learned that whenever these businesses change or modify a part they have to certify it with the government agency again to ensure that it meets specifications. This certification process can be extremely costly and provides substantial risks. Firms are also

required to maintain certain security procedures on sites and may restrict access to their production facilities.

Tax Policy and Investments

Businesses in California constantly complain about the corporate tax rate of 8.84%. However, a recent LA Times article reported that the Council on State Taxation found that due to many of the tax breaks given to corporations the true tax rate is around 4.7% which is lower than Texas. This is accomplished primarily on a tax break given for R&D and Prop 13 which means that most businesses that have owned their property for a long time pay significantly lower property taxes (Semeuls 2010). From talking with an industry representative we learned that there are two additional taxes that are particularly burdensome for the fabricated metal sector. The first is a tax on new equipment which falls under the property tax heading. This tax requires that business owners pay a tax whenever they purchase new equipment which can be a disincentive to purchasing newer more efficient equipment. This is in contrast to states like Arizona and Texas which don't tax new equipment. The second tax is a tax on "tooling". Often metal manufacturers will not own the "toolings" or specific molds that are used to create their products. However, they are still forced to pay a taxes on these. Some shops use thousands of different toolings from different customers and are taxed for each use. They are often unable to pass these tax costs on to the true owners of the toolings from the fear of losing business.

A full understanding of tax impact on the sector will require some additional research. Local taxes, in particular, are especially complicated. Metals firms in the City of Los Angeles are subject to business taxes on sales, but these rates vary among different types of transactions. For instance, sales of metal may be taxed at the 1.27% retail rate, whereas other fabrication activities may be taxed at the wholesale rate of 1.01% or the "miscellaneous services" rate of 3.56% (LA Municipal Code). Firms have also alluded to an additional tax on local trades. This requires further investigation, but, if true, holds unfortunate implication for potential agglomerative effects in the Los Angeles metals sector.

Investment in metal manufacturing firms follows two distinct paths. For public firms the basis for investment is profitability and the company's ability to attract new share holders by paying returns. For Private firms it is most often governed by the possibility to capture increased market share or through the acquisition of unique processes. For example, a firm may invest in several other firms within its industry in order to purchase them and control the market of its products. Likewise, a firm may buy another firm or invest in another firm that possesses a unique process that may be important to its own processes. Most firms already have close relationships with the other firms that they invest in. Firms may also invest or purchase another firm in a different state with lighter taxes and regulations in order to compete for contracts that would be unfeasible given California's regulatory requirements.

The Public Sector

The public sector has played two major roles in the fabricated metals sector. The first is through the construction of public works projects which utilize a lot of different fabricated metal products such a structural metals, sheet metal, and valves. The second is through the defense industry and various aerospace companies which need specialized metal products. From talking with the Sheet Metal Union Local 105 as well as several of our site visits we have learned that public sector demand has helped many firms to lessen the impacts of the recession especially in the construction industry. Likewise, one of our contacts that dealt with the aerospace industry said, "If Boeing is doing good, we're doing good," regarding Boeing's military contracts.

Customer Mandates

Another interesting level of regulation that was brought up through our site visits was the requirements placed on firms by their customers. Many downstream businesses require specific alloys and parts which must be tested and certified. These are particularly demanding for military and defense components used in aerospace which fall under the International Traffic in Arms Regulations (ITAR) and Nadcap. We were informed that due to certain environmental regulations imposed by CARB, one of our interviewees was no longer able to meet the specifications for a defense contract without changing their processes. To recertify their parts using new practices took so long that in the end they lost the contract on those parts. It should be noted, however, that while customer mandates increase costs across the market, they are applied uniformly to all potential suppliers. Therefore, customer mandates alter the nature of competitive advantage only inasmuch as the ability to meet the mandates varies between firms. The situation in which state regulations conflict with federal contracting requirements is a particularly dysfunctional example of regulatory NIMBYism.

Community Concerns

Many of the regulations and governing bodies that were discusses above are the outcome of community concerns with different industries. Fabricated metal processing requires equipment and chemicals that are noisy, noxious, dusty, and toxic. Therefore there is a need for regulation. Views on how far this regulation needs to go depends upon the business being considered. For example, is it fair to force a firm out of business even if it was located in an area long before the residential neighborhood grew up around it? Do residents that move to a neighborhood that borders an industrial district have the right to complain about noise or dust from operations? Current regulations often side with the environmental goals set forth by policymakers. Many small businesses feel that their voices go unheard in the policy making process. However, as one of our survey respondents noted, if businesses are taking proactive steps to mitigate their environmental impacts, they have a stronger voice when they come to the table. For example, recycling of electronic component or scrap metal often releases toxic chemicals or metals such as lead in the process. If we force all of the recycling plants to shut down, however, we will merely shift recycling overseas where there are no environmental protections at all. This may mean we cannot bow to the whim of every NIMBY.

Linkages and Power

As noted throughout the report, demand for metal fabrication is driven by demand in other manufacturing sectors and within the fabrication sector itself. Metals products can be conceptually divided into two categories. Some products, especially specialized primary metals and some other specialized products, enjoy a worldwide market. Because they do not depend on local demand, companies that are able to maintain a competitive advantage vis-à-vis their competitors may well remain in business regardless of particular demands in Los Angeles—though remaining competitive is hardly trivial. Most other metals firms remaining in Los Angeles, however, are dependent on local demand and thus on the presence and health of other manufacturers. We have repeatedly referred to the aerospace and the defense industries, but it should be clear that any sort of manufacturing that requires lots of metal parts will be beneficial to the sector.

Metal fabrication and production is both highly interdependent and highly concentrated in LA, there is thus the possibility to take advantage of the agglomeration's potential through further collaboration between firms and public technical assistance in collaboration. Though not a total success, such arrangements have proven highly beneficial to metalworking firms in Massachusetts (Forrant 1998). Metals producers often seek to incorporate as much of production in house as possible, because customers are starting to request complete products, but barring that companies engage in high levels of contracting to nearby firms.

One difficulty in promoting collaboration is the continuum structure of activism by environmental groups. Some groups, especially those concerned with environmental justice and the holistic well-being of an area, have the potential to form political coalitions and collaborations with industry; however, these groups are susceptible to political liability from environmental groups more focused on environmental outcomes who may accuse them of fraternizing with the enemy, or being insufficiently serious about environmental protection. Any effort to promote industry with desirable environmental outcomes through collaboration and political coalitions should focus on bolstering groups that seek to moderate industry with environmental concerns.

Unions are also an important factor. Unions, where they exist, have the potential to exert serious political influence. Because their fate is tied to that of manufacturing, these unions could play a large role in working toward mutually beneficial outcomes with industry. At the same time, they can provide accountability on maintaining reasonable labor standards. James Simonelli attests that such collaborations exist to a greater extent in the Bay Area, and that Northern California unions have lobbied alongside him in Sacramento. In Los Angeles, the Sheet Metal Workers Local 105 exerts significant influence in the field. We have found that union density is extremely low in this industry in general, however; several firms we have spoken to have no unionization. Finding ways to improve this situation may be highly beneficial both to workers,

who can enjoy accountability for wages and working conditions, and to firms, who have much to gain through political collaboration.

Traditional political alliances may help to produce an adverse climate for sustainable local manufacturing. Many constituents, secure in their economic fortunes, are much more concerned with environmental protection than with economic development that benefits the poor. Others may support anti-regulatory policies that favor multinational corporations and pay little heed to local economic development or environmental outcomes. This leaves little room for politics that seek to promote reasonable environmental protection that takes the needs of local business into account. This trend can be countered by creating strong political coalitions that promote environmentally sustainable economic development, and who are willing to consider serious cost-benefit analyses, that weigh the social costs environmental regulation with actual environmental benefits.

Interviews with business owners and with an industry representative have painted a distressing picture about the nature of governmental regulation with respect to manufacturing. Employment in the high value-added field of manufacturing, including metals manufacturing, remains a gateway for those beginning with few skills or advantages to earn a middle class wage and provide better economic opportunities for their children. Regulators should take care that they are not overplaying their role as State actors in reinforcing class barriers. At the same time, more research must be done to complete the picture of working conditions and environmental outcomes in metals manufacturing, to ensure that the sector is indeed a sustainable source of high paying low-skill-at-entry jobs.

VIII. Conclusions and Recommendations

Conclusion 1: Los Angeles fabricated metals are an essential nexus in a local manufacturing agglomeration.

On the surface, metal fabrication appears to form a link in a traditional commodity chain. Slightly deeper investigation reveals that extensive trading of services takes place within the fabricated metals sector. For instance, a primary metal manufacturer may supply a metal forging facility with ingot, but also contract to a local machine shop for a replacement part for a machine and buy scrap from a stamping facility for recycling. Or a machine shop may contract to a treating and plating facility before supplying to a defense contractor. Moreover, not only do fabricated metals depend on downstream markets to maintain demand for their services, but the reverse is also true: downstream industries require the presence of sufficient fabrication capability to efficiently conduct their business. The complex web of relationships results in extensive interdependence.

Between their interdependence and the sheer quantity of manufactures located in the county, fabricated metals and its commodity web constitute an agglomeration in Los Angeles.

Recommendation: Take advantage of agglomeration, using government support where appropriate to bring trade associations and labor unions to the table.
Benefits from agglomeration include the sharing of training, education, strategy, technology, matching between potential collaborators, and improved matching between firms and potential employees. Left alone, agglomerations can lie fallow, their potential benefits unrealized; such appears to be the case with fabricated metals in Southern California.

Metals firms tend to be competitive and distrustful and are frequently wary of collaboration. Less hostile regulation may help improve this climate, but more can be done. At other times and in other places, state and local government have successfully provided assistance to trade associations in making the industry more open and collaborative (Forrant and Flynn 1998). For example, the **National Tooling and Machining Association** (NTMA), which has a local affiliate in San Clemente, was involved in a well-known and highly successful collaboration with the government to provide shared training opportunities, technology sharing, and other networking. After a few years, the NTMA's program was able to continue in collaboration without government support. While this venture thrived in full bloom for only about a decade, this is largely an argument for increased flexibility. This recommendation is abstract in large part due to this need for flexibility: particular arrangements should result from direct communication between government, manufacturers, and other relevant parties.

Other trade associations are likely to be amenable to this sort of partnership. As many collaborators as possible should be brought who are relevant to the project. **Labor unions**, with their symbiotic relationships with metals firms, may also prove excellent partners in collaboration.

Conclusion 2: Growth machine zoning habits put heavy industry, including metals manufacturing, at severe risk.
Heavy industry is frequently unsightly, malodorous, and noisy, creating an extremely unpleasant atmosphere, unacceptable to those who do not benefit directly from the activity. Residents have excellent means of redress available to them, including the Air Quality Management District (AQMD), which can post violations for "strong odors, dust, or smoke," regardless of their actual harmful or noxious properties. Their means of redress are so effective, in fact, that any heavy industrial establishment in a zone approached by non-industrial uses can be almost assured of being forced to leave in the near future.

Acutely aware of this, manufacturers do their best to make their unattractive characteristics known in zoning hearings. Unfortunately, developers are also aware of their favored position once their projects are built. Thus they push their development projects through, explicitly refusing any agreement not to complain once their projects are built.

This is failure of political pluralism, which seems to occur mainly during the process of zoning hearings. We have not attended any of these hearings, but we suspect that growth machine politics drive non-industrial projects into an unfairly privileged position.

Recommendation: Realign the power structure of land use negotiations to ensure fair outcomes—either through adjustments to residential/commercial land use redress policies, or through improvements in the zoning code adjustment process.

There are two main ways to fix this power imbalance. The less desirable option is to weaken redress opportunities, so that developers no longer have an incentive to seek to build on existing heavy industrial zones. While such a measure would prove effective improving fair outcomes between industry and development, it would be less than optimal because, at their core, these redress options make sense. Noxious odors and annoying sounds can significantly decrease residents' and businesses' enjoyment and fair use of their properties; yet they derive none of the benefit of producing the emissions. One possible middle position would be to adjust these policies marginally, but this is suboptimal because doing so would both weaken legitimate protection of property owners and, at the same time, prove inadequate to correcting the power balance.

A better option would be to improve the hearing process to favor current establishments. It is reasonable that the needs of existing users of the land should be given priority in land use decisions. This is good policy, even when not specifically considering the case of heavy industry. The danger to regional manufacturing activity makes the case all the more compelling.

One thing is clear: the combination of an overly powerful redress process and an unreasonable growth priority in land use hearing is perilous to the prospects of heavy industry. They cannot both sustainably remain in force.

Conclusion 3 and Recommendation: Current taxation and regulation policies do not optimally meet fiscal, environmental, and business incentive needs. These should be corrected.

Taxes have two major effects: first, they raise revenue for government activities; second, they alter market incentives. It is clear that current taxation schemes in Los Angeles create perverse incentives that harm local manufacturing. Taxing productive activity discourages production, and taxing new machinery discourages innovation. These taxes are forced in large part by State Constitutional provisions limiting property taxes and mandating a two-thirds legislative supermajority to raise taxes. Ideally, these should be repealed. Taking the world of political reality into account, however, policy makers can still seek to minimize perverse incentives. The warehousing tax on toolings and municipal business tax are especially dubious, and policy makers should seek to find alternative sources of revenue.

Environmental regulations should take into account their effects on local business, and take into consideration the fact that regulations may only encourage pollution to move elsewhere. It is

a legitimate local government interest to seek to limit local pollution sources that have adverse localized effects. For example, regulating industrial effluent can protect vital water resources. In this case, it is beside the point whether polluting activity moves elsewhere, because government has mandated that local clean water is a priority for which it is willing to pay. Moreover, to the extent that local government can successfully limit regional or worldwide production of pollutants through regulation, it is reasonable for it to do so.

Sometimes, however, restricting the production of pollution with global impacts may result in nearly the same quantity being produced elsewhere. A clear example is the production of carbon dioxide gas. In terms of global warming effects, carbon dioxide emitted in Nevada or China has the same impact on California as carbon dioxide emitted in the state. Therefore, statewide carbon regulation has three actual effects: first, it encourages the migration of carbon production to other states—presumably at a slightly lower level of production, because forcing relocation implies a slight, if negligible, increase in production cost. Second, some businesses will be able to remain at full production and stay within the state, while producing less greenhouse gas. This ideal outcome will only occur in some instance, however. Third, California will symbolically demonstrate its leadership on combating global warming, and may be in a better position in the case that a wide scale carbon regime is imposed. Policy makers must ask themselves whether these moderate benefits outweigh a significant loss of manufacturing employment.

State governments are not empowered to enact tariffs, but the federal government should consider pairing carbon regulation with commensurate tariffs on non-carbon regulated imports.

Conclusion 4: Multiple stakeholders have a strong interest in preserving and encouraging fabricated metals manufacturing in Los Angeles County, and there exists extensive potential for collaboration to do so.

Fabricated metals manufacturing is an important source of employment in Los Angeles, which should be preserved and encouraged if possible. Labor unions, even in their much-diminished form, are related symbiotically to manufacturers. When metals manufacturing migrates, both unions and small firms suffer. Moreover, there is a strong coalition for encouraging good jobs and promoting social justice. Finally, some environmental groups, especially those concerned with environmental justice, seek to promote fair environmental outcomes while retaining jobs that provide opportunity for poor Angelenos.

Recommendation: Labor, small manufacturing establishments, economic development, and social and environmental justice interests can and should collaborate to promote a shared interest in preserving fabricated metals manufacturing.

Any of these groups can seek to initiate collaboration. In order to bring small firms on board, labor, social and environmental justice, and economic development groups should seek to collaborate with trade associations. Collaboration between all of these stakeholders, while difficult, holds great promise in creating a strong political coalition for the protection of industry,

with due attention to fair labor and environmental outcomes. Government and nonprofits may also play a role in bringing these diverse parties together.

IX. Appendices

Appendix A. Detailed NAICS Codes for Metal Fabrication

NAICS 332 - Fabricated Metal Product Manufacturing	
332111	Iron and steel forging
332112	Nonferrous forging
332114	Custom roll forming
332115	Crown and closure manufacturing
332116	Metal stamping
332117	Powder metallurgy part manufacturing
332211	Cutlery and flatware (excluding precious) manufacturing
332212	Hand and edge tool manufacturing
332213	Saw blade and handsaw manufacturing
332214	Kitchen utensil, pot, and pan manufacturing
332311	Prefabricated metal building and component manufacturing
332312	Fabricated structural metal manufacturing
332313	Plate work manufacturing
332321	Metal window and door manufacturing
332322	Sheet metal work manufacturing
332323	Ornamental and architectural metal work manufacturing
332410	Power boiler and heat exchanger manufacturing
332420	Metal tank (heavy gauge) manufacturing
332431	**Metal can manufacturing**
332439	Other metal container manufacturing
332510	Hardware manufacturing
332611	Spring (heavy gauge) manufacturing
332612	Spring (light gauge) manufacturing
332618	Other fabricated wire product manufacturing
332710	Machine shops
332721	Precision turned product manufacturing
332722	Bolt, nut, screw, rivet, and washer manufacturing
332811	Metal heat treating
332812	Metal coating, engraving (excluding jewelry and silverware), and allied services to manufacturers
332813	Electroplating, plating, polishing, anodizing, and coloring
332911	Industrial valve manufacturing
332912	Fluid power valve and hose fitting manufacturing
332913	Plumbing fixture fitting and trim manufacturing
332919	Other metal valve and pipe fitting manufacturing
332991	Ball and roller bearing manufacturing
332992	Small arms ammunition manufacturing
332993	Ammunition (excluding small arms) manufacturing
332994	Small arms manufacturing
332995	Other ordnance and accessories manufacturing
332996	Fabricated pipe and pipe fitting manufacturing
332997	Industrial pattern manufacturing
332998	Enameled iron and metal sanitary ware manufacturing
332999	All other miscellaneous fabricated metal product manufacturing

Appendix B: City of Burbank Zoning Code

P = permitted
(blank) =prohibited
[PRH] = prohibited if residentially adjacent as defined in 10-1-203

CUP = Conditional Use Permit required
[CUP] = CUP required if residentially adjacent as defined in 10-1-203

AUP = Administrative Use Permit required
[AUP] = AUP required if residentially adjacent as defined in 10-1-203

LAND USE	C-2	C-3	C-4	M-1	M-2	MDM-1	MDC-2	MDC-3	MDC-4	NB	GO	RC	C-R	RBP	BCC-1	BCC-2	BCC-3	BCCM	MPC-1	MPC-2	MPC-3	OS	AP	RR	AD
Laboratory - X-ray, treatment, or clinic	P	P	P	P	P		P	P			P			P		P	P	P		CUP	CUP		CUP	CUP	
Lapidary mfg.			CUP	P [CUP]	P [CUP]			CUP	CUP									CUP					CUP	CUP	
Laundromat	P	P	P				CUP	CUP	CUP			P		P		P	P	P		CUP	P				
Laundry		CUP	CUP	P [CUP]	P [CUP]			CUP	CUP					CUP			CUP	CUP			CUP		CUP	CUP	
Laundry agency -no washing	P	P	P				P	P	P	P	P	P		P		P	P	P	P	P	P				
Leather (assembly & fab.)			CUP	P [CUP]	P [CUP]													CUP					CUP	CUP	
Library - municipal	P	P	P				P	P	P			P	CUP		P	P	P	P	P	P	P				
Library	P	P	P				P	P	P				CUP		P	P	P	P	P	P	P				
Linoleum (process, pack or treat)					P [CUP]																		CUP	CUP	
Lubricating oil (process, pack or treat)					P [CUP]																		CUP	CUP	
Machinery mfg. & repairing				P [CUP]	P [CUP]													CUP					CUP	CUP	
Machine shop			CUP	P [CUP]	P [CUP]													CUP					CUP	CUP	
Malt (assembly & fab)					P [CUP]																		CUP	CUP	
Market, convenience	P	P	P				P	P	P							P	P	P	CUP	P	P				
Market, neighborhood	P	P	P				P	P	P			CUP				P	P	P	CUP	P	P				
Market, super	P	P	P				P	P	P							P	P	P	CUP	P	P				
Massage parlor	CUP	CUP	CUP	CUP	CUP											CUP	CUP	CUP					CUP	CUP	
Messenger service	P [CUP]	P [CUP]	P [CUP]				P [CUP]	P [CUP]	P [CUP]	P [CUP]	P [CUP]	P [CUP]		P [CUP]	P [CUP]	P [CUP]	P [CUP]	P [CUP]		P	P				
Metal (assembly & fab.)			CUP	P [CUP]	P [CUP]													CUP					CUP	CUP	
Metal (process, pack or treat)					P [CUP]																		CUP	CUP	
Metal Stamping					P [CUP]																		CUP	CUP	
Mobile home dealer - new and used		CUP	CUP	P [CUP]	P [CUP]													P [CUP]			CUP		CUP	CUP	
Moped or motor scooter dealer - including service, repair & testing in c.e.b.		CUP	CUP																						
Motel	P [CUP]	P [CUP]	P [CUP]	CUP	CUP	CUP	CUP	P [CUP]	P [CUP]						P [CUP]	P [CUP]	P [CUP]	P [CUP]		CUP	CUP		CUP	CUP	

Appendix C: List of Associations and Industry Contacts

List of Large Associations and Resources

- **American Iron and Steel Institution**: A company that provides high quality value, added products to wide array of customers to produce steel in a safe environmentally friendly manner.
- **American Metal Market**: AMM.com is the international news service of American Metal Market, the daily newspaper of the metals and recycling industries.
- **Association of Iron and Steel Engineer**: Dedicated to advancing the steel Industry through education, training, publications, research and electronics resources.
- **Australian Stainless Steel Development Association**: Stainless steel technical information, applications and contacts in Australia
- **Iron & Steel Society**: The Iron and steel society seeks to be the premier professional technical society serving its members and advancing knowledge exchange in the global iron and steel industry
- **National Association of Steel Stockholders**: NASS also has many Associate members who represent suppliers to the steel stock holding Industry.
- **South East Asia Iron & Steel Institute**: Professional technical institute representing the iron and steel industries in South East Asia.
- **Steel Founders' Society of America**: Dedicated to the technical and operational excellence of cast steel products in manufacturing.
- **Southern Africa Stainless Steel Development Association**
- **Steel Manufacturers Association**: Public policy information on the steel trade association.
- **Steel Service Center Institute**: SSCI serves as the voice of the steel service center industry. Its purpose is to enhance the financial return of member companies.
- **The Association on Steel Distributors** (ASD) is a non-profit organization, that provides the steel distribution industry a forum for ideas exchange and market information.
- **Thomas Regional Directory**: Gives you free access to searchable database of more than 520,000 distributors, manufactures, and service companies.

Additional Contacts

NATIONAL TOOLING AND MACHINING ASSOCIATION (NTMA)
9300 Livingston Road
Fort Washington, MD 20744-4998
(800)-248-6862
https://www.ntma.org/

Note: This organization has played a major role in public-private partnerships that have sought to increase and improve collaboration in metalworking agglomerations such as that in western Massachusetts. It is highly involved in training and networking.

LOCAL CHAPTER NTMA:
Los Angeles Chapter
1519 Via Tulipan
San Clemente, CA 92673
Phone: 949.369.7309
Fax: 949.366.1057
Web Site: www.lantma.org

NATIONAL INSTITUTE FOR METALWORKING SKILLS
10565 Fairfax Boulevard, Suite 203
Fairfax, VA 22030
703.352.4971
703.352.4991 fax

INDUSTRIAL ENVIRONMENTAL ASSOCIATION
110 West "C" St.
Suite 900
San Diego, CA 92101
P: (619) 544-9684
F: (619) 544-9514
Email: iea@iea.sdcoxmail.com

PRECISION MACHINING ASSOCIATION
6363 Oak Tree Blvd.
Independence, OH 44131
Phone: 216.901.8800
Fax: 216.901.9190
http://www.pma.org

SHEET METAL WOKERS INTERNATIONAL ASOCIATION (SMWIA) LOCAL 105
2120 Auto Centre Drive
Glendora, CA 91740
Phone: 909 305-2800
Email: smwia@local105.org

The directors of these organizations as well as the following individuals are highly knowledgeable in the fabricated metals sector and are committed to the success of the industry.

They are potentially very valuable partners in seeking to strengthen, green, and develop metals manufacturing. We have already worked with James Simonelli and Luther Medina extensively.

Contacts:

- James Simonelli, Executive Director, California Metals Coalition
- Patricia Szczuka, VP of Computed Tool and Engineering, Inc., President of LA Chapter of NTMA
- Brenda Baker, Executive Director, LA / NTMA
- Luther Medina, Business Representative, SMWIA Local 105.

Appendix D. Business Surveys

We prepared a survey for distribution to California Metals Coalition (CMC) members. James Simonelli of CMC edited the survey and distributed the revised questionnaire to many of CMC's constituent firms. Both versions of the questionnaire are included (with some formatting changes). Responses are omitted to protect the companies' confidentiality, but they have been incorporated into the argument of the paper. Five surveys were returned.

Sector Analysis of Fabricated Metal Manufacturing[1]

Prepared by: Rye Baerg and Ian Elder

For: Goetz Wolff, UCLA Department of Urban Planning

Date: October 28, 2010

Overview

This study will explore historical and current trends in the fabricated metal sector (NAICS 332), with an emphasis on California and Los Angeles County. Los Angeles is unique in being one of the largest hubs of fabricated metal manufacturing in the U.S., as well as a gateway for fabricated metal imports and exports. This study will ask the following questions in order to understand the structure of the fabricated metal sector in California and Los Angeles County. Findings will be summarized in a final report, targeted primarily to policymakers considering strategies to revitalize the local economy.

Objectives

I. Industry Structure. We want to be able to present a clear explanation of the ***flow of goods and services*** in this supply chain, especially as it pertains to fabricated metals producers. We also want to understand ***how firms and clients meet***, how firms make ***location decisions*** and ***compete*** in the regional, domestic and international economy.

Key questions we want to answer in our analysis:

1. What can policy makers do to attract and retain fabricated metals manufacturing jobs in Los Angeles? We will ask you things like, "If you were just starting out as a new business today, would you still locate here in LA, and why?"
2. How does the sector relate to the overall Los Angeles economy? We will ask questions like "How do you find and maintain clients?" and "How do you source your raw materials and equipment?"
3. What is the nature of competition in fabricated metals? We will ask questions such as, "How do you prioritize between speed, quality, and cost?" and "How do you decide when to narrow or diversify your product line?
4. How what ways have firms been affected by the current recession? We may ask things like, "In what particular ways have you been affected, and what future prospects do you see?"

[1] This is the initial version of the survey, prepared by the UCLA Fabricated Metals Team.

II. Business Structure. We want to be able to understand the ***internal structure*** of fabricated metals businesses. We want to know which ***management structures*** are most efficient, and we want to understand the ***dynamics between management and the rest of the workforce.*** We would also like to discuss the ***role of new technologies and processes*** in metal fabrication.

Key questions:

1. How do firms find labor, and how do they interact once they are hired? We will ask things like, "What specific types of workers are you looking for?" "What kinds of opportunities for advancement do different types of workers have?" and "How are your workers trained?"
2. How have firms reacted to technological change, both within your specialty and at different points of the commodity chain? We will be asking, "What are the newest technological advances that have influenced your business?"

III. Policy Issues. We want to find ways to encourage manufacturers to adopt ***environmentally friendly practices***, without damaging the local business climate. We also want to anticipate ***future needs*** for the industry. We will be interested in business owners' perspective on the following questions:

1. "What types of local tax and land-use, educational, and other policies do you think would encourage growth in the sector? How about state and federal policies?"
2. "What potential do you see for developing "green" process improvements that are also business-friendly?"
3. "What role should Los Angeles endeavor to play in the future of the fabricated metal sector?"

Sector Analysis of Metal Manufacturing[2]

Prepared by: Rye Baerg and Ian Elder

For: Goetz Wolff, UCLA Department of Urban Planning

Date: October 28, 2010

Overview

This study will explore historical and current trends in the metal sector (NAICS 332), with an emphasis on California and Los Angeles County. Los Angeles is unique in being one of the largest hubs of metal manufacturing in the U.S., as well as a gateway for metal imports and exports. This study will ask the following questions in order to understand the structure of the metal sector in California and Los Angeles County. Findings will be summarized in a final report, targeted primarily to policymakers considering strategies to revitalize the local economy.

Background

Key questions we want to answer in our analysis:

5. Name of Company?
6. City Residing?
7. Public or Private?
8. Years at Current Location?
9. Approximate number of employees?
10. Why types of products do you manufacture?
11. What process do you use to manufacture your product?

Objectives

I. Industry Structure. We want to be able to present a clear explanation of the ***flow of goods and services*** in this supply chain, especially as it pertains to metal manufacturers. We also want to understand ***how firms and clients meet***, how firms make ***location decisions*** and ***compete*** in the regional, domestic and international economy.

Key questions we want to answer in our analysis:

1. What can policy makers do to attract and retain metals manufacturing jobs in Los Angeles and/or California?
2. If you were just starting out as a new business today, would you still locate here, and why?
3. How does the current economic state of the sector relate to the overall Los Angeles economy?
4. How do you find and maintain customers?
5. What type of equipment and materials are critical to your process? How do you source your raw materials and equipment?
6. What is the nature of competition? Is there a priority between speed, quality, and cost?
7. How do you decide when to narrow or diversify your product line?

[2] This is the version of the survey distributed to CMC member firms. It was prepared by the UCLA Fabricated metals team and edited and distributed by Mr. Simonelli.

8. How has your firm been affected by the current recession?
9. What future changes or prospects do you see following the recession?

II. Business Structure. We want to be able to understand the ***internal structure*** of a metals businesses. We want to know which ***management structures*** are most efficient, and we want to understand the ***dynamics between management and the rest of the workforce*.** We would also like to discuss the ***role of new technologies and processes*** in metals manufacturing.

Key questions we want to answer in our analysis:

3. How does your firm find labor?
4. What specific types of workers are you looking for?
5. What kinds of opportunities for advancement do different types of workers have?
6. How are your workers trained?
7. What is traditionally the education background of new workers?
8. How have you reacted to technological change, both within your specialty and at different points of the commodity chain?
9. What are the newest technological advances that have influenced your business?
10. If you could have one new piece of equipment, what would it be and why?

III. Policy Issues. We want to find ways to encourage manufacturers to adopt ***environmentally friendly practices***, without damaging the local business climate. We also want to anticipate ***future needs*** for the industry. We will be interested in business owners' perspective on the following questions:

4. What types of land-use or zoning policies do you think would encourage growth in the sector? Is this a local, state or federal challenge?
5. What types of tax policies do you think would encourage growth in the sector? Is this a local, state or federal challenge?
6. What types of training/educational policies do you think would encourage growth in the sector? Is this a local, state or federal challenge?
7. How many local government agencies are you regulated by? Do they require data submittal or permits?
8. How many regional government agencies are you regulated by? Do they require data submittal or permits?
9. How many state government agencies are you regulated by? Do they require data submittal or permits?
10. How many federal government agencies are you regulated by? Do they require data submittal or permits?
11. What potential do you see for manufacturing products for the "green" economy (ex: clean energy)?
12. What types of current processes that you employ would fall under "green" practices?
13. What process improvements, that are not cost prohibitive, could make you more "green?"
14. What role should Los Angeles and/or California endeavor to play in the future of the metals sector?

Submitted by:
Name:
Title:
Phone:
Email:

X. Glossary

Computer Control Programmer/Operator – Uses computer numerically controlled (CNC) machines. CNC machines include tools such as lathes, laser cutting machines, roll forms, press brakes and printing presses. Many old-fashioned machines can be retrofitted with a computer control, which can greatly improve the productivity of a machine. Computer control programmers and operators normally produce large quantities of one part, although they may produce small batches or one-of-a-kind items. These machines are most commonly used in metalworking industries where precision is imperative, because computers can be more accurate than humans in this work. Programmers turn plans into a set of commands. Operators set up the machines and run test runs. Operators may also possess some programming skills to make small adjustments. Operators may also include less skilled workers which load pieces into a machine.

Boiler Makers – Make, repair and install boilers.

Casting – Casting involves pouring molten metal into a mold that has been formed into the shape of the desired part.

Die Makers – Make forms that are used in stamping or forging. They may also make metal molds used in plastics production.

Drafters – Create blueprints and schematics for parts and architectural metal products. Most use computer aided/automated design.

Drawing – Pulling metal into thin strands to create wire-type products.

Electrical Discharge Machining (EDM) – A manufacturing process that involves making intricate cuts into tempered metals.

Electrochemical Machining (ECM) – A manufacturing process that uses electrolysis to remove metal from the object being worked on.

Extruding – Pushing or drawing material through a die of desired shape. Extruding makes it possible to form brittle materials into complex shapes.

Grinding – Grinding metal to remove excess surface material and improve surface quality.

Herfindahl-Hirschman Index – An index used to measure the degree to which an industry is concentrated. Used to identify oligopolies.

Machine shop – A facility where machining takes place.

Metal forging – The term for shaping metal by using localized compressive forces.

Metal stamping – Includes a variety of sheet-metal forming manufacturing processes, such as punching with a machine press or stamping press.

Milling – A desired shape is achieved by removing excess metal from a piece as it is fed through a machine.

Operator/tender – Monitor machines during production. Perform loading and unloading tasks and minor adjustments. May periodically measure parts to ensure quality. May oversee multiple machines at the same time.

Rolling – Flattening metal by pressing it through a pair of rollers.

Setter – Set up machines for operation, run initial test runs, and perform minor repairs. Setup includes replacing or sharpening different tools within machines.

Soldering and Brazing – Combine metals using a metal with a lower melting point than the two metals that are joined.

Tool Makers – Make highly specialized tools, jigs, and forms for other manufacturers.

Toolings – Parts used to shape metals such as molds that are owned by the customer not the fabricated metal shop.

Turning – Holding a piece of metal in a chuck against a lathe to achieve a desired shape.

Welder – Combines metals through the application of heat. Arc welding is the most common, however, there are over 100 processes.

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