Intellectual Property and the U.S. Economy: 2016 Update

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Executive Summary

Innovation and creative endeavors are indispensable elements that drive economic growth and sustain the competitive edge of the U.S. economy. The last century recorded unprecedented improvements in the health, economic well-being, and overall quality of life for the entire U.S. population.[1] As the world leader in innovation, U.S. companies have relied on intellectual property (IP) as one of the leading tools with which such advances were promoted and realized. Patents, trademarks, and copyrights are the principal means for establishing ownership rights to the creations, inventions, and brands that can be used to generate tangible economic benefits to their owner.

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 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 firms.

This report builds on the 2012 version by providing an update on the impact of IP on our economy and a fresh look at the approach used to measure those results. The update continues to focus on measuring the intensity of IP use, and its persistent relationship to economic indicators such as employment, wages, and value added. While our methodology does not permit us to attribute those differences to IP alone, the results provide a useful benchmark. Furthermore, this and other studies together make clear that IP is a major part of a robust and growing economy.

Accordingly, in an effort to provide a more comprehensive analysis, this report also incorporates findings from other studies that target similar research questions but apply different methodologies. Overall, we find that IP-intensive industries continue to be an important and integral part of the U.S. economy and account for more jobs and a larger share of U.S. gross domestic product (GDP) in 2014 compared to what we observed for 2010, the latest figure available for the 2012 report. We discuss these and other results in more detail below.

1 Gordon 2016.

Principal Findings

- IP-intensive industries continue to be a major, integral and growing part of the U.S. economy.
- This report identifies 81 industries (from among 313 total) as IP-intensive. These IP-intensive industries directly accounted for 27.9 million jobs in 2014, up 0.8 million from 2010.
- Trademark-intensive industries are the largest in number and contribute the most employment with 23.7 million jobs in 2014 (up from 22.6 million in 2010). Copyright-intensive industries supplied 5.6 million jobs (compared to 5.1 million in 2010) followed by patent-intensive industries with 3.9 million jobs (3.8 million in 2010).
- While jobs in IP-intensive industries increased between 2010 and 2014, non-IP-intensive jobs grew at a slightly faster pace. Consequently, the proportion of total employment in IP-intensive industries declined slightly to 18.2 percent (from 18.8 percent in 2010).
- In contrast, the value added by IP-intensive industries increased substantially in both total amount and GDP share between 2010 and 2014. IP-intensive industries accounted for $6.6 trillion in value added in 2014, up more than $1.5 trillion (30 percent) from $5.06 trillion in 2010. Accordingly, the share of total U.S. GDP attributable to IP-intensive industries increased from 34.8 percent in 2010 to 38.2 percent in 2014.
- While IP-intensive industries directly accounted for 27.9 million jobs either on their payrolls or under contract in 2014, they also indirectly supported 17.6 million more supply chain jobs throughout the economy. In total, IP-intensive industries directly and indirectly supported 45.5 million jobs, about 30 percent of all employment.
- Private wage and salary workers in IP-intensive industries continue to earn significantly more than those in non-IP-intensive industries. In 2014, workers in IP-intensive industries earned an average weekly wage of $1,312, 46 percent higher than the $896 average weekly wages in non-IP-intensive industries in the private sector. This wage premium has largely grown over time from 22 percent in 1990 to 42 percent in 2010 and 46 percent in 2014. Patent- and copyright-intensive industries have seen particularly fast wage growth in recent years, with the wage premium reaching 74 percent and 90 percent, respectively, in 2014.
- The educational gap between workers in IP-intensive and other industries observed in 2010 virtually disappeared by 2015. The share of workers in IP-intensive industries with a bachelor's degree or higher fell from 42.4 percent in 2010 to 39.8 percent in 2015, whereas that percentage increased from 34.2 percent to 38.9 percent for workers in non-IP-intensive industries.
- Revenue specific to the licensing of IP rights totaled $115.2 billion in 2012, with 28 industries deriving revenues from licensing.

- Total merchandise exports of IP-intensive industries increased to $842 billion in 2014 from $775 billion in 2010. However, because non-IP-intensive industries' exports increased at a faster pace, the share of total merchandise exports from IP-intensive industries declined to 52 percent in 2014 from 60 percent in 2010.
- Exports of service-providing IP-intensive industries totaled about $81 billion in 2012 and accounted for approximately 12.3 percent of total U.S. private services exported in 2012.

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I. Introduction

"Whether through the music or movies that inspire us, the literature that moves us, or the technologies we rely on each day, ingenuity and innovation serve as the foundation upon which we will continue to grow our economies and bridge our cultural identities."

— President Barack Obama, April 26, 2016

Innovation and creative endeavors are indispensable elements that drive economic growth and sustain the competitive edge of the U.S. economy. The last century recorded unprecedented improvements in the health, economic well-being, and overall quality of life for the entire U.S. population as technological innovation in medicine and groundbreaking scientific advances in many fields were realized.[2] Tremendous advances in worker productivity boosted individuals' earning capacity. This allowed consumers to purchase and enjoy the abundant supply of new products and increasingly diverse creative works of art. As goods and services became more accessible, they were distinctively marked so buyers could readily select products that meet their individual preferences.

Intellectual property (IP) has been a vital instrument for achieving such advances throughout our nation's history. A growing number of U.S. and international studies demonstrate the important role of IP in economic activity. This report shows that IP-intensive industries continue to be a major, integral and growing part of the U.S. economy. We find that the 81 industries designated as IP-intensive directly accounted for 27.9 million jobs and indirectly supported an additional 17.6 million jobs in 2014. Together, this represented 29.8 percent of all jobs in the U.S. The total value added by IP-intensive industries amounted to 38.2 percent of U.S. GDP and IP-intensive industries paid 47 percent higher weekly wages compared to other industries. Further, at $842 billion the merchandise exports of IP-intensive industries made up 52 percent of total U.S. merchandise exports. Exports of service-providing IP-intensive industries totaled about $81 billion in 2012, accounting for 12.3 percent of total U.S. private exports in services.

IP incentivizes the creation of new goods and services by conferring exclusive rights to their creators. While inventions typically are a product of ingenious endeavors that require long, persistent, and meticulous effort, subsequent duplication and use of such innovations are often less costly. Patents add to the incentive that inventors have to invest in costly research and development (R&D) by providing the opportunity to reap the rewards of their innovations. In the words of Abraham Lincoln, the patent system "added the fuel of interest to the fire of genius in the discovery and production of new and useful things."[3] Similarly, copyrights provide the framework that incentivizes authors to create literary, artistic, musical, dramatic, cinematic, and other works by granting them the exclusive right to engage in the activities that derive economic bene-

2 Gordon 2016.

3 Nicolay and Hay 1905, 113.

fits from their work. Thus, patents and copyrights serve as tools to stimulate individual, firm, and industry level entrepreneurial ventures that feed into economic activities nationwide.

To further exploit the potential of their competitive advantage, producers need effective ways to indicate to consumers the reliability of their products' source. A trademark "makes effective competition possible in a complex, impersonal marketplace by providing a means through which the consumer can identify products which please him and reward the producer with continued patronage."[4]

Patents, trademarks, and copyrights are the principal means for establishing ownership rights to the creations, inventions, and brands that can be used to generate tangible economic benefits to their owner. In 2012, the Department of Commerce issued a report titled *Intellectual Property and the U.S. Economy: Industries in Focus*. Produced jointly by the Economics and Statistics Administration (ESA) and the United States Patent and Trademark Office (USPTO), the report aimed to identify the industries that rely most heavily on patents, trademarks, or copyrights as IP-intensive and estimate the contribution of those industries to the U.S. economy. It generated a substantial amount of interest in the IP community, both domestically and abroad, and motivated other agencies and organizations to produce similar studies investigating the use and impact of IP across countries, industries, and firms.

This update of the 2012 report has two purposes. First, we duplicate the methodology of the 2012 report to examine how the economic contribution of U.S. IP-intensive industries has evolved. Second, we review related studies that have been completed since 2012, and discuss the contributions of the different methods. The latest results bolster the 2012 findings, confirming — across a range of methodologies — the importance of IP in the economy. In fact, the relative contribution of IP-intensive industries generally increased in the last several years. We describe these and other results in more detail in Section IV below.

This report attempts to understand the ways in which IP is used across different industries. Our methodology aims to measure the intensity of IP use, but does not directly measure the extent to which IP incentivizes the creation of new goods and services. We find differences in employment, wages, value added, and other outcomes that are correlated with IP use, although our methodology does not permit us to attribute those differences to IP alone. As in any area of research, no single study will yield the complete picture.

This is why it is important for policy-makers and researchers to consider multiple methodologies for understanding how IP functions in the economy. We are encouraged that other organizations, agencies, and governments have been energized to replicate, extend, or supplement the work done in the 2012 report. Taken together, these contributions significantly advance our knowledge. Persistent research with a solid empirical foundation will continue to provide the evidence upon which good policy can rest. The evidence to date demonstrates that IP is an important part of a robust and growing economy.

4 Smith v. Chanel, Inc. 402 F.2d 562, 566 (9th Cir. 1968).

II. The 2012 Report and Related Studies

It is instructive to evaluate the methodology and results of the 2012 report in the context of the related research completed since the first report's release. The 2012 report identified IP-intensive industries, and compared those industries to other industries across a number of different dimensions. The methodology consisted of identifying IP-intensive industries based on the use of IP. According to that report, intellectual property protection affects commerce throughout the economy by:

- Providing incentives to invent and create;
- Protecting innovators from unauthorized copying;
- Facilitating vertical specialization in technology markets;
- Creating a platform for financial investments in innovation;
- Supporting entrepreneurial liquidity through mergers, acquisitions, and IPOs;
- Supporting licensing-based technology business models; and
- Enabling a more efficient market for trading in technology and know-how.

All of these mechanisms combine to determine the value of IP to individuals and firms and the contribution of IP to the economy. Analyzing and measuring all the ways in which IP impacts the economy is beyond the scope of any individual report. However, a number of studies quantifying the economic impact of IP-intensive firms have emerged since the publication of the 2012 report. We are encouraged to see continued interest in research that builds upon, challenges, and provides alternative methodologies to the 2012 report.

This section reviews a selected group of studies that targeted similar research questions to the 2012 report and which were published after that time. The European Patent Office and the Office for Harmonization in the Internal Market (OHIM) published a comparable report in 2013 using European Union (EU) data.[5] [6] It relies on similar methodologies to identify intellectual property rights (IPR) intensive industries in Europe and quantifies their contribution to the European economy in the 2008–2010 period. The study finds that IPR-intensive industries generated €4.7 trillion worth of economic activity, which amounted to almost 39% of EU GDP. Furthermore, the study finds that IPR-intensive industries directly employed 56.5 million Europeans, which accounted for almost 26% of all jobs for the period. The similarity in the findings serves to further reinforce the core message of the 2012 report that IP-intensive industries are an integral part of the economy.

While these reports quantify the contribution of IP-intensive industries in the economy, there is justified skepticism as to how accurately the employment and value added outcomes can be at-

5 As of March 2016, OHIM is known as the European Union Intellectual Property Office.

6 EPO and OHIM 2013.

tributed to IP itself. For example, the fact that we observe significant employment in IP-intensive industries does not inform us about the contribution of IP to economic growth because employment in non-IP-intensive industries is a viable alternative. The reports also study the wage differentials between IP-intensive and non-IP-intensive industries. Both reports show that IP-intensive industries pay higher wages than other industries. While this wage premium is noteworthy, we cannot conclude that the wage differential is due to IP.

In 2015, OHIM issued a second report, relying on firm-level data to compare firms that own IPRs to those that do not.[7] The report considers a representative sample of over 130,000 European firms and studies their economic outcomes, taking into account whether they own patents, trademarks, or designs. The study finds that IPR-owning firms earn, on average, 29 percent more in revenue per employee and pay, on average, 20 percent more in wages. This difference is even more significant for small and medium enterprises that own IPRs as they earn 32 percent more in revenue, on average, per employee compared to their counterparts with no IPRs. While this study does not identify the causal impact of IPRs, it provides detailed evidence of a high correlation between IPR-ownership and economic performance.

The methodology in the 2015 OHIM study addresses a limitation in the way the earlier reports defined IP-intensive industries. The previous reports measure IP-intensity at the industry-level based on the aggregate volume of IP relative to employment. They then designate an industry as IP-intensive or non-IP-intensive based on whether the IP to employment ratio falls above or below the average for all industries. There are reasonable, alternative measures of IP intensity; including a ratio of IP to gross output, research and development, or value added. But data limitations, such as data sensitivity and the absence of legal requirements on producers to record and report on internal activities, preclude access to data at the level of detail needed to systematically employ such measures. The 2015 OHIM report successfully overcomes these limitations by developing detailed IP-to-firm data necessary for conducting a disaggregated analysis comparing IPR-owning with non-IPR-owning firms in Europe.

USPTO and U.S. Census researchers have recently constructed patent-to-firm data to enable similar analysis for the U.S.[8] The authors match data on owners and inventors of U.S. patents issued between 2000 and 2011 to U.S. Census Bureau data on firms and workers. Using this comprehensive database, the authors analyze patent-intensive firms and their contribution to the U.S. economy. They find that patenting firms represent only 1 percent of U.S. firms (2000–2011) but are among the largest in the economy, accounting for 33 percent of employment. Patenting firms create more jobs than their non-patenting counterparts of the same age across all age categories except the very youngest (firms <1 year old). The authors also find that most patenting firms are small businesses. But, because they patent less frequently, the majority of U.S. patents are held by a few large, prolific patenting firms. Lastly, they find that while the manufacturing sector is par-

7 OHIM 2015.

8 Graham et al. 2015.

ticularly patent intensive with more than 6 percent of firms owning a patent between 2000 and 2011, the majority of patenting firms are in the services and wholesale sectors.

A handful of recent academic papers have also attempted to measure the impact of IP on firm performance. One recent notable contribution uses detailed USPTO data to study whether patents have a causal impact on the growth potential of startups.[9] The authors find that patents do in fact "help startups create jobs, grow their sales, innovate, and eventually succeed" and that a delay in a patent grant can retard the benefit of each of these.[10] [11]

Another line of research uses surveys to study the role that IP plays in the economic performance of firms as well as their innovative efforts. A recent study surveys over 6,000 American manufacturing and service sector firms to evaluate the extent to which firms that introduce new products in the market outsource innovation to specialized firms. It finds that between 2007 and 2009, 16 percent of manufacturing firms introduced a new product in their industry. Of these innovators, 42 percent reported patenting their most significant new product, though there is considerable variation across industries and firms. More R&D-intensive industries, i.e., those with above average share of firms investing in R&D, tend to patent new products at higher than average rates. Roughly 63 percent of large manufacturing firms reported patenting their most significant new product innovation, compared to only 47 percent of medium firms and 36 percent of small firms.[12]

The UK Intellectual Property Office published another survey based study in 2012 that aims to quantify the extent to which patents increased expenditure in R&D. Using data from the UK innovation survey and linked data on firm performance, the authors estimate the patent profit premium, meaning the additional returns to R&D that can be attributed to patent protection.[13] They find that patent premiums are positive and provide incentives to invest in R&D, though estimates vary by type of firm and industry. Estimated patent premiums are lower for smaller firms and firms outside biotech and pharmaceutical industries. However, premium and incentive effects are comparable for young and older firms, indicating that patent protection can incentivize R&D for new as well as established innovators.

9 Farre-Mensa et al. 2016. By employing an instrumental variables approach, the authors are able to identify a causal relationship, as opposed to a mere correlation.

10 Ibid., 2.

11 Note that some startups may prefer a delay in patent grant because a larger share of its overall economic value may be realized later in the patent term or during the period of time that is accrued due to patent term adjustment.

12 Arora et al. 2016.

13 Arora et al. 2012.

Taken together, these contributions significantly advance our knowledge about the role of IP in the economy. An important direction of future work is exploiting even more granular data and seeking methods to identify causal links between IP and economic performance. Survey based studies, which can be designed to target specific research questions, will also continue to improve our understanding about the extent to which IP contributes to the economy. And it is critical that policy-makers consider scientific research standards when evaluating evidence with policy making implications.

III. Identifying IP-Intensive industries

As in the 2012 report, IP-intensity for an industry is defined as the count of its intellectual property for a given period of time relative to the industry's total employment. An industry is designated as IP-intensive if its IP-count to employment ratio is higher than the average for all industries considered. Dividing IP-counts by employment is one approach to adjust for differences in industry size, which makes industries more comparable. However, there are other alternatives. For instance, IP-counts could be normalized by capital holdings, research and development expenditures, value added, or gross output. In addition, other methods are available for differentiating between IP-intensive and non-IP-intensive industries.[14] To maintain consistency and allow comparisons to the 2012 report, this update follows the methodologies applied previously but expands coverage to the 2009–2013 period.[15]

Patents

The USPTO grants utility, plant, and design patents that give the grantee 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 Unites States."[16] Using the U.S. Patent Classification (USPC) scheme, patents are classified in over 450 patent "technology classes" that distinguish their inventive content.[17] [18] The USPTO maintains a general concordance between its technology classifications and 30 North American Industry Classification (NAICS) codes. The concordance enables analysts to associate utility patents with these NAICS coded industries.[19] We rely on NAICS-based patent counts for 2009 to 2013 to identify patent-intensive industries.[20] This approach strictly limits the patent analysis to the manufacturing sector because the concordance only associates patents with manufacturing industries. Non-manufacturing industries, such as construction, utilities, and information, may rely on utility patents, but these industries are not captured by the patent-NAICS concordance. We calculate a measure of industry patent "intensity" defined as the ratio of total patents over the five years in a NAICS category to the average payroll

14 For example, analyzing the differences by deciles or even evaluating a continuous function are possible alternative approaches that may prove informative.

15 Detailed description of the methodology is provided in the Appendix.

16 35 U.S.C. § 154(a)(1).

17 Utility patents may be classified into more than one technology class but are organized according to their primary classification.

18 While it does not affect any of the results in this report, it is worth noting that official use of the USPC was discontinued in January of 2015. Patents are now classified using the Cooperative Patent Classification (CPC) scheme.

19 This concordance was created by the USPTO with financial support from the National Science Foundation. Because no similar concordances to NAICS are available for plant or design patents, only utility patents are used in our analysis. See www.uspto.gov/web/offices/ac/ido/oeip/taf/all_tech.htm for more information on utility patents. For an overview of NAICS, see www.census.gov/eos/www/naics/index.html.

20 See www.uspto.gov/web/offices/ac/ido/oeip/taf/data/misc/patenting_trends/info_ptrends2008.txt.

employment by industry.[21] Because employment reflects the overall size of an industry, dividing patent counts by employment normalizes patenting activity with respect to industry size.[22] This approach evens the playing field, so that the most patent-intensive industries are defined not as the ones with the most patents, but rather as those with the most patents per worker.

Nearly all the industries identified as patent-intensive in the 2012 report are also designated as such for the 2009–2013 period. One industry, *resin, synthetic rubber, fibers, and artificial and synthetic fibers and filaments* (NAICS 3252), did not make the cutoff in the current report. In addition, some changes occurred in the rank-order of these industries. For example, *semiconductor and other electronic components* (NAICS 3344) was previously designated as the third most patent-intensive industry, but dropped to fifth place. However, based on the close similarity in the list and rank-order of patent-intensive industries across reports, it appears that patent-intensity at the industry level is quite persistent over time.[23]

Trademarks

A trademark is defined as "a word, phrase, symbol, or design, or a combination thereof, that identifies and distinguishes the source of the goods of one party from those of others."[24] Through exclusive rights of use, trademarks confer legal protection that enables companies to communicate to consumers the quality characteristics of their products and services and recoup investments therein.

As in the 2012 report, this study uses three different approaches to identify trademark-intensive industries.[25] The first approach, as with patents, measures the trademark-intensity of an industry based on the ratio of trademark counts to employment and designates those industries with an above average ratio as trademark-intensive. Starting with the complete set of trademark registrations, we matched publicly traded companies by their name to a separate database containing information on the firms' primary industry and number of employees. These data allowed us to calculate trademark intensity by industry for the matched firms. The second approach uses the USPTO's listing of top 50 trademark registering companies (which, unlike the first approach, include both private and public companies) from the Performance and Accountability Reports for 2009–2013 and identifies industries that appear repeatedly as trademark-intensive. To expand coverage for privately-held companies and for smaller and younger firms, the third approach draws a random sample of 300 registrations from the 194,326 trademark registrations in 2013. We assign NAICS industry codes to the U.S. registrants in the sample and calculate the industry share of total registrations, labeling those with an above average share as trademark-intensive.

21 Using a five-year period (in this case, years 2009–13) instead of just one year helps minimize the chance that anomalies in any given year will skew our results.

22 Value added and gross output are two alternative gauges of industry size; however, estimates at the level of detail needed for this analysis are not available due to data confidentiality limitations.

23 A detailed discussion of the methodology and a table of results are provided in the Appendix.

24 *U.S.* Patent and Trademark Office 2016. We use the term trademark to encompass both trade and service marks.

25 These methodologies are discussed in detail in the Appendix.

We combine the results from each approach to form the final group of trademark-intensive industries.

The results from these exercises, which are summarized in Tables A-6, are noteworthy in at least two ways. First, the diversity of the industries listed as trademark-intensive is indicative of both the spread and intensity of trademark use. Second, we observe significant consistency across the three methodologies in the industries designated as trademark-intensive; which provides some evidence on the validity of these approaches.

For robustness, we also compare the final group to the industries covered by the companies in Interbrand's listing of Best Global Brands in 2013.[26] As discussed in the Appendix, these two groups overlapped significantly further corroborating our findings.

Copyrights

The 1976 Copyright Act of the U.S. states that copyright protects "original works for authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device."[27] Copyright-intensive industries were first defined by the World Intellectual Property Organization's (WIPO) *Guide on Surveying the Economic Contribution of the Copyright-based industries* and subsequently applied to the U.S. Economy.[28] As in the 2012 report, this update uses a narrower definition of copyright-intensive industries than WIPO, focusing on industries that produce creative works and excluding several industries associated with the distribution of copyrighted material. We define copyright-intensive industries as those primarily responsible for the *creation or production* of copyrighted materials. This group includes nearly all industries traditionally associated with production of creative works.[29]

26 Interbrand 2013.

27 17 U.S.C § 102(a).

28 World Intellectual Property Organization 2003. See, for example, Siwek 2009.

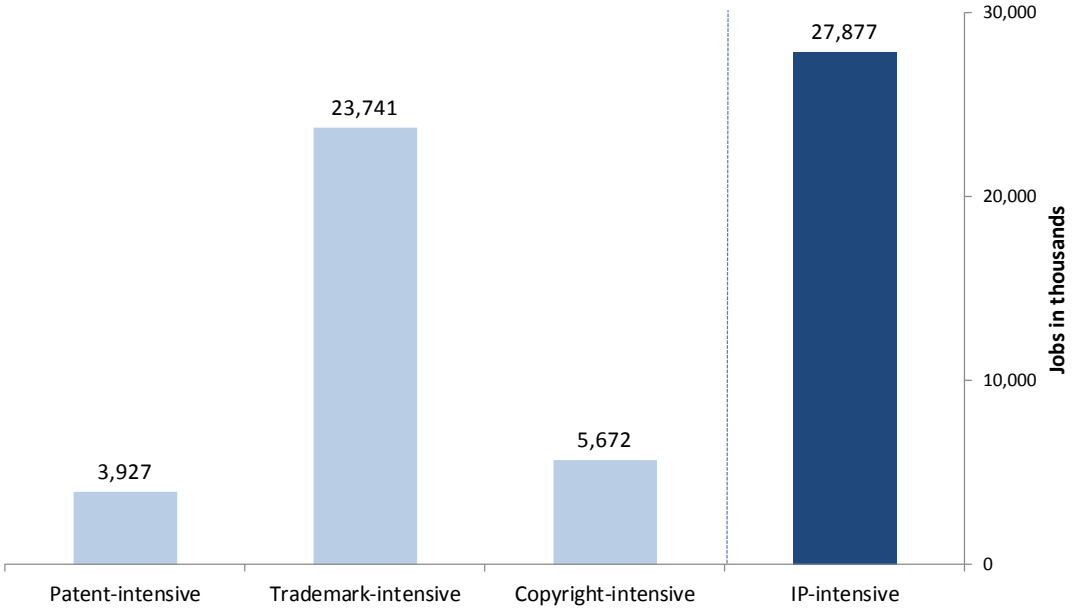
29 A more detailed description of our methodology is provided in the Appendix.

IV. IP-Intensive Industries in the Economy

Employment

Employment in IP-intensive industries totaled 27.9 million in 2014, representing 18.2 percent of all jobs in the economy (See Figure 1). Since the 2012 report, employment in IP-intensive industries has generally increased, rising from 27.1 million in 2010. However, due to employment growth in non-IP-intensive industries, IP-intensive industries account for a slightly lower overall percentage of U.S. jobs (down from 18.9 percent in 2010). As in the 2012 report, trademark-intensive industries contribute the most to employment. These industries accounted for 23.7 million jobs in 2014 (up from 22.6 million in 2010), or 85 percent of all IP-intensive jobs (up from 83 percent in 2010).[30] Copyright-intensive industries supplied 5.6 million jobs (compared to 5.1 million in 2010) followed by patent-intensive industries with 3.9 million jobs (3.8 million in 2010). Twenty-three of the 81 industries considered in this report were intensive in more than one form of IP protection. For instance, *Audio and Video Equipment Manufacturing* (NAICS 3343) is both patent-intensive and trademark-intensive. These multi-intensity industries accounted for 5.5 million jobs (up from 4.5 million jobs for 24 industries in 2010).[31]

Figure 1. Employment in IP-Intensive Industries, 2014



Source: ESA calculations using data from the Bureau of Labor Statistics' Industry Productivity program.
Note: Estimates include wage and salary employment, the self-employed, and unpaid family workers. Because several industries were found to be trademark-intensive and patent- or copyright-intensive, total employment in IP-intensive industries is less than the sum of employment in patent-, trademark-, and copyright-intensive industries.

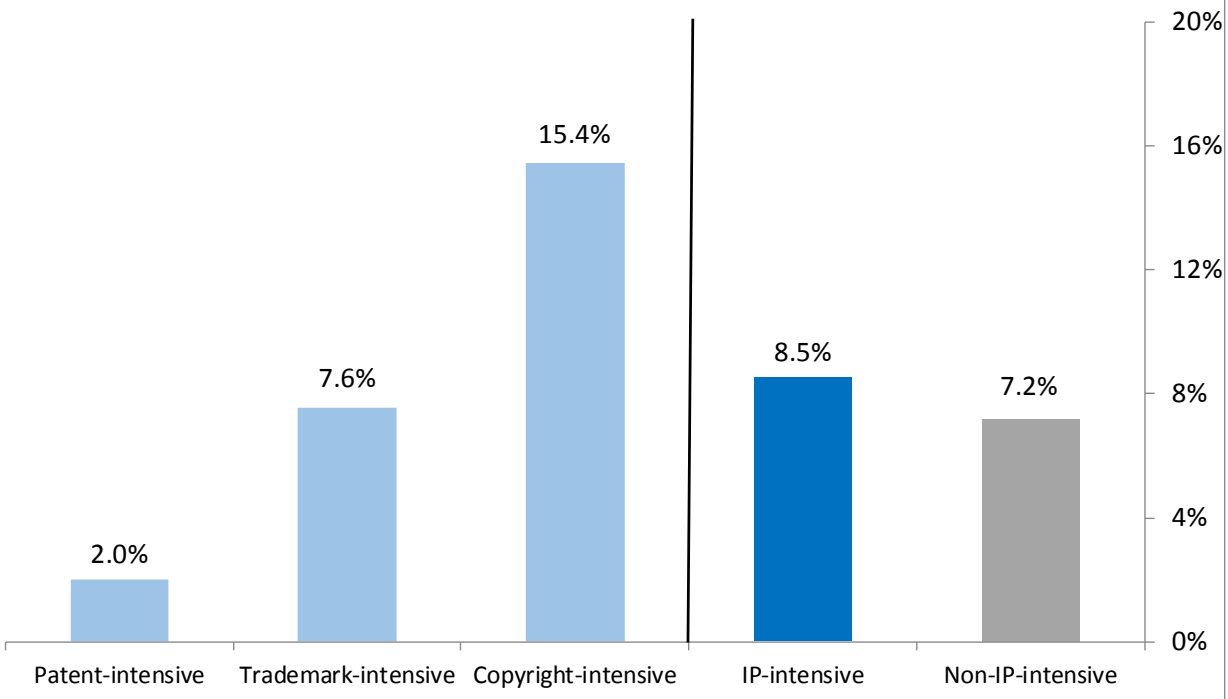
30 The fact that 66 out of the 81 IP-intensive industries are trademark-intensive industries likely explains why these industries continue to account for a large majority of IP-intensive industries employment.

31 Because some industries are intensive in more than one form of IP, the sum across the individual groups is larger than the total for IP-intensive industries. The 5.5 million figure can be calculated by subtracting overall IP intensive employment from the sum of employment of trademark, patent, and copyright intensive industries.

Self-employed individuals make up a significant portion of jobs in IP-intensive sectors, particularly in copyright-intensive industries. Self-employed individuals accounted for 2.4 million jobs in 2014 (unchanged from 2010); which amounts to 8.5 percent of IP-intensive industries employment (compared to 8.9 percent in 2010). By contrast, the self-employed share of jobs in non-IP-intensive industries dropped to 7.2 percent in 2014 from 8.8 percent in 2010 (See Figure 2).

At the individual IP level, the share of self-employed has exhibited relatively small changes since 2010. Trademark-intensive industries increased their share from 7.3 percent in 2010 to 7.6 percent in 2014, while patent- and copyright-intensive industries dropped to 2.0 percent (from 2.2 percent) and 15.4 percent (from 16.5 percent), respectively. The fact that copyright-intensive industries continue to have the highest self-employment share is not surprising as many jobs in the creative and performing arts are contract rather than payroll jobs, usually related to the completion or performance of a specific authored work. However, it should also be noted that trademark-intensive industries continue to have the largest number of self-employed persons at 1.8 million.

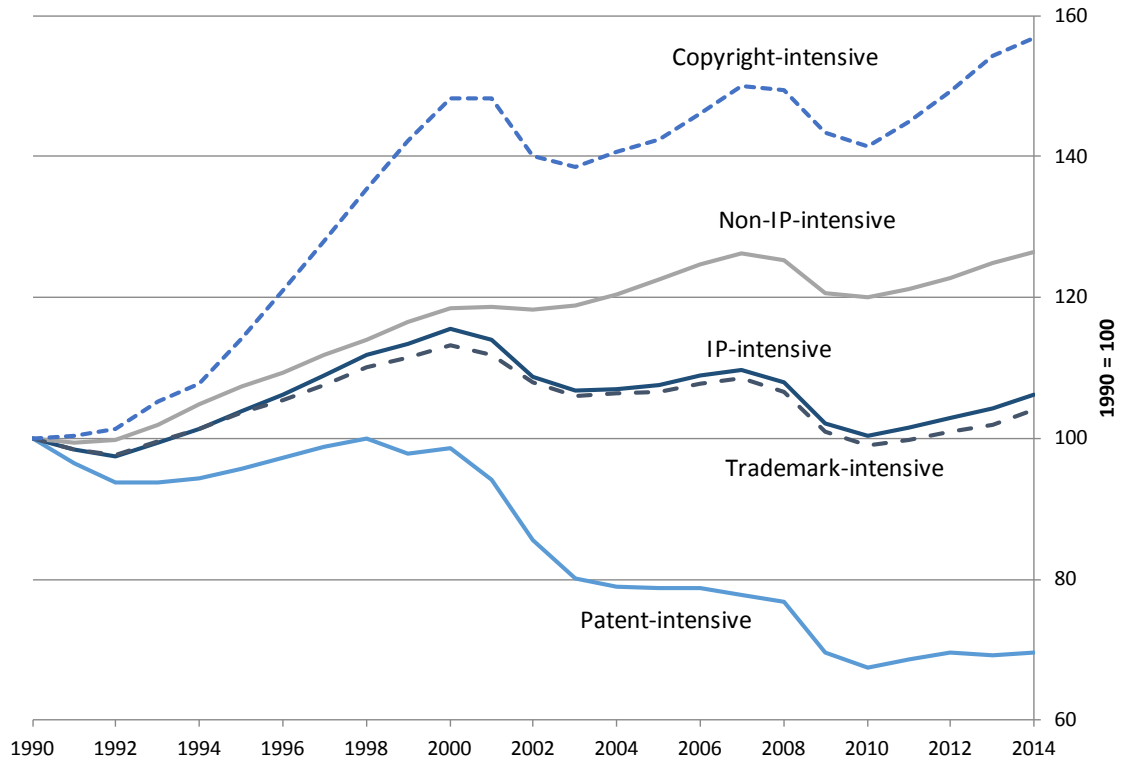
Figure 2. Self-Employed Share of All Jobs in IP-Intensive Industries, 2014



Source: ESA calculations using data from the Bureau of Labor Statistics' Industry Productivity program.
Note: Estimates show the self-employed and unpaid family workers as a share of all jobs. However, unpaid family workers account for only about one percent of the combined total of the self-employed and unpaid family workers outside of agriculture.
The IP-intensive bar on the right represents all IP-intensive (patent-, trademark- and copyright-intensive) industries.

Figure 3 shows the trends in employment growth across IP and non-IP-intensive industries over the past twenty-five years. As noted in the 2010 report, employment in IP-intensive industries was nearly the same in 2010 as in 1990 because considerable growth in employment during the 1990s was largely reversed in the 2000s. Since 2010, however, jobs in these industries rebounded. From 2010 to 2014, IP-intensive industry employment grew 6 percent, driven by trademark and copyright-intensive industries. Patent-intensive industries showed moderate job growth following the Financial Crisis, but this may reflect the fact that patent-intensive industries are restricted to manufacturing. Since 2010, employment in non-IP-intensive industries outpaced that of IP-intensive industries by 2 percentage points. As a result, the share of total employment in IP-intensive industries edged down over the past two and half decades from 21.0 percent in 1990 to 20.6 percent in 2000 and 18.2 percent in 2014.

Figure 3. Indexed Employment in IP-Intensive Industries, 1990-2014



Source: ESA calculations using data from the Bureau of Labor Statistics' Industry Productivity program.

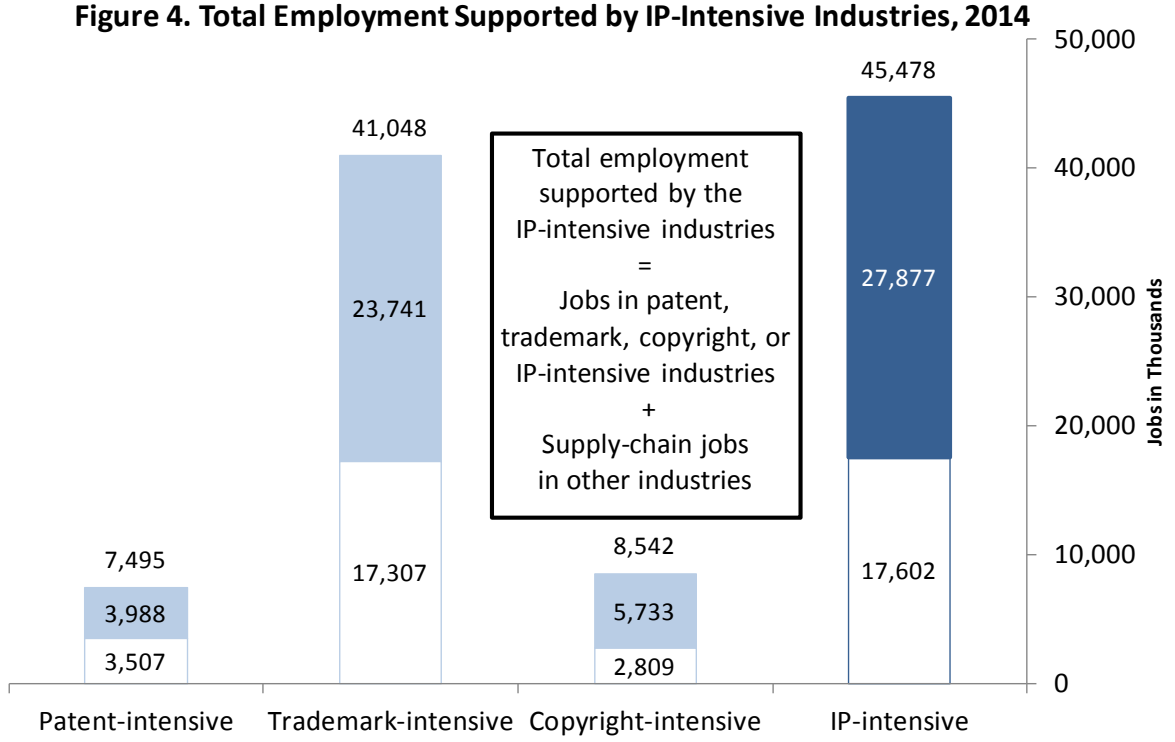
Total Employment Supported by IP-intensive Industries

While IP-intensive industries directly accounted for 27.9 million jobs either on their payrolls or under contract in 2014, they also helped to support an additional 17.6 million jobs in other (non-IP-intensive) industries that supply them goods and services (i.e. the supply chain). Taken

together, IP-intensive industries directly and indirectly supported 45.5 million jobs, about thirty percent of all employment.[32]

Figure 4 shows direct employment in IP-intensive industries (medium blue bar) along with indirect employment in the supply chain (the rectangle below the blue bar). Indirect employment increased for all IP-intensive industries with trademark-intensive industries growing the most since 2010. Trademark-intensive industries indirectly employed 17.3 million jobs in 2014, up from 13.1 million in 2010. Copyright-intensive industries supported an additional 2.8 million jobs indirectly in 2014, compared to 2.5 million in 2010. Patent-intensive industries indirectly supported 3.5 million jobs, up slightly from 3.3 million in 2010.

Figure 4. Total Employment Supported by IP-Intensive Industries, 2014



Source: ESA calculations using data from the Bureau of Economic Analysis' Industry Accounts office and the Bureau of Labor Statistics' Industry Productivity program.
Note: Estimates include wage and salary employment, the self-employed, and unpaid family workers. Because several industries were found to be trademark-intensive and patent- or copyright-intensive, total employment in IP-intensive industries is less than the sum of employment in patent-, trademark-, and copyright-intensive industries.

32 These estimates are derived from unpublished input/output tables computed and analyzed by staff from the Bureau of Economic Analysis' Industry Accounts office. Data are consistent with the December 2010 annual revision to the annual Input-Output tables and are based on the 2014 after-redefinition domestic make and use tables and estimates of the share of 2014 employment attributable to final demand in IP-intensive industries. Total output requirement tables were calculated based on the make and use table following the methodology published in the mathIO.doc, which are available at www.bea.gov/industry/zip/cxctr2002detail.zip. In the previous report, non-IP employment was calculated using employment data from BEA. In this update employment measures come from the Bureau of Labor Statistics' Industry Productivity program: http://www.bls.gov/lpc/lpc_hours_and_employment.xlsx. NAICS codes are converted to industry codes using: http://www.bea.gov/industry/xls/GDPbyInd_VA_NAICS_1997–2012.xlsx.

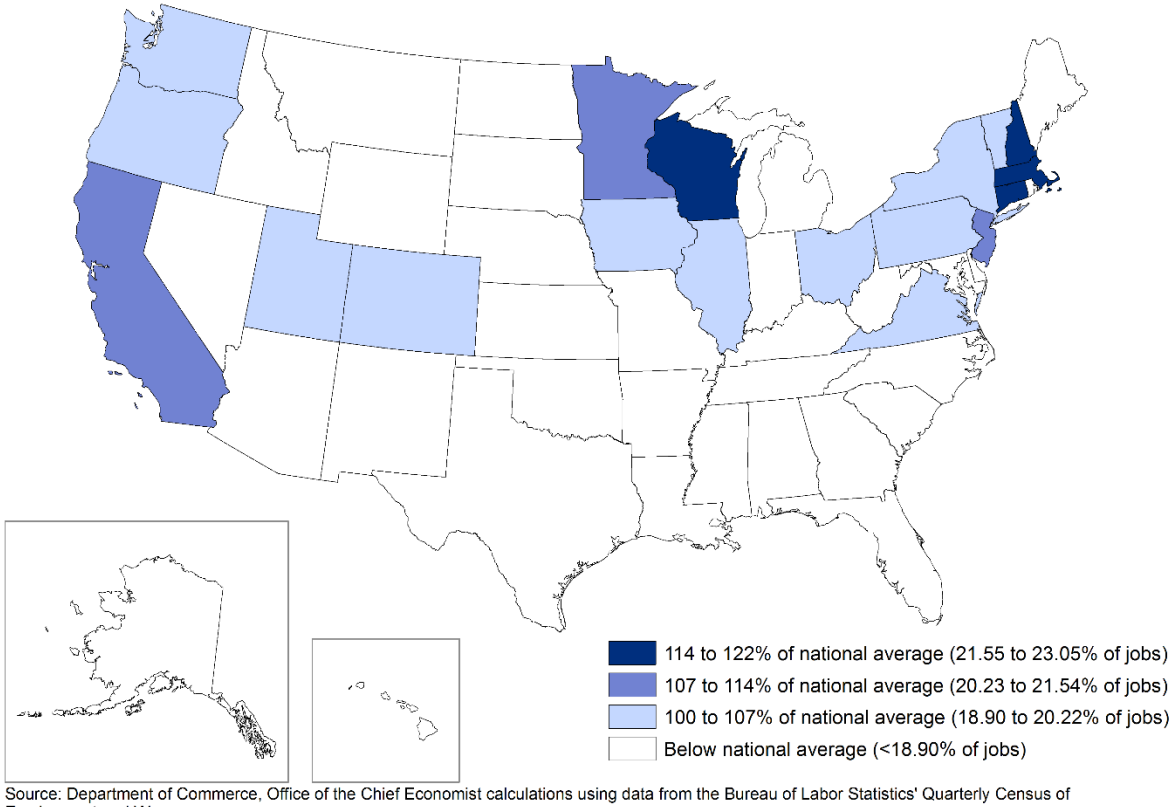
As in the 2012 report, patent-intensive industries rely more heavily on the supply chain as evidenced by a larger share of total jobs in indirect employment (47 percent) compared to trademark- and copyright-intensive industries.

In addition to the indirect employment supported through the supply chain, IP-intensive industries also help support downstream businesses that facilitate the distribution and trade of goods and services. If one were to include indirect employment in these businesses, total employment supported by IP-intensive industries would be greater than the 45.5 million jobs mentioned above.

IP-Intensive Payroll Jobs by State

Employment in IP-intensive industries is not evenly distributed across states. Map 1 highlights those U.S. states that are above the national average in terms of the share of covered employment in IP-intensive industries.[33] Eighteen states (up from 16 in 2010) exceeded the national average of 18.9 percent, which was 19.1 percent in 2010. With a few exceptions, IP-intensive states cluster in New England, the upper Midwest, and West Coast. This is broadly similar to the distribution reported in the 2012 report. The top five states are also similar. In 2014, they were New Hampshire (23.1 percent), Connecticut (23.0 percent), Wisconsin (22.5 percent), Massachusetts (21.9 percent), and Minnesota (21.2 percent). Vermont, which was part of the top five in 2010, was replaced by Minnesota.

Map 1. IP-Intensive Industries' Share of Covered Employment by State, 2014

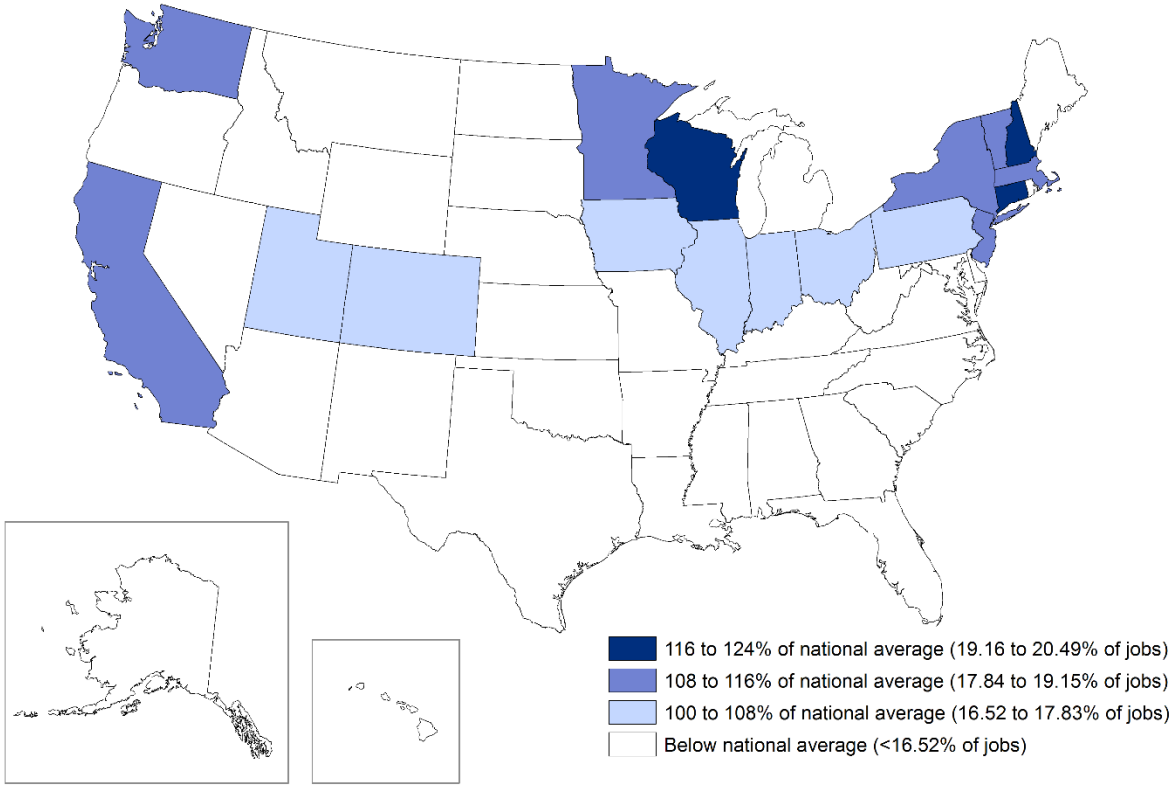


Source: Department of Commerce, Office of the Chief Economist calculations using data from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages.

33 The data used to examine state employment are from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW) and measure covered employment. Covered employment refers to jobs covered by state and federal unemployment insurance law, which represent practically all of civilian wage and salary employment. These data do not include the self-employed or unpaid family workers. For more information on QCEW, see www.bls.gov/cew.

As seen in Map 2, the state distribution for trademark-intensive industries looks like what is observed in Map 1 for all IP-intensive industries. Sixteen of the 18 states with above-average shares of IP-intensive jobs also had above-average shares of trademark-intensive jobs. This reflects the contribution of trademark-intensive industries to IP-intensive jobs and the fact that 66 of the 81 IP-intensive industries were designated as trademark-intensive. Only Virginia and Oregon do not show up as trademark-intensive employment states.

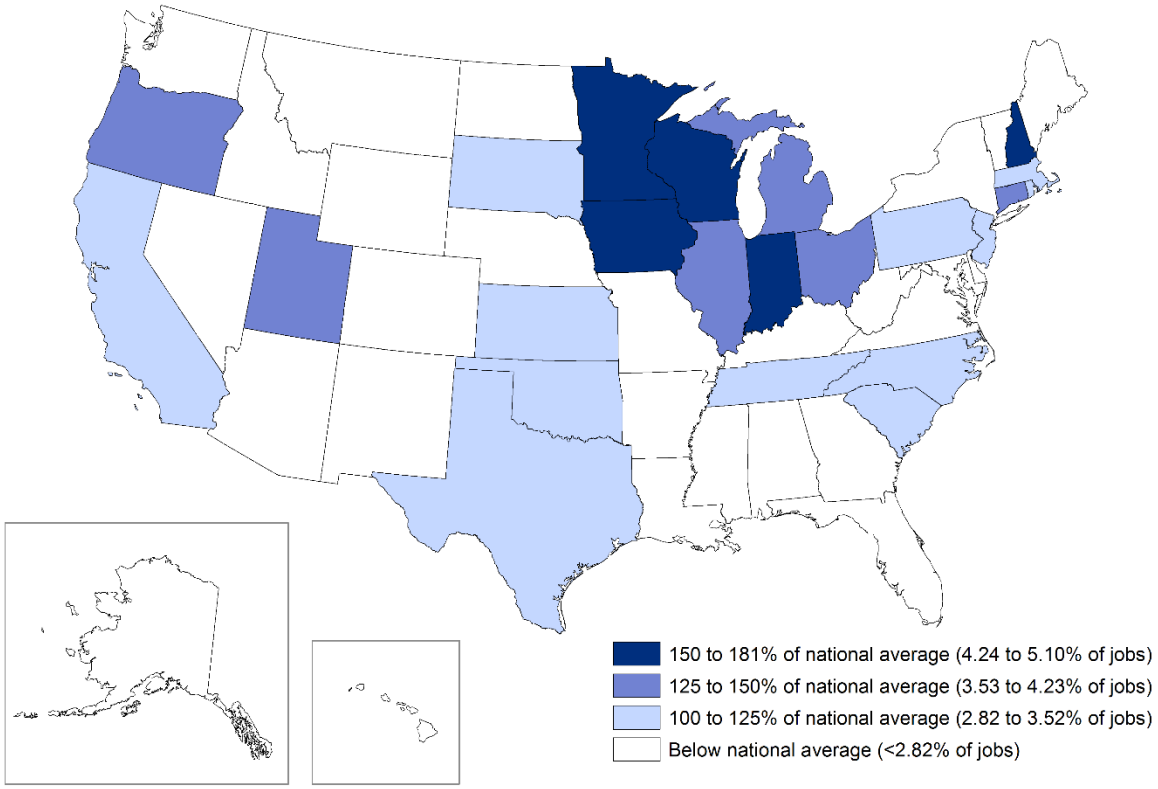
Map 2. Trademark-Intensive Industries' Share of Covered Employment by State, 2014



Source: Department of Commerce, Office of the Chief Economist calculations using data from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages.

In 2014, 23 states had above-average shares of employment in patent-intensive industries, up from 21 states in 2010 (See Map 3). Texas, Oklahoma, and Kansas were added in 2014 while Vermont was removed. States in New England and the upper Midwest continue to have the highest shares.

Map 3. Patent-Intensive Industries' Share of Covered Employment by State, 2014

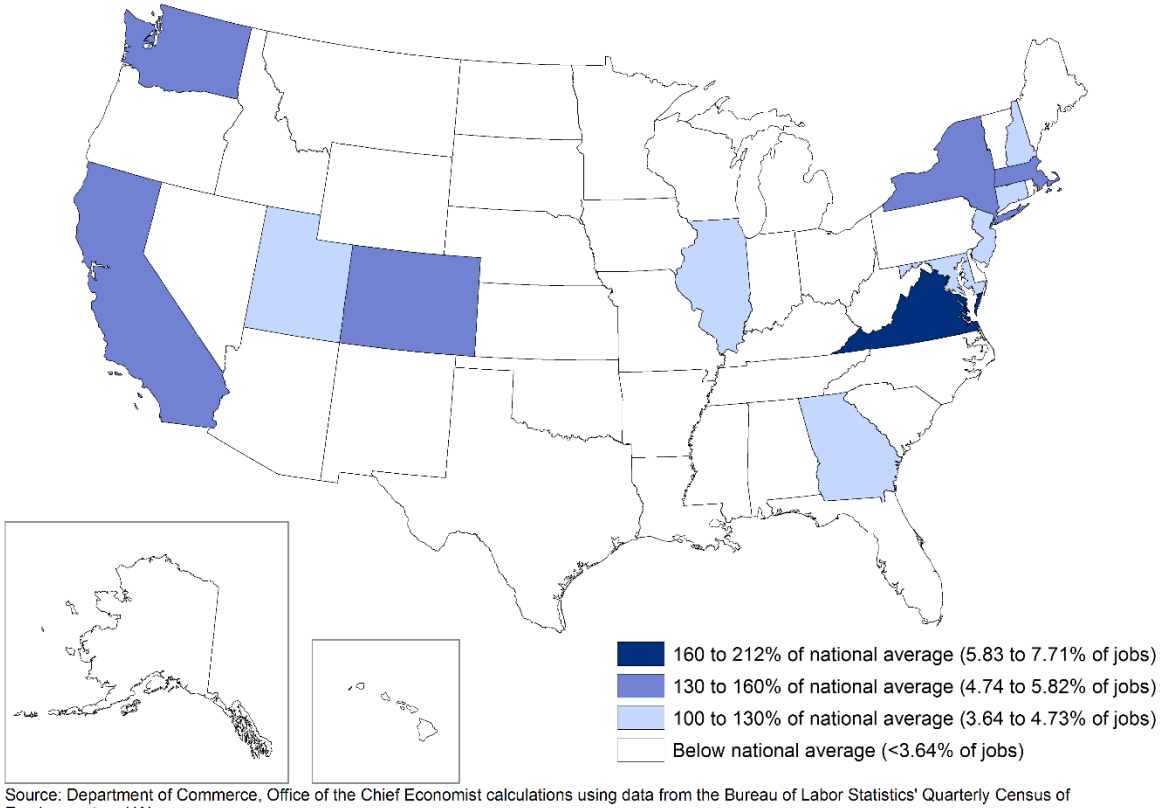


Source: Department of Commerce, Office of the Chief Economist calculations using data from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages.

For copyright-intensive industries in 2014, 14 states had above-average employment shares and 11 of these appeared on the 2010 list. Minnesota was removed from the list, while Illinois and New Hampshire were added. As in the previous report, these states are mostly spread along the East and West coasts. (See Map 4.)

Overall, five out of the six states that had above-average employment shares for patent-, trademark-, and copyright-intensive industries in 2010 also did in 2014. These are California, Connecticut, Massachusetts, New Jersey, and Utah. Even more, Oregon and Washington became IP-intensive states in 2014. The inclusion of Oregon is due to the increased share of its patent-intensive industries while the inclusion of Washington is due to the increased share of its trademark-intensive industries. These results suggest the use of intellectual property is expanding geographically.

Map 4. Copyright-Intensive Industries' Share of Covered Employment by State, 2014

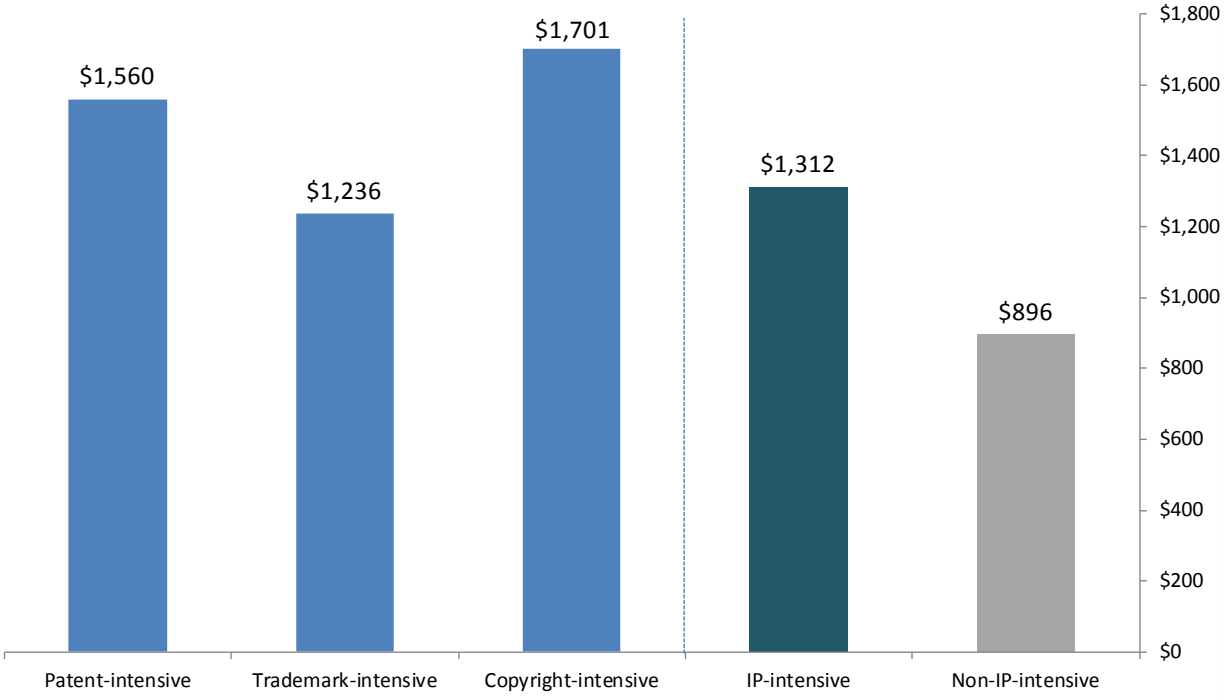


Source: Department of Commerce, Office of the Chief Economist calculations using data from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages.

Average wages

Private wage and salary workers in IP-intensive industries continue to earn significantly more than those in non-IP-intensive industries. In 2014, the average weekly wage of $1,312 was 46 percent higher (up from 42 percent in 2010) than for workers in non-IP-intensive industries (See Figure 5). While workers in non-IP-intensive industries earned $896 per week, those in patent- and copyright-intensive industries earned $1,560 and $1,701 per week, respectively. At $1,236 per week, workers in trademark-intensive industries earned less than their counterparts in patent- and copyright-intensive industries, but still 38 percent more than non-IP-intensive workers.

Figure 5. Average Weekly Wages of Private Wage and Salary Workers in IP-Intensive Industries, 2014

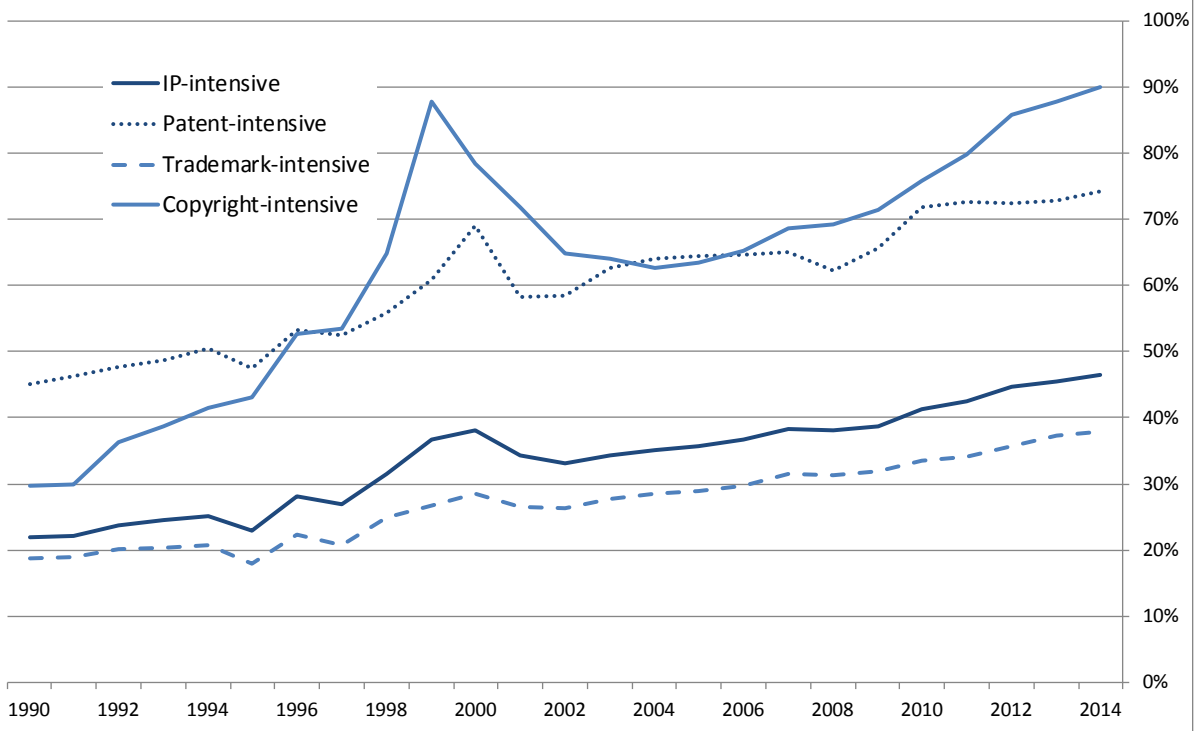


Source: ESA calculations using data from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages.

Figure 6 plots the trends in wage premiums for workers in IP-intensive industries.[34] With some notable volatility, these premiums have generally increased. In the decade after 1990, the premium for workers in IP-intensive jobs increased from 22 to 38 percent. It lost some ground early in the 2000s but has been rising steadily since 2002. By 2014, the IP-intensive industry wage premium stood at 46 percent. The trademark-intensive industry subgroup followed a similar path. In 1990, trademark-intensive industries paid 19 percent more with this premium climbing to 29 percent by 2000 and 38 percent by 2014. Wages in the patent-intensive industries started at a 45 percent premium and grew through the 1990s before surging up to 69 percent by 2000. This surge was reversed in 2001 and held fairly flat in the last decade before rising again since 2008. In 2014, the average wage premium for patent-intensive workers was 74 percent.

The wage premium in copyright-intensive industries experienced a more extreme version of the trends discussed above. In 1990, workers in these industries earned 30 percent more than non-IP intensive industry workers, on average. This premium tripled during the following decade to 88 percent by 1999. Over the next five years, it decreased to 63 percent before growing again to 90 percent by 2014. The wage premium for all four sets of industries was higher in 2014 than at any point over the prior 24 years.

Figure 6. Average Weekly Wage Premium of Workers in IP-Intensive Industries Relative to Non-IP-Intensive Industries, 1990-2014



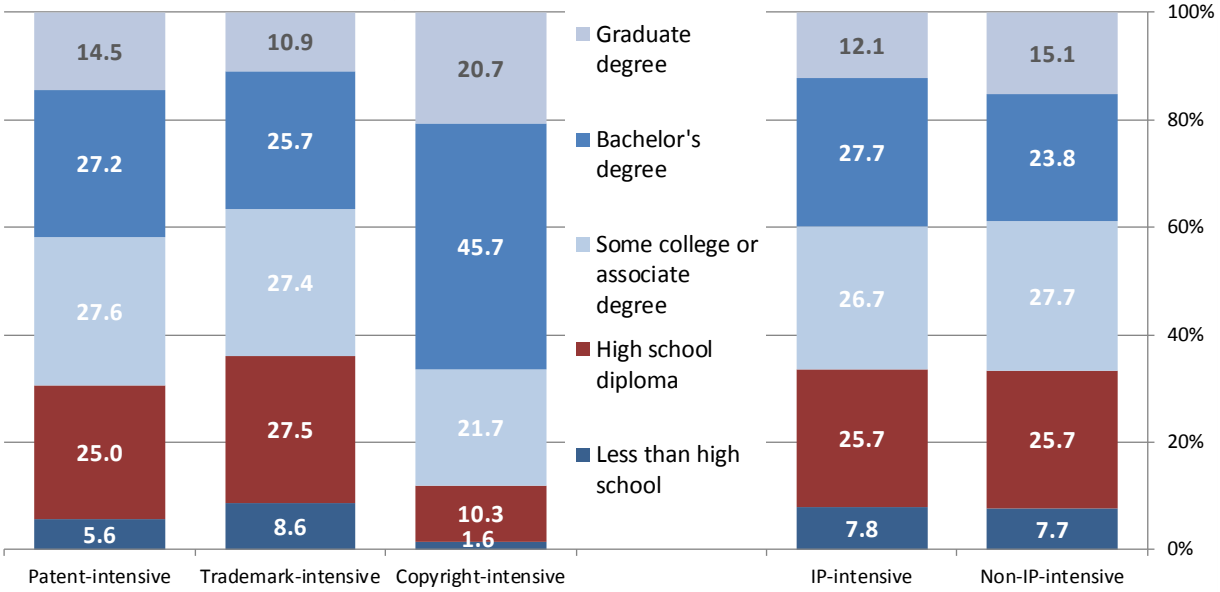
Source: ESA calculations using data from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages.

34 The wage premium measures the percentage difference between the wages of workers in IP-intensive industries versus those in non-IP-intensive industries. It is a premium because average weekly wages are higher in IP-intensive industries.

Education

In competitive labor markets, wages are closely correlated to worker productivity, and educational attainment is a common gauge of workers' skill and expected productivity. Thus, we expect employees in IP-intensive industries to have relatively high educational attainment. The 2010 data were consistent with this hypothesis as 42.4 percent of workers age 25 and older in IP-intensive industries had a bachelor's degree or higher, compared with 34.2 percent in private non-IP intensive industries.[35] However, data from the 2015 Current Population Survey show this education gap virtually disappeared (See Figure 7). The share of workers in IP-intensive industries with a bachelor's degree or higher fell to 39.8 percent in 2015, whereas that percentage increased to 38.9 percent for workers in non-IP-intensive industries. Besides the increase in educational attainment among workers in non-IP-intensive industries, trademark-intensive industries contributed to the narrowing of the educational attainment gap. In 2015, the share of workers with college education or higher in trademark-intensive industries fell to 36.6 percent (from 38.8 percent in 2010). By contrast, this share increased to 66.4 percent (from 61.2 percent in 2010) for copyright-intensive industries and 41.7 percent (from 38.7 percent) for patent-intensive industries.

Figure 7. Distribution of Employed Persons in IP-Intensive Industries by Educational Attainment, 2015



Source: Current Population Survey, 2015, Public Use Microdata Files and ESA calculations. Estimates are for employed persons age 25 and over.

35 These estimates are calculated from 2010 and 2015 Current Population Survey public-use microdata, as accessed through the Census Bureau's DataFerrett tool at dataferrett.census.gov.

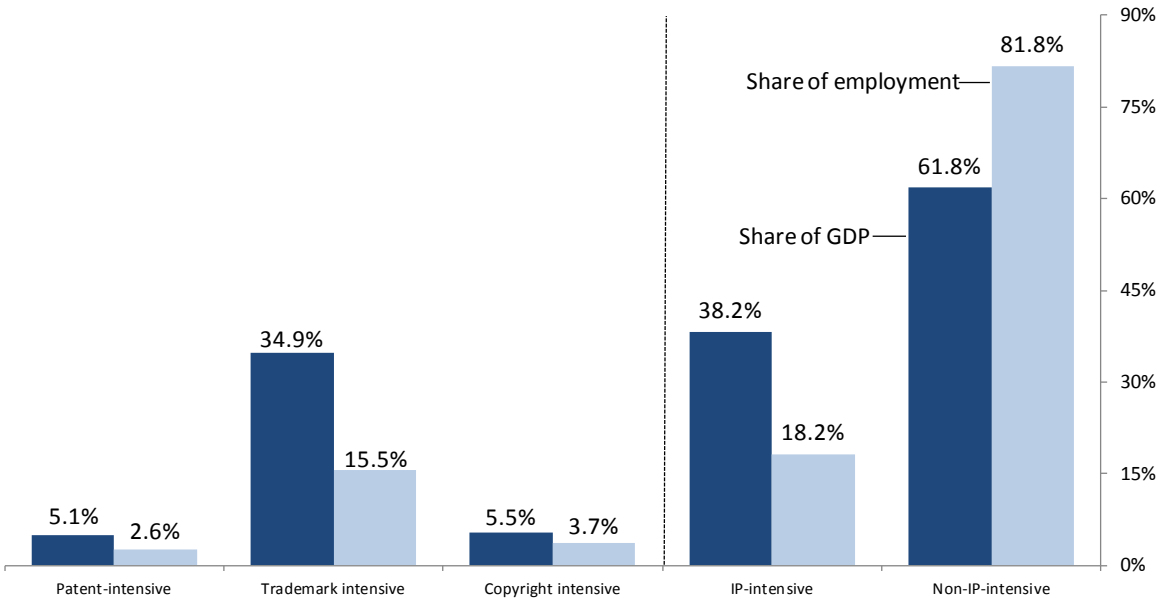
As was the case in 2010, workers in copyright-intensive industries were the most educated of the three IP-intensive segments in 2015 with 20.7 percent having attained a graduate degree, and only 1.6 percent having less than a high school diploma. The share of workers in patent-intensive industries with at least a bachelor's degree was smaller, at 41.7 percent, but still higher than the share for non-IP-intensive industries. In trademark-intensive industries, however, the share of workers with a college or higher degree fell below that of the non-IP-intensive industries by 2015.

Value added

While jobs in IP-intensive industries increased between 2010 and 2014, jobs in non-IP-intensive industries grew at a slightly faster pace. Consequently, the proportion of total employment in IP-intensive industries actually declined to 18.2 percent from18.8 percent in 2010. (See Figure 8) In contrast, the value added by IP-intensive industries increased substantially in total amount and as a share of GDP between 2010 and 2014. IP-intensive industries accounted for $6.6 trillion in value added in 2014, up more than $1.5 trillion (30 percent) from $5.06 trillion in 2010. Accordingly, the share of total U.S. GDP attributable to IP-intensive industries increased from 34.8 percent in 2010 to 38.2 percent in 2014.

Trademark- and copyright-intensive industries appear to be driving the recent growth in value added. Between 2010 and 2014, the share of GDP attributed to trademark- and copyright-intensive industries increased to 34.9 percent (from 30.8 percent) and 5.5 percent (from 4.4 percent), respectively. Trademark-intensive industries alone accounted for $6.1 trillion in value added in 2014 (up from $4.5 trillion in 2010). The value added by patent-intensive industries increased from $763 to $881 billion between 2010 and 2014. However, because this growth trailed the other IP-intensive segments, the share of GDP attributable to patent-intensive industries declined from 5.3 percent to 5.1 by 2014.

Figure 8. Value Added and Employment Shares of IP-Intensive Industries, 2014



Source: ESA calculations using data from the Bureau of Economic Analysis, National Income and Product Accounts and the Bureau of Labor Statistics' Industry Productivity program.

IP Revenue

Up to this point, IP-intensity was defined based on the counts of patents, trademarks and copyrights per employee at the industry level. While this method adjusts total IP holdings for differences in industry size, it does not directly measure the revenue associated with using intellectual property. Using revenue to define IP-intensity is more restrictive because it requires rights holders to attribute some portion of total revenue directly to IP holdings, which is difficult due to the intangible nature of IP assets. Ideally, information would be available on the full revenue stream attributable to an industry's intellectual property which would include both the measurable and unmeasurable contributions of IP. With this information, an alternative IP-intensity metric could be defined as total IP revenue or IP revenue as a share of total revenue, which is another way to adjust for industry size.

Although comprehensive information of this type do not exist, the Economic Census of U.S. business establishments does provide some data on measureable revenues associated with licensing, royalties, and other forms of trade of intellectual property. The Economic Census, which is conducted every five years by the U.S. Census Bureau, asks companies to report sales by specific

product lines.[36] Ninety-one of these product lines were identified as related to IP.[37] Revenue for each of the 91 product lines were summed and used to define an IP-intensity metric based on the ratio of IP revenue to total revenue at the industry level.

Table 1 shows the 29 four-digit NAICS industries that had some IP-related revenue, ranked by the IP share of total revenue in 2012. The distribution of IP-related revenue was fairly concentrated. Six industries had IP revenue shares above the 11.3 percent average (among industries for which the Economic Census collected IP-related revenue), and these industries accounted for about 82 percent of total revenue from IP-related products. All six industries were also identified as IP-intensive using the IP counts per employee metric.

Overall, 15 of the 29 industries with any IP revenue in 2012 were also classified as IP-intensive using the IP counts per employee metric. Of the 14 industries that were not previously classified, five were in the "*other services (except public administration)*" sector, four were in the *arts, entertainment, and recreation* sector, four were in the *professional, scientific and technical services* sector, and one was in the *information* sector.

36 The Economic Census is the U.S. Government's official five-year measure of American business and the economy. It is conducted by the U.S. Census Bureau and response is required by law. The latest census was completed in 2012. In October through December 2012, forms were sent out to nearly 4 million businesses, including large, medium and small companies representing all *U.S. locations and industries*. Respondents were asked to provide a range of operational and performance data for their companies. To learn more about the Economic Census, please see http://www.census.gov/econ/census/.

The industry classifications for all establishments covered by the economic census and surveys are based on the North American Industry Classification System (NAICS). For more on Industry Classification of Establishments:

http://www.census.gov/econ/census/help/naics_other_classification_systems/industry_classification_of_establishments.html.

37 Table A-11 in the appendix provides a complete list of these codes.

Table 1. Industries with IP-Related Revenue, Ranked by IP Revenue Intensity, 2012

Above mean

Above mean + 1 std. dev.

NAICS code	IP-intensive	Industry title	IP-related revenue ($millions)	Cumulative share	IP-revenue intensity (IP/total revenue)
5121	X	Motion picture and video industries	48,182	35.0%	59.7%
5331	X	Lessors of nonfinancial intangible assets	18,615	48.5%	56.4%
7115	X	Independent artists, writers, and performers	7,524	54.0%	50.3%
5122	X	Sound recording industries	5,198	57.8%	46.4%
5152	X	Cable and other subscription programming	29,284	79.0%	46.0%
7111	X	Performing arts companies	3,605	81.6%	26.0%
7114		Agents and managers for public figures	637	82.1%	10.9%
5191	X	Other information services	5,294	85.9%	5.6%
7113		Promoters of performing arts, sports, and similar events	988	86.7%	5.4%
7112		Spectator sports	1,663	92.4%	5.0%
5151	X	Radio and television broadcasting	2,217	94.0%	3.5%
8139		Professional and similar organizations	2,006	95.5%	3.1%
5111	X	Newspaper, periodical, book, and directory publishers	1,140	96.3%	1.1%
5112	X	Software publishers	1,922	97.7%	1.1%
6114		Business schools and computer and management Training	63	97.7%	0.6%
5511		Management of companies and enterprises	676	98.2%	0.6%
5411		Legal services	920	98.9%	0.4%
8133		Social advocacy organizations	61	98.9%	0.2%
5415	X	Computer systems design and related services	814	99.5%	0.2%
5419	X	Other professional, scientific, and technical services	123	99.6%	0.2%
8134	X	Civic and social organizations	24	99.6%	0.1%

5418	X	Advertising, public relations, and related services	107	99.7%	0.1%
7121		Museums, historical sites, and similar institutions	18	99.7%	0.1%
5413		Architectural, engineering, and related services	268	99.9%	0.1%
8132		Grant-making and giving services	80	100.0%	0.1%
5179	X	Other telecommunications	13	100.0%	0.0%
8129		Other personal services	3	100.0%	0.0%
5171	X	Wired telecommunications carriers	21	100.0%	0.0%
Total		**All industries with IP-related revenue**	**137,684**	**100.0%**	**11.3%**

Note: Intensity measure is the percent of overall revenue generated for each four-digit NAICS industry from the licensing of intellectual property protected assets.
Source: ESA calculations using data from the Census Bureau's 2012 Economic Census.

The product line codes in the Economic Census can also be grouped into those that explicitly mention IP licensing as the source of revenue. As shown in Table 2, revenue specific to the licensing of IP rights totaled $115.2 billion in 2012, with 28 industries deriving revenues from licensing. Among these industries, the *motion picture and video* industry generated the largest revenue, $41.6 billion in 2012, followed by the *cable and other subscription* industry and the *lessors of nonfinancial intangible assets* industry. Not only do these three industries account for nearly 78 percent of all reported direct revenues from IP licensing, they also have the largest shares of licensing revenue, averaging 50.7 percent of total revenue.

Table 2. IP-licensing Revenue by Industry, 2012

NAICS code and industry title	IP-licensing revenue ($millions)	Share of total revenue (%)
Total	**$115,174**	**5.2%**
5121 - Motion picture and video industries	41,595	51.5%
5152 - Cable and other subscription programming	29,284	46.0%
5331 - Lessors of nonfinancial intangible assets	18,615	56.4%
5191 - Other information services	5,294	5.6%
5417 - Scientific research and development services	5,238	4.5%
5122 - Sound recording industries	3,014	26.9%
5151 - Radio and television broadcasting	2,217	3.5%
8139 - Professional and similar organizations	2,006	3.1%
5112 - Software publishers	1,922	1.1%
7115 - Independent artists, writers, and performers	1,353	9.0%

5111 - Newspaper, periodical, book, and directory publishers	1,140	1.1%
5415 - Computer systems design and related services	814	0.2%
5511 - Management of companies and enterprises	676	0.6%
7112 - Spectator sports	607	1.8%
7114 - Agents and managers for public figures	348	6.0%
5413 - Architectural, engineering, and related services	268	0.1%
7111 - Performing arts companies	168	1.2%
7113 - Promoters of performing arts, sports, and similar events	129	0.7%
5418 - Advertising, public relations, and related services	107	0.1%
5419 - Other professional, scientific, and technical services	97	0.1%
8132 - Grant-making and giving services	80	0.1%
6114 - Business schools and computer and management Training	63	0.6%
8133 - Social advocacy organizations	61	0.2%
8134 - Civic and social organizations	24	0.1%
5171 - Wired telecommunications carriers	21	0.0%
7121 - Museums, historical sites, and similar institutions	18	0.1%
5179 - Other telecommunications	13	0.0%
8129 - Other personal services	3	0.0%

Source: U.S. Census Bureau, 2012 Economic Census

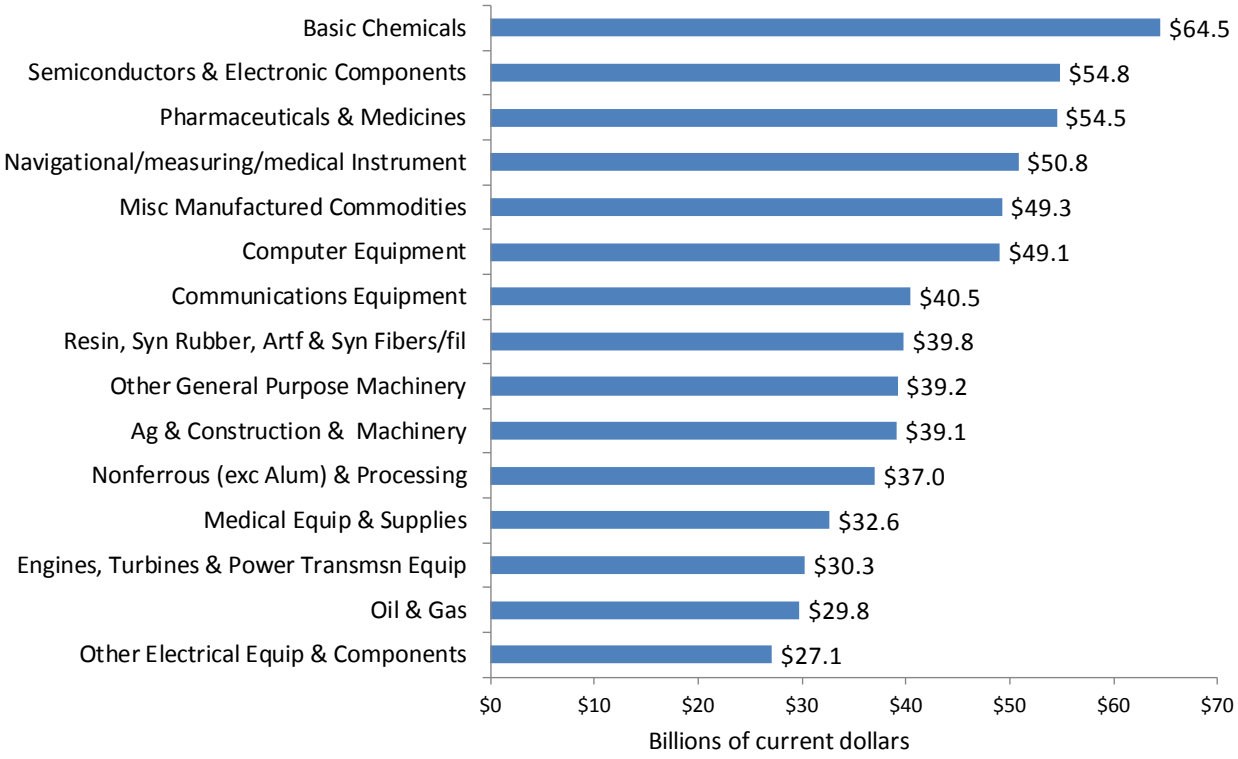
Foreign trade

Once again using IP counts per employee to group industries, IP-intensive industries continue to account for a significant share of U.S. exports and imports. Total merchandise exports increased from $775 to $842 billion between 2010 and 2014. However, because exports from non-IP-intensive industries increased at a faster pace, the share of total merchandise exports from IP-intensive industries declined to 52 percent in 2014 from 60 percent in 2010. The value of merchandise imports into IP-intensive industries totaled $1,391 billion in 2014, which is largely unchanged from 2010, but fell as a percent of overall U.S. merchandise imports from 69.9 to 59.3 percent between 2010 and 2014.

The breakdown of exports by industry for 2014 is very similar to that for 2010. Manufacturing industries accounted for 96 percent of merchandise exports from IP-intensive industries in 2014, compared to 99 percent in 2010. *Oil and gas extraction and nonmetallic minerals* sectors accounted for the rest in both years. Within manufacturing, exports from the *basic chemicals* sector led

the way, increasing from $58.4 to $64.5 billion between 2010 and 2014. Exports from the *semiconductors and other electronic components* sector, which topped the chart at $64.0 billion in 2010, fell to $54.8 billion in 2014. (See Figure 9)

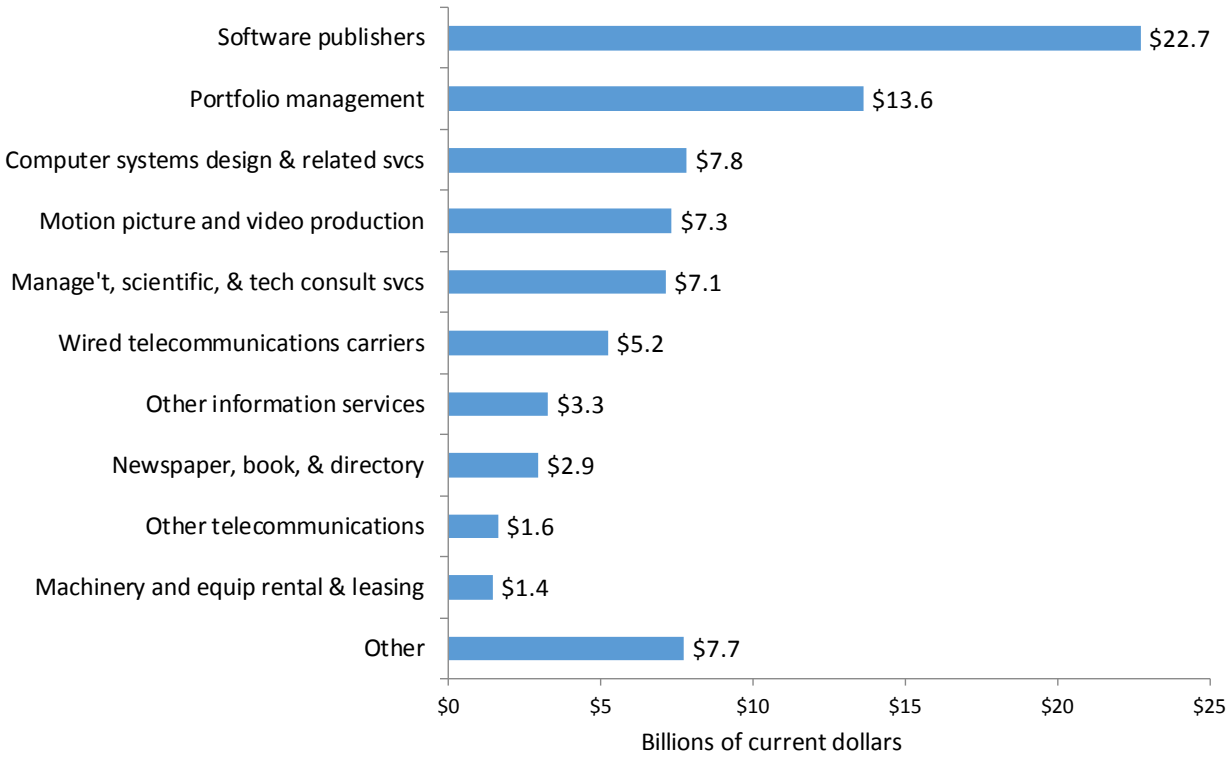
Figure 9. Merchandise Exports of Selected IP-Intensive Industries, 2014



Source: ESA calculations using data from the Census Bureau's Foreign Trade Division.
Note: The selected industries accounted for 76.5 percent of merchandise exports of IP-intensive industries.

Data on trade in services are more limited. However, using the latest Economic Census data, we obtained detailed accounting of service exports for 2012. We find that exports of service-providing IP-intensive industries totaled about $81 billion in 2012 (compared to $90 billion in 2007). This accounted for 12.3 percent (compared to 19 percent in 2007) of total U.S. private exports in services. As shown in Figure 10, exports of software publishers totaled $22.7 billion and continue to be the largest group of service exports. However, export by the portfolio management industry, totaling $13.6 billion in 2012, replaced the motion picture and video industry for the second place compared to the 2007 rankings. The latter went down from $15.3 billion in exports in 2007 to $7.3 billion in 2012 and appears to account for a substantial part of the decline in exports of service-providing IP-intensive industries. Other major services export categories in 2012 included computer system design ($7.8 billion), motion picture and video production ($7.3 billion), management & technical consulting ($7.1 billion), and wired telecommunications carriers ($5.2 billion).

Figure 10. Exports of IP-Intensive Service-Providing Industries, 2012



Source: ESA calculations using data from the Census Bureau's 2012 Economic Census.

V. Conclusion

The 2012 report *Intellectual Property and the U.S. Economy: Industries in Focus* identified IP-intensive industries and quantified their contribution to the U.S. economy. It found that in 2010 IP-intensive industries supported over 40 million jobs and accounted for about $5.06 trillion in value added; equivalent to 34.8 percent of U.S. GDP. The current report provides updated results demonstrating that IP-intensive industries supported 45.5 million jobs and contributed $6.6 trillion in value added in 2014, equivalent to 38.2 percent of U.S. GDP. In addition, the current report reinforces the earlier finding that IP use permeates all aspects of the economy with increasing intensity and extends to all parts of the U.S.

Besides data on the prevalence of IP, policy makers are interested in learning more about how effectively it is used to stimulate economic activity. However, understanding the effectiveness and benefits of IP use requires an understanding of the value that IP owners attribute to their assets, and how that value translates into incentives for the creation of new goods and services. While an expansive welfare analysis of IP is beyond the scope of this report, evidence that informs such an analysis is an important direction for future work.

With more granular data that connects inventors and firms of various types with IP assets, we could start to answer a variety of questions about the distinct functions of IP in the economy. In particular, policy makers would benefit from research on whether IP users seek IP protection to facilitate financial investment in innovation, to support entrepreneurial liquidity, or to enable technology transfer, and the extent to which these advantages stimulate inventive activity. Understanding the role of IP in the performance of diversely situated firms and in the economy overall requires the application of a variety of methodologies and persistent efforts, many of which are already underway.

Appendix

In this Appendix, we provide a detailed discussion of the methodologies used to designate IP-intensive industries for each of the three IP types (i.e. patents, trademarks, and copyrights). The methodologies follow very closely what was applied in the 2012 report. We also provide a table of the IP related product codes from the Economic Census which were discussed in the Section IV under IP revenue.

Patents

Patents are classified in over 450 patent "technology classes" that distinguish their inventive content.[38] Additionally, the USPTO maintains a general concordance between its technology classifications and 30 North America Industry Classification (NAICS) codes (26 unique codes and 4 combinations), which enables analysts to associate patents with these industries.[39] We rely on these NAICS-based patent counts for 2009 to 2013 to identify patent-intensive industries.[40] Just as a patent can be assigned to more than one technology class, it also may be associated with multiple industries. Because no similar concordances to NAICS are available for plant or design patents, only utility patents are used in our analysis.[41] This approach strictly limits the patent analysis to the manufacturing sector because the concordance system only associates patents with manufacturing industries. Service-providing industries may also rely on utility patents in their production processes, but these industries are not captured by the patent-NAICS concordance we employ.

Fractional vs. Whole Patents Counts

The USPTO reports patent data by NAICS category using two different counting measures. The first gives one full count to every industry with which a particular patent is associated. The second divides each patent by the number of industries it is associated with, thus creating fractional counts of patents. The sum of the fractional counts equals the total number of patents issued in a given year, while the sum of the whole counts across industries is greater than the number of patents issued. Patent analyses within a given industry or technology class commonly use whole counts; however, cross-industry analyses typically use fractional counts in order to avoid over-counting. For these same reasons, fractional counts are used in this report.[42] It is important to note that the NAICS concordance maintained by the USPTO associated each patent with its

38 Utility patents may be classified into more than one technology class but are organized according to their primary classification.

39 This concordance was created by the USPTO with financial support from the National Science Foundation. For an overview of NAICS, see www.census.gov/eos/www/naics/index.html.

40 See www.uspto.gov/web/offices/ac/ido/oeip/taf/data/misc/patenting_trends/info_ptrends2008.txt.

41 To contrast the scale of technology patents, design patents break out into 33 classes and plants have only one patent class. See www.uspto.gov/web/offices/ac/ido/oeip/taf/all_tech.htm for more information on utility patents.

42 It should be noted that the use of fractional patent counts differs from our treatment of trademarks registrations for which only whole counts of registrations by class are available.

final use in the economy. In practice, this means that the patents are all associated with manufacturing NAICS codes regardless of whether the company that owns them is a manufacturer or a company that may be classified in the services sector.[43]

Methodology

Using the USPTO maintained concordance, we calculate a measure of industry patent "intensity," defined as the ratio of total patents over the five years (2009–2013) in a NAICS category to the average payroll employment by industry. Because employment is a gauge of industry size, dividing patent counts by employment normalizes patenting activity with respect to industry size.[44] This approach helps put all industries on an even playing field, so that the most patent-intensive industries are defined not as the ones with the most patents, but rather those with the most patents per worker.

By using a five-year period (in this case, years 2009–13) instead of just one year helps minimize the chance that anomalies in any given year will skew our results. The analysis was performed at the highest possible level of NAICS industry detail, and so results include four-digit industries as well as some individual three-digit industries and combinations of three- or four-digit industries.[45] As shown in Table A-1, most patent-intensive industries in the sample fall into the four-digit NAICS industries, which may be a product of the patent-intensive nature of these more finely disaggregated industry sectors.

43 For full details on the nature and caveats of the patent data used, see www.uspto.gov/web/offices/ac/ido/oeip/taf/govt/naics/explan_naics.htm.

44 Value added and gross output are two alternative gauges of industry size. However, estimates at the level of detail needed for this analysis are not available due to data confidentiality limitations.

45 In the NAICS classification, a three-digit code is a larger aggregation as compared to a four-digit code. So, for instance, NAICS 236 "construction of buildings" is a larger aggregation of which NAICS 2361 "residential building construction" is a smaller and more specific subset.

Table A-1. Patent Intensity, 2009–13

NAICS code	Industry Title	Patents (number)	Employment (1000 jobs)	Patent Intensity (patents/1000 jobs)	
3341	Computer and peripheral equipment	105476	160.2	658.40	
3342	Communications equipment	65854	113.2	581.75	
3343, -6	Other computer and electronic products	11412	44.7	255.30	
3345	Navigational, measuring, electromedical, and control Instruments	59266	406.6	145.76	
3344	Semiconductors and other electronic components	55072	381.5	144.36	
3251	Basic chemicals	16223	143.3	113.21	
3399	Other miscellaneous	27872	318.3	87.57	
335	Electrical equipment, appliances, and components	29729	371.9	79.94	
3391	Medical equipment and supplies	23678	315.5	75.05	
3254	Pharmaceutical and medicines	20317	276.7	73.43	
3253, -5, -6, -9	Other chemical product and preparation	15123	286.2	52.84	
333	Machinery	50978	1069	47.69	Above Mean
3252	Resin, synthetic rubber, and artificial and synthetic fibers and filaments	2845	91.7	31.03	
326	Plastics and rubber products	12250	637.8	19.21	
332	Fabricated metal products	22574	1387.2	16.27	
3365, -6, -9	Other transportation equipment	3008	186.4	16.14	
3361, -2, -3	Motor vehicles, trailers and parts	11770	740.2	15.90	
327	Nonmetallic mineral products	5462	392.8	13.91	
313, -4, -5, -6	Textiles, apparel and leather	4623	467.2	9.90	
3364	Aerospace product and parts	4295	492.8	8.72	
337	Furniture and related products	1789	388.7	4.60	
331	Primary metal	1369	385.8	3.55	
321	Wood products	1264	372.6	3.39	
322, -3	Paper, printing and support activities	1922	897.1	2.14	
312	Beverage and tobacco products	333	195.1	1.71	
311	Food	971	1500.5	0.65	
Total		**555488**	**12023.0**	**46.20**	

Source: USPTO calculations using the agency's patent data and the Bureau of Labor Statistics' Industry Productivity program.

Note: Patent intensity is defined as the ratio of patents to employment and is measured in patents/thousand jobs.

Trademarks

Unlike patents, there is little academic research examining industry use of trademarks. The 2012 report offered what may be the first comprehensive analysis of trademark use by U.S. industries that is grounded in original research, data, and measurement theory. The methodology applied in the current report and detailed below is derived from what was designed in the 2012 report. As a preliminary matter, we recognized that each trademark registration has a description of the type of good or service with which the protected mark is used in commerce. The USPTO classifies goods and services for administrative convenience, and applicants for trademark registration must provide a separate description — and pay separate application and maintenance fees — for each "class" in which the goods or services associated with the trademark is classified.[46] This makes working with trademark registration data different from working with patent grant data.

Trademark application and maintenance fees are assessed on a per-class basis, and registration holders may elect to renew their registrations with respect to some but not all classes.[47] As a result, holding a "multi-class" registration is practically equivalent to holding multiple registrations, one for each class. Accordingly, in the foregoing analysis each class listed on a registration was considered as the unit of analysis, creating a class-registration count. For example, if one mark (or logo) is registered in three classes,[48] then our input measure in the analysis reflects three trademark registration counts, one for each class.

The approach that we adopted for measuring trademark-intensive industries parallels, but differs from, the approach employed when analyzing patents. For patents, each patent was counted only once overall; for trademark measurements, each mark is counted once for each class in which it belongs, potentially counting it more than once overall according to the number of classes in which it is registered. Since it is not easy to ascertain which trademarks are relatively more important, we use the best measure available, based on the economic realities of the fee system.[49] Because each trademark registration-class involves some fixed filing fee paid to the USPTO, the more classes in which a trademark is registered indicate more times that a fee has been paid to the USPTO. Using these fee-payments is an effective method to base an IP-intensity measure and this approach was followed consistently for both trademarks and patents.

46 For a list of classes, see Trademark Manual of Examining Procedure (TMEP) chapter 1400 (April 2016 edition). Fees also are a function of the type of application form used. For more information on the trademarking process, see *Trademark Basics* at www.uspto.gov/trademarks/basics/BasicFacts_with_correct_links.pdf.

47 Each class used to group the goods or services in a registration for purposes of administrative fee payments may cover a wide variety of goods or services. A trademark right exists as to each good or service on or in connection with which the mark is used. The classification of the goods and services does not determine the scope of the protection given to a mark.

48 An example is the mark "Nike" being registered in classes associated with (a) software, (b) golf equipment, and (c) eyewear. See U.S. trademark registration numbers 3406594, 3389746, and 3081688, each by Nike, Inc.

49 We could weight companies by number of employees, but it is more difficult to decide whether a given trademark taken by itself should be weighted heavily or lightly.

Because trademark registrations can be segmented by class but not by industry, there is no USPTO NAICS concordance for these data. Due to this methodological limitation, there is no single, straightforward way to tabulate registrations and measure trademark intensity by industry. Accordingly, and because the measurement of trademark use is a new science, we opted for over-inclusiveness and developed a three-pronged approach to identifying trademark-intensive industries.

We relied on three related but distinct approaches, using different samples of companies that have registered USPTO trademarks. The first approach is the closest approximation to the methodology used to identify patent-intensive industries. Starting with the complete set of trademark registrations, we matched publicly traded companies by their name to a separate database containing information on the firms' primary industry and number of employees. These data allowed us to calculate trademark intensity by industry for the matched firms. In the second approach, we reviewed lists of the top 50 corporate trademark registrants published by the USPTO (which, unlike the first approach, include both private and public companies) and identified industries that appear repeatedly. To help moderate the tendency of the first two approaches to under-represent smaller and younger firms, our third approach took a representative and random sample of firms drawn from the complete database of U.S. corporate trademark registrations from 2009 to 2013.

Trademark Intensity

Methodology 1

Like our method for defining patent intensity, we define trademark intensity as the ratio of trademark registrations to employment in a given industry. Thus, we are measuring the number of trademark registrations per employee. The USPTO applied a firm-name standardization routine developed originally for patent analysis in order to match companies with new trademark registrations to companies in Compustat's database of financial statements of publicly traded companies.[50] This matching identified 507,008 distinct standardized firm names in the 2009–13 trademark registration and trademark renewal records. These were firms that either registered or renewed at least one trademark from 2009 to 2013. We merged these records with 9531 standardized parent-company records drawn from the Compustat database. Successful matches were made for 3094 firms. Since Compustat records also include NAICS codes, we were able to sum trademark registrations and employment by four-digit NAICS industry and then estimate industry trademark intensity as the number of matched firm trademarks per worker in each industry.[51]

Because Compustat does not record the relationships between parent and subsidiary companies, the identities of trademark registrants were only matched to the name of the publicly traded

50 This methodology has previously been applied in studies of patents, particularly as detailed in Hall, Jaffe, and Trajtenberg 2001. This paper and other supporting documentation are available at www.nber.org/patents/.

51 To the extent that matched firms differ in their Federal trademark registration behavior relative to unmatched firms, these trademark intensities are biased. However, what really matters for our analysis is not whether the estimates are individually biased but rather if any bias varies across industries.

parent company reporting financial statements to the U.S. government. Accordingly, trademarks registered in the name of subsidiaries that have different names than the parent company were not matched by our method.[52]

Table A-3 provides the designation of trademark-intensive industries for years 2009–2013 using the first of the three methodologies. While there are notable differences, there is significant overlap between the industries in this list compared to the one in the 2012 report covering years 2004–2008. There are two main sources of differences. First, while the methodology is the same in both cases, a more exhaustive data cleaning process in the current report led to a more comprehensive coverage of firms with trademark registration that were assigned to an industry. Secondly, an industry is added to the data as trademark-intensive only if there are at least five firms identified that belong to it. Thus, a single additional firm can determine whether an industry is designated as trademark-intensive. Although unlikely, this could significantly impact the rank-order of some industries. For example, while *land subdivision* (NAICS 2372) did not make it in the list of trademark-intensive industries in the previous report, it is on the top of the current list as presented in Table A-3 below. Despite these differences, we again find significant consistency across the two periods as over 65 percent of the industries designated as trademark-intensive in the 2012 report are also included in the current list.

Table A-3. Industries with Above-Average Trademark Intensity, 2009–13

Naics Code	Industry Title	Trademark Intensity (trademarks/1000 workers)
2372	Land subdivision	59.4
5259	Other investment pools and funds	47.9
3399	Other miscellaneous manufacturing	46.2
3343	Audio and video equipment manufacturing	30.4
3351	Electric lighting equipment	21
3219	Other wood products	20.8
5191	Other information services	16

Naics Code	Industry Title	Trademark Intensity (trademarks/1000 workers)
3371	Household and institutional furniture and kitchen cabinets	4.6
6214	Outpatient care centers	4.3
4234	Commercial equipment	4.2
3162	Footwear manufacturing	4.1
2123	Nonmetallic mineral mining and quarrying	4.1
5311	Lessors of real estate	4.1
2111	Oil and gas extraction	4

52 For this reason, this method not only tends to overweight large, publicly traded companies, but also those companies that have a particular trademark-registration approach. Which is consistent with patent scholarship suggesting that IP ownership may show systematic differences along these dimensions. See Arora et al. 2011, 29–30.

4541	Electronic shopping and mail-order houses	15
5232	Securities and commodity exchanges	12.9
5111	Newspaper, periodical, book, and directory publishers	11.5
6219	Other ambulatory health care services	9.4
3279	Other nonmetallic mineral products	8.8
5331	Lessors of nonfinancial intangible assets (except copyrighted works)	8.5
5223	Activities related to credit intermediation	8.5
5112	Software publishers	7.5
3332	Industrial machinery	7
7132	Gambling industries	6.6
5151	Radio and television broadcasting	6.1
3391	Medical equipment and supplies	6
3359	Other electrical equipment and components	5.8
3254	Pharmaceuticals and medicine	5.8
3256	Soaps, cleaning compounds, and toilet preparations	5.6

3251	Basic chemicals	4
3231	Printing and related support activities	3.9
5416	Management and technical consulting services	3.7
3314	Nonferrous metal (except aluminum) production and processing	3.6
3115	Dairy products	3.5
5241	Insurance carriers	3.1
5171	Wired telecommunications carriers	3.1
2212	Natural gas distribution	2.8
5619	Other support services	2.8
4236	Electrical and electronic goods	2.7
3333	Commercial and service industry machinery	2.7
3345	Electronic instruments	2.6
3252	Resin, synthetic rubber, and artificial synthetic fibers and filaments	2.6
3261	Plastics products	2.6
3114	Fruit and vegetable preserving and specialty food	2.5

4885	Freight transportation arrangement	5.5
3253	Pesticides, fertilizers, and other agricultural chemicals	5.2
5418	Advertising and related services	5.2
4244	Grocery and related products	5.2
3369	Other transportation equipment	5.1
5179	Other telecommunications	5.1
5239	Other financial investment activities	4.9
5324	Machinery and equipment rental and leasing	4.8
3342	Communications equipment	4.7
5419	Other professional and technical services	2.4
2361	Residential building construction	2.4
3339	Other general purpose machinery	2.4
5121	Motion picture and video industries	2.4
5152	Cable and other subscription programming	2.4
6215	Medical and diagnostic laboratories	2.4
3121	Beverages	2.2
3336	Engine, turbine, and power transmission equipment	1.9
2211	Power generation and supply	1.9

Source: USPTO calculations using the agency's trademark registration data and company employment data from Compustat.

Top 50 Trademark Registering Companies

Methodology 2

Since 2006, the USPTO's annual Fiscal Year Performance and Accountability Reports have identified the 50 companies that obtained the largest number of trademark registrations during the Federal fiscal year (FY) pertaining to that report.53 Because these reports do not provide the primary NAICS code of the companies in question, we used Avention and Manta to determine the relevant NAICS industry classification for each of the companies listed for FY 2009–13.[54] On the theory that these large companies operate in industries with large numbers of trademark registrations relative to the size of the industry, those industries were defined as trademark-intensive.

53 See www.uspto.gov/about/stratplan/ar/index.jsp to access the annual "Performance and Accountability Reports." In each report, the Top 50 Trademark Registrants tables are Table 29B or 30B within the USPTO Workload Tables in Section 5, "Other Accompanying Information." The most recent list of Top 50 trademark registrants is for FY2015.

54 We used both Avention and Manta NAICS classification of individual firms. If only one of these sources provide a NAICS code for the firm, we record that NAICS as the appropriate classification. If there is a mismatch between the two sources, we researched the firm's line of business using Internet searches and identified which of the two gave a more appropriate classification. If neither have appropriate classification, the firm is not included in the sample.

After assigning each company to a four-digit NAICS industry, we tabulated the number of times companies within each industry appeared in the top 50 during the FY 2009–13 period. We designated industries with counts of five or larger as trademark-intensive. At the extremes, counts of five or higher occurred if a given company was among the top 50 registrants in each of the five years studied, or if five different companies in an industry had reached the top 50 in a single year during the period.

The results are provided in Table A-4. Only three industries are missing from the list of trademark-intensive industries listed in Table A-3. These are grocery stores (NAICS 4451), sugar confectionery product manufacturing (NAICS 3113), and department Stores (NAICS 4521).

Table A-4. Industries with Five or More Appearances in the Listings of Top 50 Trademark Registering Companies, 2009–13

NAICS Code	Industry Title	Number of Top 50 Appearances
3399	Other miscellaneous manufacturing	28
3254	Pharmaceutical and medicine manufacturing	28
3256	Soap, cleaning compound, and toilet preparation manufacturing	21
5121	Motion picture and video industries	13
5151	Radio and television broadcasting	13
3343	Audio and video equipment manufacturing	12
7132	Gambling industries	10
4451	Grocery stores	10
5241	Insurance carriers	9
3113	Sugar and confectionery product manufacturing	7
4521	Department stores	6

Source: USPTO calculations using data from the USPTO's Annual *Performance and Accountability Report*, Avention, Manta, and Internet searches.

Random Sample of All Trademark Registrations

Methodology 3

One shortcoming of identifying industries based on the trademark intensity or top 50 appearances is that these approaches tend to bias selection toward larger companies that register a greater number of trademarks.[55] Moreover, these approaches can fail to account for the critical importance that single trademarks may hold for large entities (for instance, Coca-Cola soft drink or Apple personal computer) or of differences in industry composition and concentration. Accordingly, those methods will miss industries composed of smaller companies that may account for many trademarks as a group but do not otherwise fall in the USPTO top 50 listing. To help

55 Note that many small companies use trademarks but, for various reasons, do not seek Federal registration. Yet they still have rights in those marks under common law.

overcome this shortcoming, we supplemented our analyses with a random sample of registrants drawn from the universe of all 194,326 trademarks registered in 2013. These data were generated by the USPTO using publicly available source data.[56] To measure the industry share of total registered trademarks, a random sample of 300 registrations was drawn from this dataset. U.S. companies were listed as the registrant on 247 of these 300 trademark registrations.[57] We assigned four-digit NAICS industry codes to these U.S. firms using the same procedure employed for the top 50 corporate registrants.[58] Table A-5 lists those industries that were two standard deviations above the mean in the number of companies that were associated with them. The only additional industry that was identified as trademark-intensive using this methodology is *civic and social organizations* (NAICS 8134).

Table A-5. Percent Distribution of Trademark Registrations of Selected Industries from Sample of U.S.-Owned, Trademark-Registrant Companies, Ranked by Percent, 2013

NAICS code	Industry Title	Percent
3399	Other miscellaneous manufacturing	4.30%
5418	Advertising and related services	3.60%
5111	Newspaper, periodical, book, and directory publishers	3.60%
8134	Civic and social organizations	3.60%
3391	Medical equipment and supplies	2.90%
4234	Commercial equipment	2.90%

Source: USPTO calculations using the agency's trademark registration data.

One limitation of this approach is that the sample was drawn from records that pertain to only a single year. This may result in the under-identification of industries that generally register frequently in an average year, but, for some reason, were less active in 2013 (which may not be a representative year). The sample size is another important limitation. The sample we used was small because assigning NAICS codes to each company requires the use of many resources. In an ideal data world, the USPTO trademark registry would include each corporate registrant's NAICS code; however, such information is not provided in trademark applications and therefore is not included in the USPTO database. The process of assigning NAICS codes to companies was especially cumbersome because many of the firms drawn from the sample were small businesses

56 See USPTO's electronic bulk data products available at https://www.uspto.gov/learning-and-resources/electronic-bulk-data-products. For bulk research datasets, see http://www.uspto.gov/learning-and-resources/electronic-data-products/data.

57 This analysis was restricted to U.S.-owned firms because of the great difficulty in assigning NAICS codes for small, foreign-owned firms.

58 Because the sample was drawn by registrations as opposed to registrants, a single individual or company could be drawn more than once. However, based on the review of the registrant names, it does not appear to be the case that we have multiple draws of the same entity in our sample.

with few employees and had little publicly available information from which to find or infer a NAICS classification.

Table A-6 provides a complete list of all 68 industries designated as trademark-intensive and better illustrates their significant overlap as identified by the three methodologies. All but four of the industries listed in Table A-6 were selected based on their above-average trademark intensity. These four additional industries were selected based on either their top 50 registrations or the trademark registration sample; but none of these industries was flagged by both methods. Only one industry, other miscellaneous manufacturing (NAICS 3399), was selected through all three methods.

Table A-6. Trademark-Intensive Industries and Selection Criteria

NAICS Code	Industry Title	Selection Criterion		
		Trademark Intensity	Top 50	Sample
2111	Oil and gas extraction	X		
2123	Nonmetallic mineral mining and quarrying	X		
2211	Power generation and supply	X		
2212	Natural gas distribution	X		
2361	Residential building construction	X		
2372	Land subdivision	X		
3113	Sugar and Confectionary Product Manufacturing		X	
3114	Fruit and vegetable preserving and specialty food	X		
3115	Dairy products	X		
3121	Beverages	X		
3162	Footwear manufacturing	X		
3219	Other wood products	X		
3231	Printing and related support activities	X		
3251	Basic chemicals	X		
3252	Resin, synthetic rubber, and artificial synthetic fibers and filaments	X		
3253	Pesticides, fertilizers, and other agricultural chemicals	X		
3254	Pharmaceuticals and medicine	X	X	
3256	Soaps, cleaning compounds, and toilet preparations	X	X	
3261	Plastics products	X		
3279	Other nonmetallic mineral products	X		
3314	Nonferrous metal (except aluminum) production and processing	X		
3332	Industrial machinery	X		
3333	Commercial and service industry machinery	X		

3336	Engine, turbine, and power transmission equipment	X		
3339	Other general purpose machinery	X		
3342	Communications equipment	X		
3343	Audio and video equipment manufacturing	X	X	
3345	Electronic instruments	X		
3351	Electric lighting equipment	X		
3359	Other electrical equipment and components	X		
3369	Other transportation equipment	X		
3371	Household and institutional furniture and kitchen cabinets	X		
3391	Medical equipment and supplies	X		X
3399	Other miscellaneous manufacturing	X	X	X
4234	Commercial equipment	X		X
4236	Electrical and electronic goods	X		
4244	Grocery and related products	X		
4451	Grocery Stores		X	
4521	Department Stores		X	
4541	Electronic shopping and mail-order houses	X		
4885	Freight transportation arrangement	X		
5111	Newspaper, periodical, book, and directory publishers	X		X
5112	Software publishers	X		
5121	Motion picture and video industries	X	X	
5151	Radio and television broadcasting	X	X	
5152	Cable and other subscription programming	X		
5171	Wired telecommunications carriers	X		
5179	Other telecommunications	X		
5191	Other information services	X		
5223	Activities related to credit intermediation	X		
5232	Securities and commodity exchanges	X		
5239	Other financial investment activities	X		
5241	Insurance carriers	X	X	
5259	Other investment pools and funds	X		
5311	Lessors of real estate	X		
5324	Machinery and equipment rental and leasing	X		
5331	Lessors of nonfinancial intangible assets (except copyrighted works)	X		
5416	Management and technical consulting services	X		
5418	Advertising and related services	X		X
5419	Other professional and technical services	X		

5619	Other support services	X		
6214	Outpatient care centers	X		
6215	Medical and diagnostic laboratories	X		
6219	Other ambulatory health care services	X		
7132	Gambling industries	X	X	
8134	Civic and Social Organizations			X

Source: USPTO calculations.

As an additional way of checking the robustness of our methodologies, we use the listing of the top hundred global brands in 2013 as identified by Interbrand's report of *Best Global Brands*. We find that 52 out of the 100 top global brands have a NAICS code that corresponds to that of 25 out of the 68 industries that we designated as trademark-intensive. While we were still able to capture more than half of these brands, it is a significantly lower rate than the 70 percent achieved in the 2012 report.

Table A-7. Trademark-Intensive Industries with Top 100 Global Brands in 2013

Naics Code	Industry Title	Brand
2111	Oil and gas extraction	Shell
3115	Dairy products	Danone, Nestle
3121	Beverages	Coca-Cola, Pepsi, Budweiser, Nescafe, Sprite, Corona, Heineken, Jack Daniels, Johnnie Walker, Smirnoff, Moet & Chandron
3162	Footwear manufacturing	Nike, Adidas
3254	Pharmaceuticals and medicine	Johnson and Johnson
3256	Soaps, cleaning compounds, and toilet preparations	Gillette, L'Oreal, Colgate, Avon
3279	Other nonmetallic mineral products	3M
3336	Engine, turbine, and power transmission equipment	General Electric
3342	Communications equipment	Cisco, Nokia
3343	Audio and video equipment manufacturing	Samsung, Phillips, Sony, Panasonic
3345	Electronic instruments	Siemens
3359	Other electrical equipment and components	Duracell
3369	Other transportation equipment	Harley Davidson
3399	Other miscellaneous manufacturing	Cartier, Nintendo
4541	Electronic shopping and mail-order houses	Amazon.com, Ebay
5111	Newspaper, periodical, book, and directory publishers	Thomson Reuters
5112	Software publishers	Microsoft, Oracle, SAP, Adobe
5121	Motion picture and video industries	Discovery
5151	Radio and television broadcasting	Disney, MTV
5179	Other telecommunications	Facebook

5191	Other information services	Google
5223	Activities related to credit intermediation	Visa, Mastercard
5239	Other financial investment activities	Citi
5241	Insurance carriers	AXA, Allianz
5416	Management and technical consulting services	Accenture

Source: USPTO calculations using Interbrand's Top 100 Global Brands and data from Avention and Manta.

As noted before, the trademark registrations are organized by class in the USPTO database. As reflected in their class title, these 49 trademark classes are divided by the function or purpose of the good or branches of activities for services associated with a particular trademark. This differs significantly from the NAICS industry classification which aims to indicate the principal business activity of an establishment. However, looking at the trademark registration rate by class can give some insight about the products through which trademarks impact the economy the most.

Table A-8 provides a ranked list of total trademark registrations for years 2004 – 2013. The order is very closely related to what was observed in the 2012 report. Furthermore, as in the 2012 report, the same top seven trademark classes accounted for more than half of all registrations in this time period. Three of these classes are very broad and cover services ranging from wholesale and retail trade to professional and business services, financial services, insurance, educational services and the arts, entertainment, and recreation industry that consumers use on a daily basis.[59] We also observe that many of the industries we designated as trademark-intensive correspond to the top seven classes, and all of those designated as trademark-intensive using more than one methodology seem to fit into one of the top seven classes.

Table A-8. Trademark Registrations by Class, Ranked by Number of Registrations, 2004–2013

Trademark Class	Class Title	Trademark Registrations		
		Total	Percent of Total	Cumulative Percent
9	Electrical and scientific apparatus	232555	10.63	10.63
35	Advertising and business	232398	10.62	21.25
41	Education and entertainment	203850	9.32	30.57
42	Computer and scientific	128497	5.87	36.44
25	Clothing	125252	5.72	42.16
36	Insurance and financial	103485	4.73	46.89
16	Paper goods and printed matter	100455	4.59	51.49
5	Pharmaceuticals	68597	3.14	54.62
3	Cosmetics and cleaning preparations	63559	2.90	57.53
28	Toys and sporting goods	58727	2.68	60.21

59 These classes are *advertising and business* (class 35), *education and entertainment* (class 41), and *insurance and financial* (class 36).

30	Staple foods	54368	2.48	62.69
44	Medical, beauty and agricultural	50634	2.31	65.01
37	Building construction and repair	48189	2.20	67.21
43	Hotels and restaurants	46353	2.12	69.33
7	Machinery	40872	1.87	71.20
11	Environmental control apparatus	37904	1.73	72.93
10	Medical apparatus	37640	1.72	74.65
38	Telecommunications	36466	1.67	76.32
45	Personal and legal	34567	1.58	77.90
20	Furniture and articles not otherwise classified	33686	1.54	79.44
29	Meats and processed foods	33074	1.51	80.95
21	Housewares and glass	31085	1.42	82.37
1	Chemicals	30843	1.41	83.78
33	Wines and spirits	30426	1.39	85.17
12	Vehicles	29834	1.36	86.53
39	Transportation and storage	29830	1.36	87.90
18	Leather goods	28774	1.32	89.21
14	Jewelry	27943	1.28	90.49
6	Metal goods	24792	1.13	91.62
40	Treatment of materials	24744	1.13	92.75
32	Light beverages	21762	0.99	93.75
19	Non-metallic building materials	20319	0.93	94.68
31	Natural agricultural products	17726	0.81	95.49
24	Fabrics	16181	0.74	96.23
17	Rubber goods	13411	0.61	96.84
8	Hand tools	12801	0.59	97.42
2	Paints	9165	0.42	97.84
4	Lubricants and fuels	9109	0.42	98.26
34	Smokers' articles	7007	0.32	98.58
26	Fancy goods	6221	0.28	98.86
27	Floor coverings	5278	0.24	99.10
22	Cordage and fibers	4800	0.22	99.32
13	Firearms	4723	0.22	99.54
15	Musical instruments	4140	0.19	99.73
B	Services certification mark	1762	0.08	99.81
23	Yarns and threads	1701	0.08	99.89
200	Collective membership	1564	0.07	99.96
A	Goods certification mark	898	0.04	100.00
	Total	**2187967**	**100.00**	**100**

Source: USPTO calculations using the agency's trademark registration data.

Note: The cumulative percent figures may not equal the sum of the percent of total figures because of rounding.

Copyrights

As indicated in the text, our methodology for designating copyright-intensive industries draws heavily from definitions established by the World Intellectual Property Organization's (WIPO) *Guide on Surveying the Economic Contribution of the Copyright-based Industries*.[60] A series of reports by Stephen Siwek titled *Copyright Industries in the U.S. Economy* have applied these definitions to the U.S. economy.[61] While this established literature underlies our analysis, we used a more narrow definition of copyright-intensive industries than WIPO, focusing on industries that produce copyrighted work and excluding several industries associated with the distribution of copyrighted material. This deviation from the WIPO Guide was needed in order to maintain internal consistency with our measures of patent- and trademark-intensive industries.

Methodology

Because WIPO's *Guide on Surveying the Economic Contribution of the Copyright-based Industries* clearly distinguishes the type of works that can be copyrighted, the industries in which those works are created, and the downstream (distribution) industries delivering the produced copyrighted works, it is possible to develop a list of copyright-intensive industries that is comparable in scope to our lists of patent- and trademark-intensive industries. We started by focusing on "core" copyright industries, which WIPO defines as industries "wholly engaged in creation, production and manufacturing, performance, broadcast, communication and exhibition, or distribution and sales of works and other protected subject matter."[62] In other words, core copyright industries were considered 'core' because they either produce copyrighted materials or bring them to market.

For this report, we are only concerned with the set of industries that are primarily responsible for the *creation or production* of copyrighted materials and designate them as copyright-intensive. Thus, to the extent possible using four-digit NAICS industry codes, we excluded industries whose primary purpose is to distribute copyright materials to businesses, consumers or both. For example, we did not count industries such as *book, periodical, and music stores* (NAICS 4512) or *consumer goods rental* (NAICS 5322), which includes video rentals, as copyright-intensive even though they are part of the "core" category in the WIPO guide.[63] Our definition is narrower than WIPO's in order to be consistent with our treatment of patent- and trademark-intensive industries, where industries most responsible for the production of protected IP are the main focus. This approach simply reflects our goal of examining the industries in the economy that are most

60 World Intellectual Property Organization 2003.

61 See, for example, Siwek 2009.

62 World Intellectual Property Organization 2003, 29. The core copyright industries represent one of four main groups of copyright-based industries. The others are interdependent, partial, and non-dedicated support industries.

63 This discussion should not imply that distribution industries as a whole cannot by our definitions be considered IP-intensive. As discussed above, a broad range of industries seek trademark protection, including distribution industries like clothing stores, which are identified as IP-intensive.

responsible for the production of protected IP and use of this approach is not a criticism of WIPO's guidelines.

One conceptual distinction between the approach taken here and that selected in the patent and trademark sections is worth noting. Throughout this report, the focus was on industries that produce protected IP, whether patents, trademarks, or copyrights. In the case of patents and trademarks, we defined "intensive" industries as the subset of all patent or trademark producers that had high scores in various "intensity" measures, whereas we define as copyright-intensive essentially all industries traditionally associated with the production of copyrighted materials.

Table A-9 lists the copyright-intensive industries. All are involved in the creation and/or recording (in print, magnetically, or digitally) of protected works.[64]

Table A-9. Copyright-Intensive Industries

NAICS code	Industry Title
5111	Newspaper, periodical, book, and directory publishers
5112	Software publishers
5121	Motion picture and video industries
5122	Sound Recording Industries
5151	Radio and television broadcasting
5152	Cable and other subscription programming
5191	Other information services (news syndicates and internet sites)
5414	Specialized design services (visual and graphic arts)
5415	Computer systems design and related services (software and databases)
5418	Advertising and related services
5419	Other professional and technical services
7111	Performing arts companies
7115	Independent artists, writers, and performers

Source: ESA selection based on World Intellectual Property Organization 2003.

Combined List of IP-intensive industries

Table A-10 provides the total list of all eighty-one unique IP-intensive industries that we obtain from a combination of the patent-, trademark-, and copyright-intensive industries we already identified. In light of the considerable overlap between the patent- and trademark-intensive industries and some between copyright- and trademark-intensive industries, the 81-industry total is smaller than the sum of the parts. This table also indicates that 15 out of the 25 patent-intensive industries are designated as both patent- and trademark-intensive while 6 out of the 7 copyright-intensive industries are designated as both trademark- and copyright-intensive. By construction, there does not exist any overlap between patent- and copyright-intensive industries.

64 We list the relevant copyrighted materials in parentheses if the title describing the industry does not clearly indicate what protected materials are produced (e.g. *other information services* (NAICS 5191)).

This is because the USPTO developed a concordance of patent technology only to manufacturing industries from which the patent-intensive industries are identified. These industries do not cover any of the service sectors from which the copyright-intensive industries are drawn.

Table A-10 also provides the employment count in 2013 for each of these IP-intensive industries, totaling 27.3 million jobs for the year.[65]

Table A-10. IP-Intensive and Selection Criteria

NAICS Code	Industry Title		Selection criteria		
		Employment in 2013 (1000 jobs)	Patent-Intensive	Trademark-Intensive	Copyright-Intensive
2111	Oil and gas extraction	195.6		X	
2123	Nonmetallic mineral mining and quarrying	87.3		X	
2211	Power generation and supply	393.7		X	
2212	Natural gas distribution	110.7		X	
2361	Residential building construction	975		X	
2372	Land subdivision	52.4		X	
3113	Sugar and confectionary product manufacturing	73.2		X	
3114	Fruit and vegetable preserving and specialty food	170.5		X	
3115	Dairy products	135		X	
3121	Beverages	190.7		X	
3162	Footwear manufacturing	13.9		X	
3219	Other wood products	214.4		X	
3231	Printing and related support activities	473.9		X	
3251	Basic chemicals	142.6	X	X	
3252	Resin, synthetic rubber, and artificial synthetic fibers and filaments	92.3		X	
3253	Pesticides, fertilizers, and other agricultural chemicals	38.8	X	X	
3254	Pharmaceuticals and medicine	276.7	X	X	
3255	Paint, coating, and adhesive manufacturing	58.5	X		
3256	Soaps, cleaning compounds, and toilet preparations	104.9	X	X	
3259	Other chemical product and preparation manufacturing	83.5	X		
3261	Plastics products	530		X	

65 In addition to wage and salary jobs, the employment count included self-employment; which accounts for a sizeable portion of employment in the copyright-intensive industries.

3279	Other nonmetallic mineral products	72.1		X	
3314	Nonferrous metal (except aluminum) production and processing	62.5		X	
3331	Agriculture, construction, and mining machinery manufacturing	252.4	X		
3332	Industrial machinery	108.1	X	X	
3333	Commercial and service industry machinery	86.9	X	X	
3334	Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	127.6	X		
3335	Metalworking machinery manufacturing	183.8	X		
3336	Engine, turbine, and power transmission equipment	98.5	X	X	
3339	Other general purpose machinery	257.3	X	X	
3341	Computer and peripheral equipment	158.8	X		
3342	Communications equipment	101.1	X	X	
3343	Audio and video equipment manufacturing	19.4	X	X	
3344	Semiconductors and other electronic components	376.7	X		
3345	Electronic instruments	395.8	X	X	
3346	Manufacturing and reproducing magnetic and optical media	19.4	X		
3351	Electric lighting equipment	48	X	X	
3352	Household appliance manufacturing	57.7	X		
3353	Electrical equipment manufacturing	145.1	X		
3359	Other electrical equipment and components	126.9	X	X	
3369	Other transportation equipment	32.3		X	
3371	Household and institutional furniture and kitchen cabinets	246.1		X	
3391	Medical equipment and supplies	316.6	X	X	
3399	Other miscellaneous manufacturing	319.3	X	X	
4234	Commercial equipment	628.7		X	
4236	Electrical and electronic goods	320.7		X	
4244	Grocery and related products	752.5		X	
4451	Grocery stores	2600		X	
4521	Department stores	1348.3		X	
4541	Electronic shopping and mail-order houses	347.6		X	
4885	Freight transportation arrangement	205.7		X	

5111	Newspaper, periodical, book, and directory publishers	464		X	X
5112	Software publishers	300.6		X	X
5121	Motion picture and video industries	413.9		X	X
5122	Sound recording Industries	23.5			X
5151	Radio and television broadcasting	223.6		X	X
5152	Cable and other subscription programming	71.3		X	X
5171	Wired telecommunications carriers	614.7		X	
5179	Other telecommunications	92.2		X	
5191	Other information services	201.3		X	X
5223	Activities related to credit intermediation	297.4		X	
5232	Securities and commodity exchanges	7.3		X	
5239	Other financial investment activities	482.2		X	
5241	Insurance carriers	1433.9		X	
5259	Other investment pools and funds	1.6		X	
5311	Lessors of real estate	883.7		X	
5324	Machinery and equipment rental and leasing	138		X	
5331	Lessors of nonfinancial intangible assets (except copyrighted works)	23.9		X	
5414	Specialized design services	265.6			X
5415	Computer systems design and related services	1848.4			X
5416	Management and technical consulting services	1443		X	
5418	Advertising and related services	503.9		X	X
5419	Other professional and technical services	790.6		X	X
5619	Other support services	298.9		X	
6214	Outpatient care centers	719.4		X	
6215	Medical and diagnostic laboratories	260.8		X	
6219	Other ambulatory health care services	309.7		X	
7111	Performing arts companies	138.6			X
7115	Independent artists, writers, and performers	338.6			X
7132	Gambling industries	140.7		X	
8134	Civic and social organizations	393.4		X	

Source: USPTO calculations using data from the Bureau of Labor Statistics' Industry Productivity program.

Note: Employment includes wage and salary jobs, the self-employed, and unpaid family workers and is measured in thousands of jobs.

Table A-11. IP-Related Products and Services in the 2017 North American Product Classification System (NACPS)

NAPCS code	Title
30150	Contract production services for intellectual property
30920	Live performances produced under contract
30930	Contract live sporting events
30940	Contract live public appearances and speeches
30970	Support services for production of audiovisual works and studio sound recordings
31256	Exclusivity rights
31470	Licensing of rights to use intellectual property protected by trademark
31480	Licensing of rights to use intellectual property protected by copyright
31500	Outright sale of intellectual property protected by copyright
31510	Contract production services for intellectual property protected by copyright, exclude live performing arts
31520	Contract design services for intellectual property protected by trademark
35000	Licensing of domestic rights to distribute audiovisual works
35020	Licensing of domestic rights to exhibit, broadcast, or rent feature films
35030	Licensing of domestic rights to exhibit, broadcast, or rent short films
35040	Licensing of domestic rights to broadcast or rent television programming
35050	Licensing of domestic rights to exhibit, broadcast, or rent other audiovisual works
35070	Licensing of international rights to distribute audiovisual works
35080	Licensing of international rights to exhibit, broadcast, or rent audiovisual works
35090	Licensing of international rights to use concept of domestic audiovisual works
35100	Licensing of international rights for other uses of audiovisual works
35110	Contract production services for audiovisual works
35320	Licensing of rights to use musical compositions
35331	Licensing of rights to use musical compositions - To record and reproduce for commercial use, except for distribution as phonorecords (i.e., electrical transcription rights)
35332	Licensing of rights to use musical compositions - In a dramatic work (i.e., grand rights and dramatic adoption rights)
35333	Licensing of rights to use musical compositions - In other works
35340	Licensing of international rights to publish domestic musical compositions (i.e., international sub-publishing)
35350	Licensing of rights to use musical recordings
35410	Administration of copyrights for others
35460	Merchandise licensing - Domestic and international
35520	Licensing of rights to use music
35530	Licensing of rights to use audiovisual works
35540	Contract production services for original music, excluding music for audiovisual works

35620	Licensing of rights to reproduce and distribute computer software
35730	Licensing of rights to broadcast radio programs
35740	Licensing of rights to distribute specialty audio programming content
35790	Licensing of rights to broadcast television programs
35800	Licensing of rights to distribute specialty television programming content
36250	Licensing of rights to syndicated media content
36742	Patent, copyright, and other intellectual property document filing and search services
37570	Licensing of rights to reproduce and distribute computer software protected by copyright
37910	Licensing of rights to use stock photos
38010	Patent brokering (marketing) services
38400	Patent drawing and trademark illustration services
39250	Outright sale of original works of intellectual property
39400	Licensing of rights to use intellectual property
50410	Licensing of rights to use intellectual property protected as industrial property
50420	Licensing of rights to use intellectual property protected by copyrights
50430	Licensing and royalty agreements to exploit natural resources

Source: U.S. Census Bureau at http://www.census.gov/eos/www/napcs/.

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