Intellectual property and the U.S. economy: Third edition

UNITED STATES
PATENT AND TRADEMARK OFFICE

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Intellectual property and the U.S. economy: Third edition

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Executive summary

Introduction

In 2012, the Department of Commerce issued a report titled "Intellectual Property and the U.S. Economy: Industries in Focus" (hereafter, the 2012 report). The report identified the industries that rely most heavily on intellectual property (IP)—patents, trademarks, or copyrights—as IP-intensive and estimated their contribution to the U.S. economy. It generated considerable interest and energized other agencies and organizations to produce similar studies investigating the use and impact of IP across countries, industries, and companies. In 2016, the United States Patent and Trademark Office (USPTO) issued an updated report that built on the 2012 report, titled "Intellectual Property and the U.S. Economy: 2016 Update."

This new report builds on the 2012 and 2016 versions by providing an update on the importance of IP-intensive industries to the U.S. economy and a fresh look at the approach used to measure those results.[1] The update continues to focus on measuring the intensity of industrial IP use and the IP-intensive industries' persistent relationship to economic indicators, such as output, employment, and wages. The data are more refined, improving precision in identifying companies within industries and including new industries in the report. While our methodology does not permit us to attribute our findings to IP alone, it provides a useful benchmark to characterize the economic importance of those industries that most intensively use IP protection and to compare the results internationally.

What is the issue?

The use of *tangible* capital (measurable forms of capital, such as machinery) has long been at the center of creating economic growth. When the agrarian economy dominated, plows and steam engines helped farmers become more productive. During the Industrial Revolution, machinery and factories created new products and economic opportunities. More recently, the digital revolution has brought advanced computing and communications equipment to increase productivity, thereby stimulating economic growth.

In the mid-1990s, spending by companies on *intangible* capital (such as computer software and brand development) began outpacing spending on tangible capital assets in the United States. Companies started investing more in research, development, and the commercialization of intangible assets, than in existing capital to spur growth. IP rights help protect these intangible assets and contribute to economic growth, albeit in ways that are difficult to observe or measure. This study investigates the industries that have been intensive users of IP protections and characterizes the IP-intensive industries' contributions to total U.S. economic output and employment as of 2019.

1 The current and previous reports on IP and the U.S. economy do not claim to assess a causal relationship between IP rights and economic performance.

What did the study find?

Industries in the United States that intensively use IP accounted for 41% of domestic economic activity, or output, in 2019. Output in the IP-intensive industries grew at roughly the same rate as the entire domestic economy during the previous five years, with the exception of the copyright-intensive industries, where output grew at a faster rate than the domestic economy.

Altogether, the IP-intensive industries accounted for 63 million jobs, or 44% of all U.S. employment in 2019. About 33%, or more than 47 million jobs, were directly supported by IP-intensive industries. They also indirectly supported—through the supply of intermediate goods and services—an additional 15.5 million jobs, accounting for the remaining 11% of the total.

States in the Northeast, Mid-Atlantic, Upper Midwest, and West Coast regions generally have the highest concentrations of workers in IP-intensive industries.

This report also finds that, relative to workers in non-IP-intensive industries, workers in IP-intensive industries are more likely to

- earn higher wages, with the highest earnings in the copyright-intensive industries, followed by earnings in the utility patent-intensive industries, design patent-intensive industries, and the trademark-intensive industries;
- work in larger companies (500 employees or more);
- participate in employer-sponsored health insurance;
- participate in employer-sponsored retirement plans;
- have a bachelor's or graduate degree; and
- be veterans.

Finally, the report finds differences in the composition of the workforces in the IP- and non-IP-intensive industries with regard to race and gender.

How was the study conducted?

In identifying IP-intensive industries, this study considers the relative use across domestic industries of four forms of IP protection: utility patents, design patents, trademarks, and copyrights. For the first three forms of IP protection, we measure use at the industry level as the number of IP rights (such as the number of patents granted or trademarks registered) obtained relative to industry employment. We link each granted IP right to an industry by matching registered domestic rights owners to the National Establishment Time Series (NETS) database, which contains detailed data (including primary industry) on more than 60 million establishments and covers the time period from 1989 to 2016. For each IP right, we construct a measure of industry-level IP intensity that is equal to the number of IP rights obtained during the five-year period ending in 2016 per 1,000 employees. An industry is IP-intensive in a particular IP right if its IP intensity is greater than the IP intensity for the economy as a whole.

We identify copyright-intensive industries by referencing the *Guide on Surveying the Economic Contribution of the Copyright-Based Industries* from the World Intellectual Property Organization (WIPO). We do not include all industries identified in the WIPO report because we use a narrower definition of copyright-intensive industries than WIPO. We define copyright-intensive industries as those primarily responsible for the creation or production of copyrighted materials and exclude several industries, such as book and music stores, associated with only the distribution of copyrighted material.

1. Introduction

Throughout human history, the use of *tangible* capital (measurable forms of physical capital, such as machinery) has greatly contributed to economic growth. Whether it was the introduction of the plow and the steam engine when agriculture dominated the economy, machinery and factories at the end of the 19th century, or advanced computing and communications equipment during the digital revolution, businesses have used tangible capital to increase productivity, thereby stimulating economic growth.[2]

In the mid-1990s, investments in *intangible* capital (such as computer software and brand development) overtook tangible capital investments in the United States.[3] U.S. companies are investing more in innovation—the research, development, and commercialization of intangible assets—than they are in the purchase of existing equipment and machines to spur growth.

IP rights provide incentives for organizations and individuals to develop and pursue commercial opportunities related to their intangible assets. Patents grant the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States, thereby giving the patentee the opportunity to reap greater rewards from the underlying innovation. This study considers utility and design patents separately. **Utility patents** protect useful processes, machines, articles of manufacture, and compositions of matter. **Design patents** protect the ornamental design for an article of manufacture (which may relate to its shape/configuration, surface ornamentation, or both), thus allowing companies to further differentiate their products from those of competitors and to improve the odds of commercial success. **Copyrights** incentivize the production of literary and other artistic works by granting authors the exclusive right to engage in the commercialization and distribution of these works. **Trademarks** enhance the value of both patented and unpatented innovations, as well as reputation, by identifying a good's or service's source of origin.

These IP rights protect intangible capital that contribute to economic growth in ways that are difficult to observe and measure.[4] However, we can identify the industries that have been intensive users of IP protections and assess their contributions to U.S. economic output and employment. We show that these IP-intensive industries account for a large portion of economic activity in the United States. Further, IP-intensive industries account for not only a large number of jobs but also jobs that provide a higher level of compensation; workers in IP-intensive industries tend to receive higher wages and have better access to fringe benefits. These workers are also more likely to have full-time positions, work at large companies, and have a demographic profile (e.g., gender, race/ethnicity, and veteran status) that differs significantly from their counterparts in non-IP-intensive industries.

2 See Schwab (2016). Schwab is the founder and executive chair of the World Economic Forum.

3 Intangible capital is made up of investments that are intended to increase future company productivity but that are not traditional or tangible physical capital (e.g., intangible capital includes computer software, databases, research and development, design, training, brand equity, and structural and efficiency improvements to the company's organization, as well as the creation of entertainment, literary, or artistic originals) (Sichel 2008; Haskel and Westlake 2018). Corrado and Hulten (2010) show that the investment rate was higher for tangible capital than intangible capital from 1973 to 1994. This relationship reversed so that the investment rate was higher for intangible capital from 1995 to 2007. Lev (2018) extends the Corrado and Hulten assessment a decade, illustrating how the investment rate for intangible capital remained higher than that of tangible capital through 2017. Spulber (2021, 43) finds that in 2018, "over 85 per cent of the value of the S&P 500 corporations is due to intangible assets." In the United Kingdom, intangible capital investments overtook tangible investments in the early 2000s. See Haskel and Westlake (2018, 24-25).

4 We do not include trade secrets in the report due to limited data on the use of trade secrets at the company or industry level.

This report is the third in the "Intellectual Property and the U.S. Economy" series. It updates and expands on previous reports by including design patents and using more comprehensive company-level data than previously available to the USPTO. Specifically, since the publication of the 2016 report, we successfully matched the vast majority of utility patents, design patents, and trademark registrations granted to U.S.-based entities to the National Establishment Time Series (NETS) database. The NETS database includes almost all U.S. business establishments, representing both public and private companies, as well as information on the primary industry for each establishment, among other measures. By linking the individual IP rights with these company-level data, we now have a direct match of IP rights to both public and private companies.[5]

To determine whether an industry is IP-intensive in utility patents, design patents, or trademarks, this study uses counts of granted IP rights adjusted for industry size. Adjusting for industry size is one way to make industries comparable. For each industry, totals for granted utility patents, design patents, and registered trademarks were calculated during a five-year period (2012-16).[6] These totals were divided by the industry's average employment during the same time period to produce the ratio of IP rights to employment. A particular industry is classified as IP-intensive if its ratio is above the overall average across all U.S. industries.

For instance, we identified 10,334 utility patents that domestic companies in the motor vehicle manufacturing industry received from 2012 through 2016. Average employment in that industry was 191,000 workers, yielding an intensity of 54 utility patents per 1,000 workers. Because this intensity is greater than the overall average intensity of the industries considered (roughly 4.25 patents per 1,000 workers), we classify it as patent-intensive.

We identify design patent–intensive and trademark-intensive industries using the same method. In contrast, and consistent with prior reports, copyright-intensive industries are a subset of the industries identified in WIPO's *Guide on Surveying the Economic Contribution of the Copyright-Based Industries* (WIPO 2003). Finally, we classify an industry as IP-intensive if it is intensive in any single category of IP rights.[7]

See Appendix Table A1 for a list of the IP-intensive industries. Out of 210 industries considered, we find that 13 are copyright-intensive, 70 are utility patent–intensive, 87 are design patent–intensive, and 110 are trademark-intensive. There is significant overlap across the industry clusters. For instance, 68 of the utility patent-intensive industries are intensive in at least one other form of IP. The result is similar for design patent–intensive industries, where 81 of the 87 industries are intensive in at least one other form of IP. Even for trademark-intensive industries, nearly 80% (85 out of 110) are intensive in one or more other forms of IP. Overall, 127 industries are IP-intensive.

5 This approach is similar to the one employed by the USPTO to match trademark registrations to industries in previous reports (see ESA and USPTO 2012, 2016). It is also similar to the approaches taken in recent studies by the European Patent Office (EPO) and European Union Intellectual Property Office (EUIPO) and the United Kingdom Intellectual Property Office (UKIPO). The joint study by the EPO and EUIPO (2019) matched IP rights owners to the Orbis database of European companies, and the UKIPO (2020) study matched rights holders to the Fame database of British companies. Given the changes in matching individual IP rights to industries, we urge caution in comparing the results of this report to those of the previous two reports.

6 The 2012-2016 time period reflects the availability of the establishment-level NETS database. Because the clusters of IP-intensive industries are relatively stable over time, this time period should not unduly influence the findings presented.

7 For more on the methods, see section 2 of the online supplement at www.uspto.gov/sites/default/files/documents/oce-ip-economy-supplement.pdf.

2. Output and employment in the IP-intensive industries

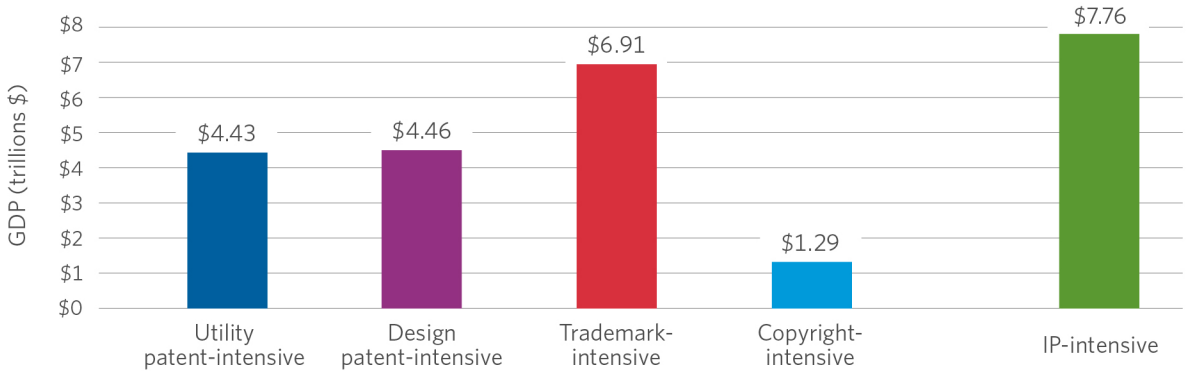
The IP-intensive industries play a significant role in the U.S. economy in terms of both output—measured as gross domestic product (GDP)—and employment. GDP and employment are two of the most important indicators of overall economic performance. The level and trend in GDP measure the volume and trajectory of the country's total domestic output of goods and services. Higher GDP indicates U.S. industries are producing more, while greater employment means more Americans are earning a living. In this section, we report on the output and employment directly attributable to IP-intensive industries.[8]

2.1 Output

In 2019, the group of IP-intensive industries accounted for $7.8 trillion in GDP (Figure 1).[9] By IP type, trademark-intensive industries accounted for nearly $7.0 trillion, while the utility patent–intensive and design patent–intensive industries each accounted for nearly $4.5 trillion. The copyright-intensive industries accounted for a smaller portion of U.S. economic activity, totaling a little under $1.3 trillion. Note that many industries are intensive in more than one type of IP. For this reason, the group total of $7.8 trillion in GDP is smaller than the sum across the individual types of IP.

After adjusting GDP for general price increases (i.e., inflation) in the 2014-2019 period, GDP attributable to the IP-intensive industries increased by roughly 12%, or by an annual rate of 2.3%.[10] Copyright-intensive industries outpaced other IP-intensive industries with respect to GDP growth since 2014—rising by 4.2%. Output in the design patent–intensive, utility patent–intensive, and trademark-intensive industries grew at annual rates of between 2.2% and 2.6%.[11] For comparison purposes, GDP grew by 2.4% per annum between 2014 and 2019, which means

Figure 1: GDP of the IP-intensive industries, 2019



Note: Individual industry values do not sum to the total value because some industries are cross-classified.

Source: USPTO estimates using data from the Bureau of Economic Analysis.

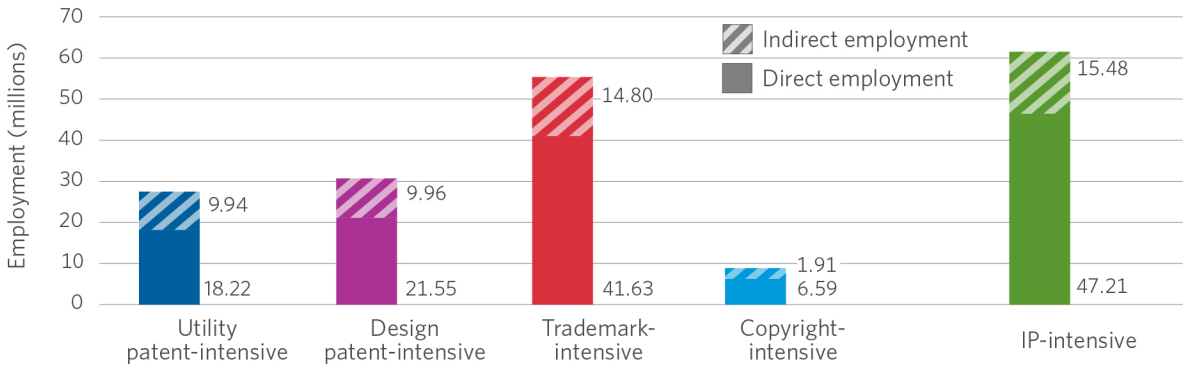
8 Although IP rights can contribute to higher GDP and employment by stimulating investment and innovation (see Verspagen 2006; Park 2007), we do not capture the increased output these innovations may spur in other non-IP-intensive industries.

9 See section 3.1 of the online supplement for a description of how we estimate total output attributed to the IP-intensive industries. Note that individual IP types do not sum to the aggregate IP total because of companies cross-classifying as IP-intensive in the use of multiple types.

10 In constant 2019 dollars, the GDP attributable to the IP-intensive industries was $6.92 trillion in 2014.

11 In constant 2019 dollars, the GDP attributable to utility patent–intensive industries was $3.91 trillion in 2014, to design patent–intensive industries was $4.00 trillion in 2014, to trademark-intensive industries was $6.15 trillion in 2014, and to copyright-intensive industries was $1.05 trillion in 2014.

Figure 2: Total employment supported by IP-intensive industries, 2019



Note: Individual industry values do not sum to the total value because some industries are cross-classified.

Source: USPTO estimates using data from the Bureau of Economic Analysis and Bureau of Labor Statistics.

that the share of total output accounted for by the copyright-intensive industries was the only share that grew significantly during this period.[12] Before detailing those shares, we will highlight employment in the IP-intensive industries.

2.2 Employment

The IP-intensive industries are an important source of employment for the U.S. economy. We measure total employment in these industries as both direct and indirect employment. Direct employment captures all workers in IP-intensive industries, whereas indirect employment captures the employees working in non-IP-intensive industries that depend, at least partially, on final sales in IP-intensive industries.[13]

As illustrated by the dark portions of the bars in Figure 2, direct employment in the IP-intensive industries totaled 47.2 million jobs in 2019. Direct employment across these industries grew by about 7% since 2014. Relative to the U.S. labor market, the share of direct employment in the IP-intensive industries remained stable at 33% between 2014 and 2019.

Similar to earlier reports in this series, this report finds that trademark-intensive industries contributed the most to direct employment—41.6 million jobs in 2019 (up from 38.8 million in 2014), or 88% of all IP-intensive jobs. Copyright-intensive industries accounted for 6.6 million jobs (compared to 5.7 million in 2014). Design patent–intensive industries directly accounted for 21.6 million jobs, which represents an increase of 1.0 million jobs from 2014.

Utility patent–intensive industries directly accounted for 18.2 million jobs in 2019, also a 1-million-job increase over the previous five years.[14] The 2019 result implies a 13% share of direct employment for the utility patent–intensive industries, which is comparable to the 10% of direct employment reported by the European IP offices (EUIPO and EPO, 2019).[15]

12 Notably, the utility patent–intensive industries grew at the economy-wide average despite the uncertainty created by court rulings on subject matter eligibility and certain provisions of the America Invents Act, which some contend diminished patent rights.

13 See section 3.2 of the online supplement for a description of how we estimate indirect employment.

14 Our finding that design patent–intensive industries employ more individuals than utility patent–intensive industries does not imply that design patents are more important to the U.S. economy than utility patents. Simply put, we find more industries to be design patent–intensive. For example, 61 industries are both design patent– and utility patent–intensive, which accounts for 87% of the utility patent–intensive industries but only 70% of the design patent–intensive industries.

15 Our employment result for utility patent–intensive industries is much higher than in previous USPTO reports because of the new approach that links utility patents to industries through the companies that own them.

IP-intensive industries also helped to indirectly support an additional 15.5 million jobs. These jobs are in non-IP-intensive industries that supply goods and services (i.e., the supply chain) as intermediate inputs to IP-intensive industries. When combined with directly supported employment, IP-intensive industries provide 63 million jobs, or 44% of national employment.

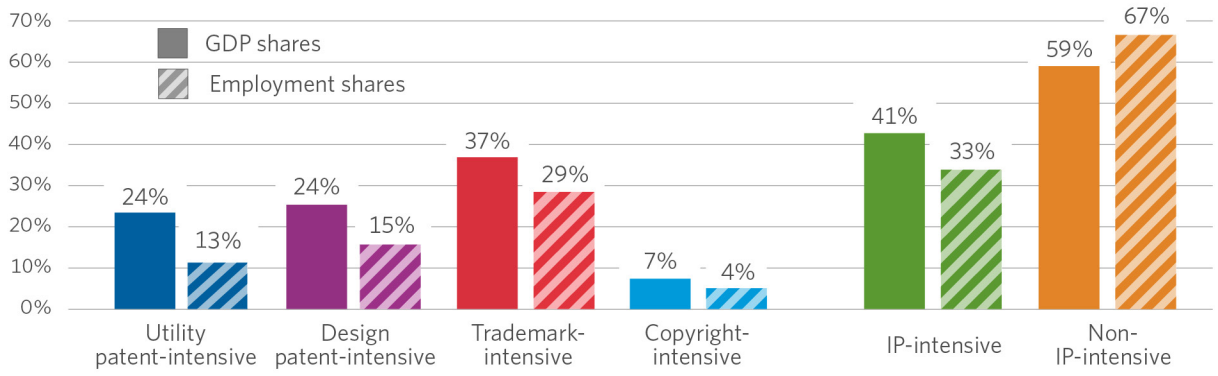
Just as trademark-intensive industries account for the largest contribution to GDP, they are also the largest employers, supporting more than 56 million jobs, or 90% of all jobs supported by the group of IP-intensive industries. Jobs in design patent–intensive and utility patent–intensive industries each hovered around 30 million, and the copyright-intensive industries supported 8.5 million jobs.

2.3 Shares of output and employment

To help place the output (i.e., GDP) and employment numbers attributable to each IP-intensive industry cluster in perspective, we estimate their shares of total U.S. GDP and employment. For instance, as shown in Figure 3, the trademark-intensive industries accounted for 37% of all U.S. domestic output, whereas the copyright-intensive industries accounted for 7%. Notably, IP-intensive industries account for a larger share of national output than national employment, suggesting a high level of labor productivity in these industries.

The output and employment shares are comparable with those of the most recent EUIPO and EPO study (2019). For instance, we attribute 33% of total employment in the United States to IP-intensive industries, whereas the 2019 EUIPO/EPO study found a 29% share for European Union employment. The U.S. GDP share is slightly smaller, 41% versus their 45%, but still comparable. Individually, we find slightly higher shares in the design patent–intensive, utility patent–intensive, and trademark-intensive industries than the EUIPO/EPO reported and a slightly lower share for copyright-intensive industries.

Figure 3: GDP and employment shares of IP-intensive industries, 2019



Note: Individual industry values do not sum to the total value because some industries are cross-classified.

Source: USPTO estimates using data from the Bureau of Economic Analysis and Bureau of Labor Statistics.

3. Examining IP-intensive employment

IP-intensive industries directly support one-third of all jobs in the U.S. economy.[16] In this section, we use the newly available company-level data to take a closer look at employment by considering how the different IP-intensive industry clusters differ by industrial sector. We also consider how employment in these industry clusters has grown over time, and we compare that growth with employment growth in the non-IP-intensive industries. We find that, outside the copyright-intensive industries, employment in the IP-intensive industries has grown more slowly than overall national employment. Lastly, we show how the IP-intensive shares of employment differ across U.S. states.

3.1 Employment by industrial sector

Examining industry employment data at the sector level provides a refined assessment of how dispersed IP-intensive employment is across the economy (see Table 1). Some sectors, such as manufacturing, have long been recognized

Table 1: Distribution of IP-intensive employment across industrial sectors, 2019 (percent)

Sector	Utility patent intensive	Design patent intensive	Trademark intensive	Copyright intensive	IP-intensive	Non IP-intensive
	~ in percent ~					
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	0.1	4.7
Mining, Utilities, and Construction	1.9	0.0	0.0	0.0	0.7	10.5
Manufacturing	44.1	46.0	18.4	0.0	22.6	2.6
Wholesale and Retail Trade	7.1	36.1	27.2	0.0	24.0	11.5
Transportation and Warehousing	0.0	0.0	0.0	0.0	0.0	7.1
Information	11.9	4.4	6.4	29.6	6.4	0.0
Finance, Insurance, Real Estate, and Leasing	5.2	3.7	10.6	0.0	9.4	5.3
Professional, Technical, Management, and Administrative Services	19.0	9.1	24.3	63.0	21.4	13.9
Education and Health Care Services	10.2	0.0	5.5	0.0	8.7	22.1
Arts, Entertainment and Recreation	0.7	0.0	2.9	7.4	2.6	1.8
Accommodation and Food Services	0.0	0.0	0.0	0.0	0.0	15.0
Other Services	0.0	0.6	4.6	0.0	4.1	5.5
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: USPTO estimates using data from the Bureau of Labor Statistics' Labor Productivity and Costs Program.

16 In the sections that follow, we consider only the employment directly attributable to the IP-intensive industries.

as important sources of IP-related jobs. Other sectors are also important for certain types of IP. Indeed, the sector that contributed the most to IP-intensive employment was in the trademark-intensive industries—the wholesale and retail trade sector (11.3 million jobs).[17]

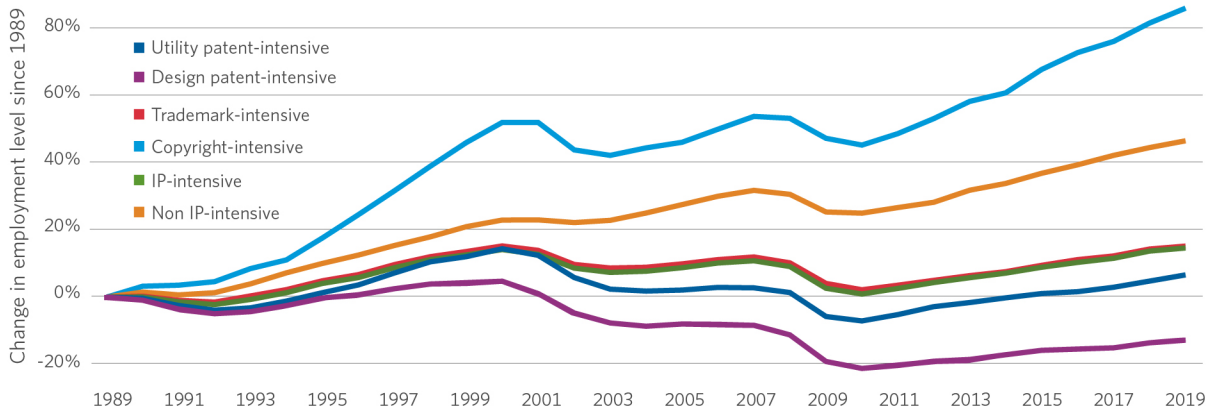
Beyond the manufacturing and the wholesale and retail trade sectors, the professional services sector also has a high concentration of IP-intensive employment. Altogether, these three sectors combine to account for 68% of all IP-intensive employment, compared to 28% of all employment in the non-IP-intensive industries. The heavy emphasis on manufacturing is especially pronounced in the utility patent–intensive and design patent–intensive industries, whereas there is a heavy emphasis on the wholesale and retail trade sector in the design patent–intensive and trademark-intensive industries.

The distribution of employees in the copyright-intensive industries is markedly different from the distributions in the other IP-intensive industries. Of these employees, 63% work in professional service industries, such as computer systems design, specialized design services, and advertising. Another 30% work in the information sector in such fields as publishing, software development, broadcasting, and motion picture and video production.[18]

3.2 Employment trends over time

Since 1989, employment in IP-intensive industries may be characterized by three phases of growth (Figure 4). First, in 1989-2000, employment grew by roughly 14% to reach an initial peak in 2000. The next decade brought both the "dot-com" collapse and the 2008 financial crisis, and IP-intensive employment fell back nearly to its 1989 level. The 2010s brought better economic fortune, and IP-intensive employment grew again by 14%, gaining back all the ground it had lost in the previous decade. Job growth was most rapid during this time in the copyright-intensive industries, adding nearly 30% more jobs and far outstripping the 18% gain made by the non-IP-intensive industries.

Figure 4: Indexed employment in IP-intensive industries, 1989-2019

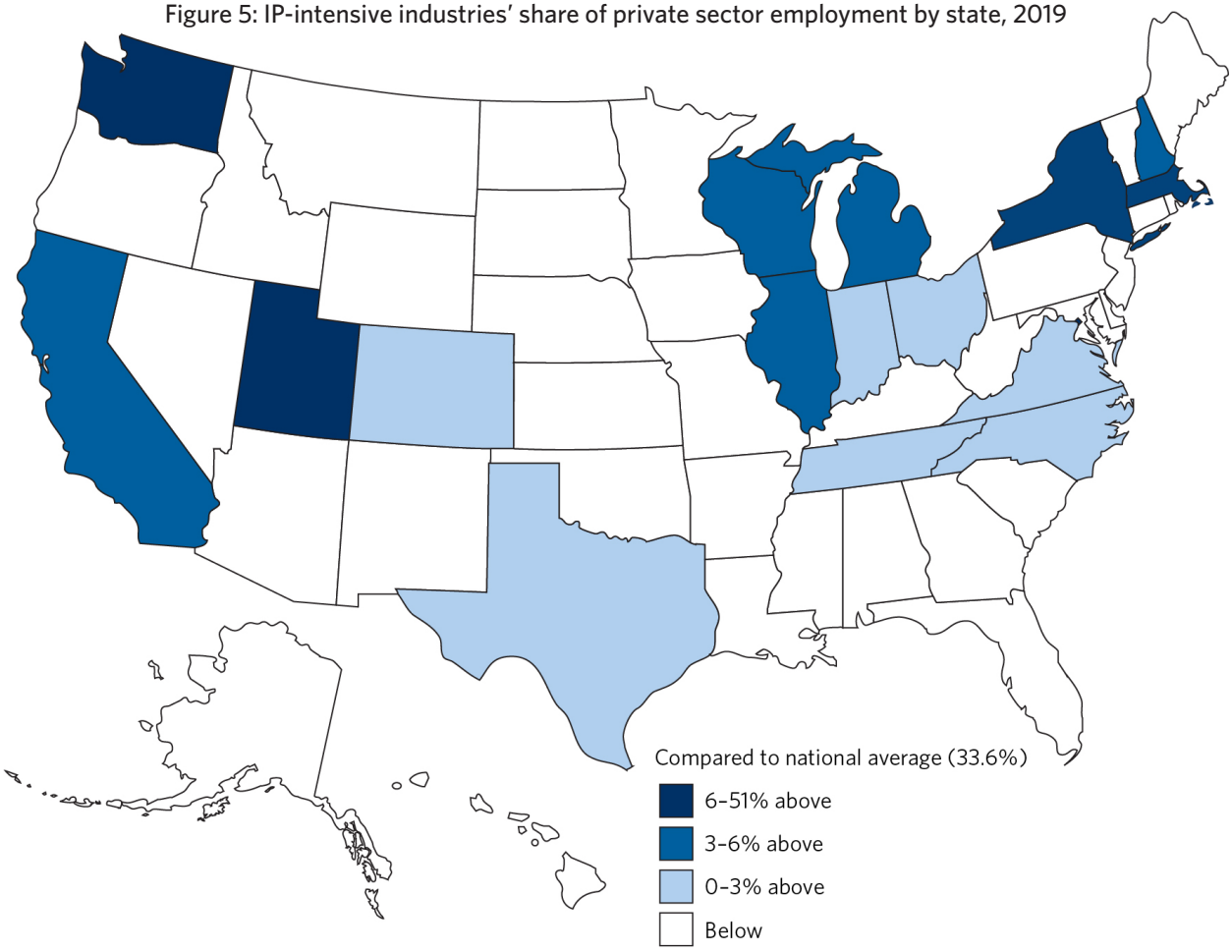


Source: USPTO estimates using data from the Bureau of Labor Statistics' Labor Productivity and Costs Program.

17 In 2019, there were 41.63 million employees in the trademark-intensive industries. Of those jobs, 27% (or 11.3 million) were in the wholesale and retail trade sector.

18 Perhaps surprisingly, less than 10% of employees in the copyright-intensive industries work in the arts and entertainment sector. However, both motion picture and music production fall under the information sector, which at least partially explains this counterintuitive result. Reassigning these industries (which account for 8% of copyright-intensive employment) to the arts, entertainment, and recreation sector would increase its share to more than 15.0% and decrease the information sector share to 21.5%.

Figure 5: IP-intensive industries' share of private sector employment by state, 2019



Note: At the national level, 33.6% of private sector employees work in IP-intensive industries. The states with the highest IP-intensive employment shares are shaded in dark blue. Each of these states exceeds the national average by at least 6%. For instance, Utah, with a 37% IP-intensive employment share, exceeds that national average by [(37-33.6)/33.6]=10.1%. The states shaded in the lighter shades of blue also exceed the national average, but by a smaller amount.

Source: USPTO estimates using data from the Quarterly Census of Employment and Wages.

3.3 IP-intensive jobs by state

In recent years, policymakers have been interested in promoting geographic diversity in innovation.[19] As illustrated in Figure 5, employment in IP-intensive industries varies widely across the United States. Sixteen states along with the District of Columbia exceeded the national average of 33.6% of private sector employment in IP-intensive industries. With a few exceptions, IP-intensive employment clusters in New England, the upper Midwest, and the West Coast. The top five states in 2019 were Utah (37.0%), Washington (36.7%), New York (35.8%), Massachusetts (35.7%), and Illinois (35.5%).[20] These states were among those with an above-average employment share in IP-intensive industries in 2014. Other states with IP-intensive employment of more than 3% above the national average include New Hampshire, California, Michigan, and Wisconsin. For state rankings in each IP-intensive industry cluster, please refer to Appendix Table A2.

19 See division B, title II of the U.S. Innovation and Competition Act of 2021 (S. 1260).

20 The District of Columbia had the highest share of private sector employment in IP-intensive industries at 50.7%.

4. Characteristics of jobs in the IP-intensive industries

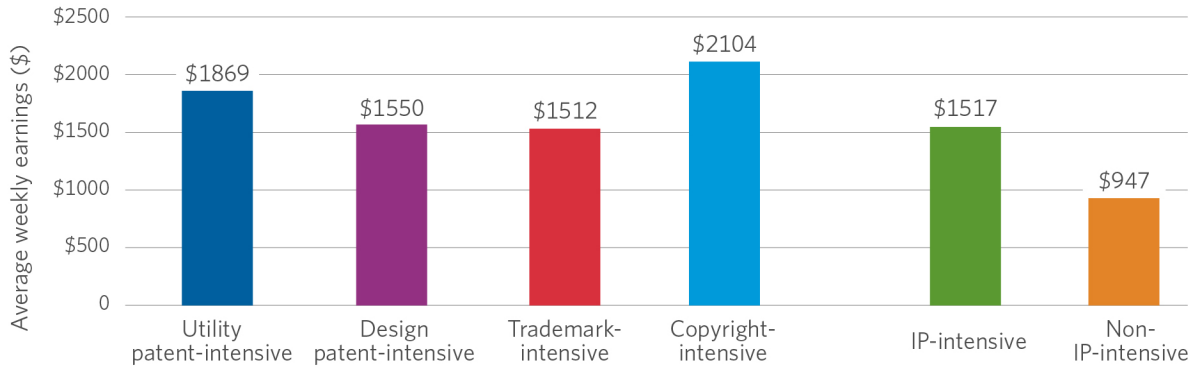
Job creation is important for policymakers. So too is creating jobs that help raise standards of living by providing workers with suitable compensation. For example, jobs that earn higher incomes *and* are accompanied by fringe benefits, such as retirement and healthcare, provide higher levels of compensation, on average, than jobs with lower incomes or no benefits. Therefore, we explore differences in earnings and fringe benefits across the IP-intensive industry clusters and compare these earnings to those in the non-IP-intensive industries. We also explore differences in other employment characteristics such as employer size and employment type. On average, we find jobs provided by the IP-intensive industries provide higher levels of total compensation than those found in the non-IP-intensive industries. Jobs in the two groups also differ across the other characteristics considered.

4.1 Average earnings

In 2019, the average weekly earnings of $1,517 for workers across all IP-intensive industries was 60% higher than weekly earnings for workers in other industries (see Figure 6). Economists refer to this difference as the "earnings premium" for workers in IP-intensive industries. For example, whereas workers in non-IP-intensive industries earned an average of $947 per week in 2019, those in utility patent-intensive industries earned $1,869 per week, yielding an earnings premium of 97% for utility patent-intensive employees. Workers in trademark-intensive industries earned less on average than those in other IP-intensive industry clusters—but still 60% more than workers in non-IP-intensive industries.

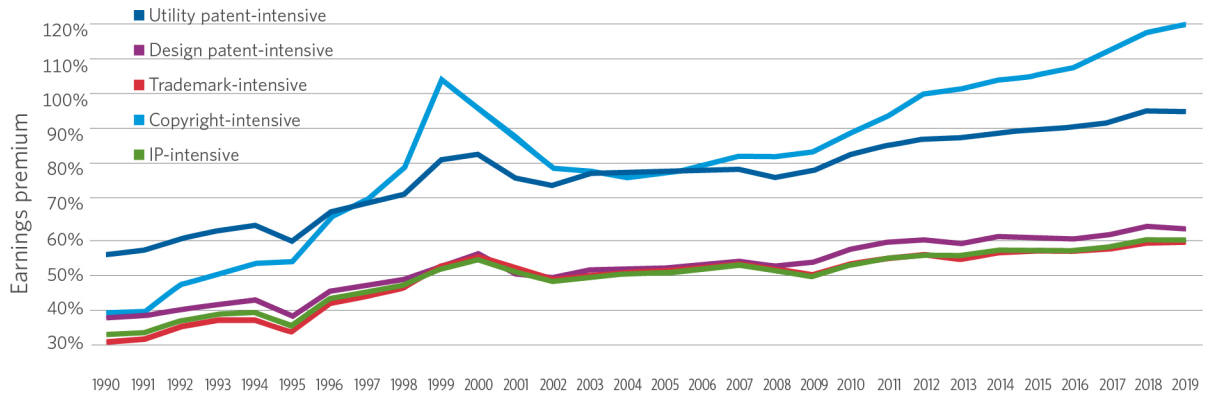
Earnings premiums of IP-intensive jobs, and especially copyright-intensive jobs, have been rising since 1990 (Figure 7). In 2009, the earnings premium in IP-intensive industries stood at 50%, and it grew steadily to reach 60% in 2019. Given that so many of the IP-intensive industries are trademark-intensive, the earnings premium for workers in the trademark-intensive industries has followed a very similar trend over time. Likewise, the design patent–intensive industries tend to have a slightly higher earnings premium than the trademark-intensive industries but have followed a trend over time similar to the aggregate measure.

Figure 6: Average weekly earnings of private wage and salary workers in IP-intensive industries, 2019



Source: USPTO estimates using data from the Quarterly Census of Employment and Wages.

Figure 7: Average weekly earnings premiums of workers in IP-intensive industries relative to non-IP-intensive industries, 1990-2019



Source: USPTO estimates using data from the Quarterly Census of Employment and Wages.

Historically, the earnings premiums enjoyed by workers in the utility patent- and copyright-intensive industries have been higher than those in the other two IP-intensive industries. By the end of the 1990s, the premium for workers in the utility patent-intensive industries relative to non-IP-intensive industries stood at more than 80%. The bursting of the dot-com bubble led to a retreat in the premium in the early years of the 2000s, but it has since grown steadily (except for the period around the financial crisis) and stood at 97% in 2019.

The earnings premium in the copyright-intensive industries experienced a more extreme version of the trends in the utility patent-intensive industries. After the bursting of the dot-com bubble, earnings in these industries relative to non-IP-intensive industries fell such that the premium stood at "only" 80% in 2004. However, relative earnings have recovered in the past 15 years so that the earnings premium stood at 122% in 2019. Notably, the earnings premiums for the utility patent–intensive, design patent–intensive, and copyright-intensive industries were higher in 2019 than at any time during the previous three decades.

4.2 Other employment characteristics

Beyond earnings, other aspects of employment include fringe benefits, such as retirement plans and health insurance, and employment status, such as full-time versus part-time, and self-employment. Full-time employment is typically an indicator of higher job stability and the availability of fringe benefits.[21] Self-employed individuals have more freedom in the type of work they do and when they do it, but they also potentially face unstable income flows and are typically not eligible for fringe benefits.[22]

We also consider employer size. Larger employers typically have more resources to offer richer fringe benefit packages while also offering greater job security and better opportunities for formal training, among other benefits. In this way, employer size can be thought of as a proxy for the other forms of nonwage compensation that we do not specifically include in the analysis.[23] As illustrated in Table 2, these job characteristics vary substantially between IP-intensive and non-IP-intensive industries.[24]

21 For example, Buchmeuller (1999) finds that employers that offer richer benefits packages to full-time workers make greater use of part-time workers for tasks that require lower levels of skill, so as to avoid providing the same benefits to lower-skilled workers.

22 See Krueger (2018).

23 This is not to discount the benefits of working for a small or medium-sized enterprise. Such companies can offer opportunities (such as increased responsibilities) that larger companies sometimes do not. Whether one prefers the benefits of larger or smaller companies, it is enlightening to see how employment in such environments differs across industries.

24 See section 3.3 of the online supplement for more information on the data and methods used for the analyses in this section.

Table 2: Characteristics of employment in IP-intensive and non-IP-intensive industries, 2019 (percent)

Characteristic	Utility patent intensive	Design patent intensive	Trademark intensive	Copyright intensive	IP-intensive	Non IP-Intensive
	~ in percent ~					
Employer Size						
Less than 100 employees	22.6	35.5	42.3	44.0	37.4	44.2
100 to 499 employees	15.8	15.5	13.7	14.5	13.6	12.8
500 or more employees	61.5	49.0	44.0	41.5	49.0	43.1
Share Self-Employed	3.3	8.6	12.0	13.5	10.2	7.9
Share Full-Time	86.3	87.3	81.3	83.3	80.8	74.0
Share health insurance	81.6	75.9	73.8	78.5	74.9	62.7
Share retirement plan	49.9	41.9	39.3	38.2	42.1	36.9

Source: USPTO estimates using data from the 2019 Current Population Survey Annual Social and Economic Supplement.

Utility patent–intensive and design patent–intensive industries have the highest shares of employees working for large enterprises (i.e., 500 or more employees). This is especially true in the utility patent–intensive industries, where more than 60% of employees work for large employers. The employer size distributions for workers in the trademark- and copyright-intensive industries are similar to the distribution observed for the non-IP-intensive industries.

Overall, a little under 9% of the workforce in the United States was self-employed in 2019. Notably, the prevalence of self-employment varies considerably across the IP-intensive industries. The percentage of self-employed workers in the patent-intensive industries is far less than in the trademark- and copyright-intensive industries. In fact, the self-employment rate among workers in the copyright-intensive industries is 50% higher than in the economy at a whole. Many jobs in the creative and performing arts are performed under contract rather than payroll employment, which likely reflects the nature of artistic and creative work as more individualistic and expressive.[25]

A larger share of workers in the IP-intensive industries are employed full-time (35 or more hours per week) and are covered by employer-provided group health insurance than in non-IP-intensive industries. Likewise, more workers in the IP-intensive industries are covered by employer-provided pensions or other comparable retirement plans. Those working in the utility patent–intensive industries had the highest percentages in each of these categories: 86% worked full-time, 82% were covered by an employer-sponsored group health plan, and 50% participated in a retirement plan at work. The additional fringe benefits (e.g., health insurance coverage and retirement plans) that employees in the IP-intensive industries receive widen the gap in total compensation between themselves and their counterparts in the non-IP-intensive industries, who are less likely to receive fringe benefits and typically earn less in the form of wage or salary income.

25 See WIPO (2015), page 40, and Henry et al. (2021)

5. Worker characteristics

The employment characteristics in the previous section describe jobs but not workers. In recent years, there has been a growing interest in the representation of various socioeconomic groups and their production and ownership of IP. To this end, the USPTO has published two reports on the use of the U.S. patent system by women.[26] Identifying active participation in the U.S. IP system for other socioeconomic groups has proven more challenging. The USPTO presently does not collect information from inventors on any socioeconomic characteristics, including gender. For this analysis, we draw on annual employee survey data to determine if there are differences in the socioeconomic composition of workers in the IP-intensive and non-IP-intensive industries. We also assess if such differences exist among the different IP-intensive industry clusters (Table 3).

In 2019, women made up a smaller share of the workforce in IP-intensive industries (43.7%) than in non-IP-intensive industries (54%). This gap was most pronounced in the design patent– and utility patent–intensive industries and could be linked to the fact that significant portions of workers in those industries are employed in manufacturing. The relatively higher share of women working in the non-IP-intensive industries is likely driven by, among other things, the significant share of workers in the healthcare and educational services sectors.[27]

Table 3: Characteristics of workers in IP-intensive and non-IP-intensive industries, 2019 (percent)

Sector	Utility patent intensive	Design patent intensive	Trademark intensive	Copyright intensive	IP-intensive	Non IP-intensive
	~ in percent ~					
Female	37.0	34.3	44.3	40.9	43.7	54.0
Race/Ethnicity						
White, Non-Hispanic	66.3	69.5	67.4	66.7	67.6	58.4
Black, Non-Hispanic	9.2	8.1	8.7	7.7	8.9	13.9
Asian, Non-Hispanic	11.0	6.7	8.4	14.5	8.3	5.6
Other, Non-Hispanic	2.2	2.0	2.3	2.5	2.3	2.6
Hispanic	11.4	13.8	13.3	8.6	13.0	19.5
Veteran Status	6.1	6.3	5.3	5.4	5.3	4.4
Education Level						
Less than high school	3.4	5.5	3.7	0.8	3.6	8.2
High school diploma	18.5	25.9	19.3	9.1	19.4	28.2
Some college or associate degree	21.8	26.3	24.0	19.8	23.4	27.0
Bachelor degree	32.4	30.3	34.0	47.7	32.2	22.2
Graduate degree	23.9	12.1	19.0	22.6	21.4	14.4

Note: Race/ethnicity categories are adopted from the CPS survey. The "Other, Non-Hispanic" race/ethnicity category includes non-Hispanic individuals who identified themselves as an American Indian or Alaskan Native, a Hawaiian or Pacific Islander, or as a mixed-race individual.

Source: USPTO estimates using data from the 2019 Current Population Survey (CPS) Annual Social and Economic Supplement.

26 Toole, Myers et al. (2019), and Toole, Saksena et al. (2020) found that, although women continue to be underrepresented with regard to utility patent grants, more women are entering and staying active in the patent system than ever before. In addition, all of the measures for female participation, including the shares of utility patents with at least one female inventor and all utility patent grantees who are women, have increased in recent years.

27 The Bureau of Labor Statistics reports that, in 2019, 30% of workers in the manufacturing sector were women. Meanwhile, women accounted for 75% of the workforce in the education and health care services sector. See www.bls.gov/cps/aa2019/cpsaat17.pdf.

Roughly two-thirds of the workers in the IP-intensive industries are White, a fifth of them are of Asian or Hispanic descent, and a tenth are Black or another race. Representation of Asians and Whites tends to be higher in the IP-intensive industries than outside of them. Asian representation is relatively high in the utility patent–intensive and copyright-intensive industries, where Asians make up 11% and 14.5% of all employees, respectively. Hispanic and Black representation is highest in the non-IP-intensive industries.

Veterans make up a larger share of workers in IP-intensive industries than in non-IP-intensive industries, accounting for 5.3% of all IP-intensive workers. The share of workers who are veterans is highest in the utility patent–intensive and design patent–intensive industries, where it exceeds 6% in each.

Given that workers in IP-intensive industries generally earn more than their counterparts in the non-IP-intensive industries, and in light of the strong positive relationship between educational attainment and subsequent earnings, we would expect that the distribution of educational attainment would differ between the IP-intensive and non-IP-intensive sectors. Our findings confirm these expectations. We see that a larger share of workers in the IP-intensive industries completed at least a four-year undergraduate program (53.6% vs. 36.6%).[28] The share of workers with four-year degrees among those in the copyright-intensive industries is particularly high at more than 70%, while more than half of the workers in the utility patent-intensive industries completed four-year degrees. Workers in the design patent–intensive industries are less likely to have graduated from college (roughly 43% did so), but workers in these industries are still more likely to have a four-year degree than those in non-IP-intensive industries.

6. Conclusions

This report highlights the contributions of IP-intensive industries to output and employment. In 2019, IP-intensive industries accounted for nearly 41% of U.S. GDP and directly accounted for 33% of all U.S. employment. These industries also indirectly accounted for an additional 11% of U.S. employment. Among the IP industry clusters analyzed, trademark-intensive industries contributed the most to national output and employment, followed by the design patent– and utility patent–intensive industries. Employment in IP-intensive industries tended to track with economy-wide upturns and downturns. Notably, by 2019, IP-intensive industries appeared to have recovered employment losses resulting from the dot-com collapse and the Great Recession.

Both the types of jobs and nature of the workforce tend to differ between IP-intensive and non-IP-intensive industries. Employers in IP-intensive industries tend to be large companies, pay higher wages, and are more likely to offer fringe benefits such as retirement and healthcare plans. In terms of workforce composition, women and minorities, except for those of Asian descent, are underrepresented in IP-intensive industries. Notably, veterans make up a larger percentage of workers in IP-intensive industries (5.3%) compared to in non-IP-intensive industries (4.4%).

Although the industry-level analysis presented in this report provides a broad perspective on the relative importance of IP-intensive industries, additional research and analysis at the company-level would help to build an understanding of the

28 To generate these numbers, we combine the shares of workers whose highest level of educational attainment is a bachelor's degree or a graduate degree.

microeconomic foundations that drive the use of IP and how IP impacts output and employment. For instance, company-level analyses can model and characterize the decisions to seek IP protection more completely. This type of analysis may, for example, shed light on the reasons for observing a persistent and growing earnings premium for workers in IP-intensive industries.

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Appendix

Table A1: IP-intensive industries, 2012–2016

Sector	Utility patent intensive	Design patent intensive	Trademark intensive	Copyright intensive
Fishing, hunting, and trapping			◆	
Support activities for mining	◆			
Animal food manufacturing		◆	◆	
Grain and oilseed milling		◆	◆	
Sugar and confectionery product manufacturing			◆	
Fruit and vegetable preserving and specialty food manufacturing			◆	
Dairy product manufacturing			◆	
Seafood product preparation and packaging			◆	
Other food manufacturing	◆	◆	◆	
Beverage manufacturing			◆	
Tobacco manufacturing	◆	◆	◆	
Fiber, yarn, and thread mills			◆	
Fabric mills	◆	◆	◆	

Table A1: IP-intensive industries, 2012–2016 (*continued*)

Sector	Utility patent intensive	Design patent intensive	Trademark intensive	Copyright intensive
Textile and fabric finishing and fabric coating mills		◆	◆	
Textile furnishings mills		◆	◆	
Other textile product mills		◆	◆	
Apparel manufacturing		◆	◆	
Leather and allied product manufacturing	◆	◆	◆	
Other wood product manufacturing		◆		
Pulp, paper, and paperboard mills	◆	◆	◆	
Converted paper product manufacturing	◆	◆	◆	
Petroleum and coal products manufacturing	◆	◆	◆	
Basic chemical manufacturing	◆	◆	◆	
Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	◆	◆	◆	
Pesticide, fertilizer, and other agricultural chemical manufacturing	◆	◆	◆	
Pharmaceutical and medicine manufacturing	◆	◆	◆	
Paint, coating, and adhesive manufacturing	◆	◆	◆	
Soap, cleaning compound, and toilet preparation manufacturing	◆	◆	◆	
Other chemical product and preparation manufacturing	◆	◆	◆	
Plastics product manufacturing	◆	◆	◆	
Rubber product manufacturing	◆	◆	◆	
Clay product and refractory manufacturing		◆	◆	
Glass and glass product manufacturing	◆	◆	◆	
Cement and concrete product manufacturing		◆		
Lime and gypsum product manufacturing	◆	◆	◆	
Other nonmetallic mineral product manufacturing		◆		
Alumina and aluminum production and processing	◆	◆		
Nonferrous metal (except aluminum) production and processing	◆	◆	◆	
Forging and stamping		◆		
Cutlery and hand tool manufacturing	◆	◆	◆	
Architectural and structural metals manufacturing		◆		

Table A1: IP-intensive industries, 2012–2016 (*continued*)

Sector	Utility patent intensive	Design patent intensive	Trademark intensive	Copyright intensive
Boiler, tank, and shipping container manufacturing	◆	◆		
Hardware manufacturing	◆	◆	◆	
Spring and wire product manufacturing	◆	◆	◆	
Other fabricated metal product manufacturing	◆	◆	◆	
Agriculture, construction, and mining machinery manufacturing	◆	◆	◆	
Industrial machinery manufacturing	◆	◆	◆	
Commercial and service industry machinery manufacturing	◆	◆	◆	
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	◆	◆	◆	
Metalworking machinery manufacturing	◆	◆		
Engine, turbine, and power transmission equipment manufacturing	◆	◆		
Other general purpose machinery manufacturing	◆	◆	◆	
Computer and peripheral equipment manufacturing	◆	◆	◆	
Communications equipment manufacturing	◆	◆	◆	
Audio and video equipment manufacturing	◆	◆	◆	
Semiconductor and other electronic component manufacturing	◆	◆	◆	
Navigational, measuring, electro-medical, and control instruments manufacturing	◆	◆	◆	
Manufacturing and reproducing magnetic and optical media	◆	◆	◆	
Electric lighting equipment manufacturing	◆	◆	◆	
Household appliance manufacturing	◆	◆	◆	
Electrical equipment manufacturing	◆	◆	◆	
Other electrical equipment and component manufacturing	◆	◆	◆	
Motor vehicle manufacturing	◆	◆		
Motor vehicle parts manufacturing	◆	◆		
Aerospace product and parts manufacturing	◆	◆		
Railroad rolling stock manufacturing	◆	◆		
Ship and boat building		◆		
Other transportation equipment manufacturing	◆	◆	◆	

Table A1: IP-intensive industries, 2012–2016 (*continued*)

Sector	Utility patent intensive	Design patent intensive	Trademark intensive	Copyright intensive
Household and institutional furniture and kitchen cabinet manufacturing		◆	◆	
Office furniture (including fixtures) manufacturing	◆	◆	◆	
Other furniture related product manufacturing	◆	◆	◆	
Medical equipment and supplies manufacturing	◆	◆	◆	
Other miscellaneous manufacturing	◆	◆	◆	
Motor vehicle and motor vehicle parts and supplies merchant wholesalers		◆	◆	
Professional and commercial equipment and supplies merchant wholesalers	◆	◆	◆	
Electrical and electronic goods merchant wholesalers	◆	◆	◆	
Machinery, equipment, and supplies merchant wholesalers		◆	◆	
Other durable goods merchant wholesalers		◆	◆	
Drugs and druggists' sundries merchant wholesalers	◆		◆	
Grocery and related product wholesalers			◆	
Petroleum and petroleum products merchant wholesalers		◆	◆	
Other nondurable goods merchant wholesalers		◆	◆	
Health and personal care stores			◆	
Clothing and clothing accessories stores			◆	
Non-store retailers		◆	◆	
All other retail		◆	◆	
Newspaper, periodical, book, and directory publishers			◆	◆
Software publishers	◆	◆	◆	◆
Motion picture and video industries			◆	◆
Sound recording industries			◆	◆
Radio and television broadcasting	◆		◆	◆
Cable and other subscription programming	◆	◆	◆	◆
Wired and wireless telecommunications carriers (except satellite)	◆		◆	
Data processing, hosting, and related services	◆	◆	◆	
Other information services	◆			◆
Nondepository credit intermediation and related activities	◆		◆	
Other financial investment activities		◆	◆	

Table A1: IP-intensive industries, 2012–2016 (*continued*)

Sector	Utility patent intensive	Design patent intensive	Trademark intensive	Copyright intensive
Securities and commodity contracts intermediation and brokerage			◆	
Funds, trusts, and other financial vehicles	◆	◆	◆	
Housing and other real estate			◆	
Machinery and equipment rental and leasing		◆	◆	
Lessors of nonfinancial intangible assets	◆	◆	◆	
Legal services			◆	
Specialized design services		◆	◆	◆
Computer systems design and related services	◆		◆	◆
Management and technical consulting services			◆	
Scientific research and development services	◆	◆	◆	
Advertising and related services		◆	◆	◆
Other professional and technical services			◆	◆
Office administrative services			◆	
Business support services			◆	
Travel arrangement and reservation services			◆	
Other support services	◆	◆	◆	
Junior colleges, colleges, universities, and professional schools	◆			
Other educational services			◆	
Offices of other health practitioners			◆	
Performing arts companies			◆	◆
Spectator sports			◆	
Independent artists, writers, and performers			◆	◆
Promoters of performing arts and sports and agents for public figures			◆	
Museums, historical sites, zoos, and parks			◆	
Gambling industries	◆		◆	
Electronic and precision equipment repair and maintenance		◆	◆	
Other personal services			◆	
Grantmaking, giving, and social advocacy organizations			◆	
Civic, social, professional, and similar organizations			◆	

Table A2: Shares of private sector workers in IP-intensive industries in 2019, by state

State	Utility patent intensive	Design patent intensive	Trademark intensive	Copyright intensive	IP-intensive
	~ in percent ~				
National Average	**13.6**	**16.1**	**29.7**	**4.4**	**33.6**
Alabama	14.0	18.7	25.7	3.1	31.6
Alaska	6.1	5.8	22.2	1.5	25.3
Arizona	11.6	13.5	28.1	3.5	31.0
Arkansas	10.4	15.7	24.4	2.3	27.5
California	14.4	15.9	31.9	6.4	35.1
Colorado	13.8	15.0	31.9	5.9	34.5
Connecticut	14.8	16.7	27.2	4.3	33.2
Delaware	11.7	10.2	28.6	2.4	29.7
District of Columbia	15.8	6.6	44.5	10.8	50.7
Florida	8.8	11.8	28.4	3.6	30.5
Georgia	12.7	16.0	29.2	4.8	32.3
Hawaii	4.0	6.5	22.4	2.6	23.4
Idaho	9.0	14.6	28.1	3.0	30.2
Illinois	14.2	17.1	31.8	4.3	35.5
Indiana	17.0	21.5	27.5	2.5	34.5
Iowa	13.2	18.5	27.6	2.7	31.2
Kansas	13.6	18.2	27.3	3.1	32.5
Kentucky	14.5	18.6	25.7	2.3	32.2
Louisiana	10.9	13.2	24.8	2.2	28.4
Maine	9.3	13.5	25.1	2.8	29.0
Maryland	12.9	11.9	29.8	5.6	31.7
Massachusetts	17.3	16.3	31.2	6.0	35.7
Michigan	17.3	21.0	27.7	3.6	35.3
Minnesota	13.1	17.4	29.8	3.9	32.4
Mississippi	11.0	17.5	23.9	1.6	28.8
Missouri	13.6	16.8	28.0	3.7	32.4

Table A2: Shares of private sector workers in IP-intensive industries in 2019, by state (*continued*)

State	Utility patent intensive	Design patent intensive	Trademark intensive	Copyright intensive	IP-intensive
	~ in percent ~				
National Average	**13.6**	**16.1**	**29.7**	**4.4**	**33.6**
Montana	6.7	10.8	24.0	2.9	25.6
Nebraska	10.8	14.5	26.7	3.6	29.5
Nevada	7.6	10.0	24.1	2.8	25.1
New Hampshire	16.3	18.3	31.3	4.3	34.8
New Jersey	12.4	14.9	31.4	4.2	33.0
New Mexico	12.1	12.3	24.6	2.3	28.2
New York	11.7	13.1	31.9	6.1	35.8
North Carolina	14.3	18.6	30.5	3.5	33.7
North Dakota	10.2	13.8	23.0	2.4	29.4
Ohio	15.6	19.2	28.2	3.2	33.6
Oklahoma	13.0	15.5	24.9	2.2	30.3
Oregon	11.0	16.3	28.4	3.9	30.6
Pennsylvania	13.8	15.5	27.1	3.4	31.8
Rhode Island	11.3	11.9	24.9	3.4	29.5
South Carolina	15.1	18.4	27.9	2.8	32.5
South Dakota	11.3	16.1	27.2	2.3	29.7
Tennessee	14.4	18.8	28.4	3.0	33.6
Texas	13.6	15.5	29.7	3.8	33.7
Utah	15.7	18.0	33.4	5.8	37.0
Vermont	11.0	13.6	27.1	3.9	30.5
Virginia	14.0	12.7	31.6	7.6	34.5
Washington	15.9	19.8	31.1	6.9	36.7
West Virginia	8.8	10.8	20.8	2.2	24.5
Wisconsin	16.3	22.0	31.0	3.1	35.2
Wyoming	9.2	10.0	19.7	2.0	25.3

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