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Business Use of Intellectual Property Protection Documented in NSF Survey

by John E. Jankowski[1]

In today's global economy, much of a business's competitive advantage lies in the ability to protect and exploit exclusive rights over investments in intellectual property (IP)—that is, creative outcomes lacking physical substance but providing long-term benefits to the company. Hence, IP protection is a persistent and recurrent concern of businesses.[2] Under IP law, owners are granted certain exclusive rights to a variety of intangible assets, such as discoveries and inventions; musical, literary, and artistic works; and symbols, names, images, and designs used in commerce. New survey findings from the National Science Foundation (NSF) and the U.S. Census Bureau (Census) indicate that trademarks and trade secrets are identified by the largest number of businesses as important forms of IP protection, followed by copyrights, and then patents. However, the level of reliance on each of these forms of IP protection varies considerably across industry sectors.

In 2009 NSF and Census launched a revamped and expanded Business R&D and Innovation Survey (BRDIS).[3] Businesses located in the United States were asked to report on the importance of various types of IP protection to their company during 2008. Specifically, they reported whether utility patents, design patents, trademarks, copyrights, trade secrets, and mask works (copyright protection for semiconductor products) were "very important," "somewhat important," or "not important." The data were weighted by industry category and size, and they were collected for businesses with and without R&D activity.[4] This InfoBrief presents summary findings from the 2008 BRDIS pilot survey on the importance of IP protection among U.S.-located businesses.

Broad Sectors

All Industries

Businesses used a variety of IP protection strategies tailored to the industries in which they operate and to the intangible asset they are meant to protect. Overall, more businesses reported that trademarks, trade secrets, and copyrights were important forms of IP protection than reported that patents and mask works were important. Fifteen percent of all businesses reported trademarks as very important (6%) or somewhat important (9%) to their business in 2008, and 14% of businesses reported trade secrets as important (6% and 8%, respectively) (table 1). Because each form of intellectual property rights (IPR) provides a specialized type of protection (see "Definitions"), the percentages are not additive across IPR types.[5] For example, a trade secret provides economic benefit precisely by keeping information from being publicly known, whereas the purpose of a trademark is to protect economic value through name or brand recognition. Hence, a single firm could identify both of these forms of IPR as important to its business.

Copyrights were identified as important by 12% of U.S.-located businesses, and 5% and 4% of businesses, respectively, indicated the importance of IP protection afforded from design patents and utility patents. Not surprisingly, mask works, which provides extremely focused copyright protection for semiconductor products, were reported as very or somewhat important by only 2% of all businesses.

These findings were for all business located in the United States. However, a very large fraction of businesses within the "all industries" totals did not report using most forms of IP protection. For example, several

TABLE 1. Businesses that reported IPR as being very, somewhat, or not important, by type of IPR and selected industry: 2008
(Percent)

IPR, industry, and NAICS code	All businesses			Businesses with R&D activity			Businesses without R&D activity		
	Very	Somewhat	Not	Very	Somewhat	Not	Very	Somewhat	Not
Trade secrets									
All industries	6	8	85	45	22	33	5	8	87
Chemicals, 325	50	17	33	68	13	19	33	20	47
Computer and electronic products, 334	36	18	46	58	25	17	17	12	71
Internet service providers, web search portals, and data processing services, 518	21	30	50	28	50	22	17	21	62
Electrical equipment, appliances, and components, 335	25	23	52	51	27	22	10	21	69
Food, 311	22	20	59	56	20	25	16	20	64
Publishing, 511	26	15	59	64	17	19	10	15	75
Trademarks									
All industries	6	9	84	33	27	40	5	9	86
Chemicals, 325	31	31	39	43	26	31	18	35	47
Publishing, 511	33	21	45	60	22	18	23	21	57
Beverage and tobacco products, 312	33	17	50	39	0	61	33	19	49
Internet service providers, web search portals, and data processing services, 518	21	25	55	37	42	22	14	17	69
Computer and electronic products, 334	22	23	55	38	32	29	8	15	76
Electrical equipment, appliances, and components, 335	21	24	56	43	33	24	7	18	75
Utility patents									
All industries	2	3	96	26	15	60	1	2	97
Computer and electronic products, 334	25	12	63	44	21	34	8	4	88
Chemicals, 325	22	15	64	38	21	41	6	8	87
Electrical equipment, appliances, and components, 335	18	12	70	43	20	37	3	7	89
Machinery, 333	14	6	81	39	13	48	7	4	90
Plastics and rubber products, 326	9	9	82	24	14	62	5	7	88
Petroleum and coal products, 324	4	12	84	20	10	70	2	12	86
Design patents									
All industries	2	4	95	15	18	67	1	3	95
Electrical equipment, appliances, and components, 335	14	15	71	28	25	47	5	9	85
Computer and electronic products, 334	13	15	72	23	24	53	5	7	88
Chemicals, 325	11	15	75	17	20	63	5	9	86
Plastics and rubber products, 326	8	14	78	28	27	45	2	10	87
Machinery, 333	8	11	81	21	22	58	5	8	87
Textile, apparel, and leather, 313–316	8	11	81	41	45	14	3	6	91
Copyrights									
All industries	5	7	88	25	25	49	4	6	89
Publishing, 511	36	25	39	58	27	14	27	23	49
Chemicals, 325	13	26	61	19	31	51	7	21	72
Computer and electronic products, 334	16	22	62	27	30	43	7	15	77
Electrical equipment, appliances, and components, 335	14	22	65	27	35	38	6	14	80
Internet service providers, web search portals, and data processing services, 518	15	20	65	25	25	50	10	18	72
Telecommunications, 517	10	16	73	51	33	16	6	15	79
Mask works									
All industries	1	2	98	4	6	90	1	2	98
Computer and electronic products, 334	12	7	81	19	10	71	5	5	90
Petroleum and coal products, 324	3	10	87	0	0	100	3	12	85
Electrical equipment, appliances, and components, 335	3	5	92	5	8	87	1	4	95
Telecommunications, 517	1	6	93	5	4	91	1	6	93
Chemicals, 325	2	5	93	2	6	92	2	4	94
Machinery, 333	3	3	94	8	6	86	2	2	96

IPR = intellectual property rights; NAICS = North American Industry Classification System.

NOTES: Sum of detail may not add to totals because of rounding. The survey asked companies to respond to a three-level Likert scale on the importance of various types of intellectual property protection. Business were asked whether utility patents, design patents, trademarks, copyrights, trade secrets, and mask works (copyright protection for semiconductor products) were “very important,” “somewhat important,” or “not important” to the company during 2008. For each type of IPR, the table lists the six 3-digit NAICS industries in which the highest share of companies reported the IPR as "very important" or "somewhat important."

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Business R&D and Innovation Survey: 2008.

nonmanufacturing industries—such as construction (North American Industry Classification System [NAICS] 23), educational services (NAICS 61), and accommodation and food services (NAICS 72)—ranked all forms of IPR low in importance, but they account for a relatively large number of businesses nationwide. Hence, their comparatively low rate of IPR use, given their large number in the business count total, clearly affects the overall pattern of IPR importance.[6]

To compensate somewhat for this weighting artifact, the next two sections highlight findings for the smaller yet more R&D-intensive manufacturing sector (NAICS 31–33) and information sector (NAICS 51). Accounting for just 8% and 1%, respectively, of the survey population total, these two sectors account for 67% and 13%, respectively, of total business R&D expenditures in the United States.[7] Furthermore, these two sectors have much higher incidences of product innovation than does any other 2-digit NAICS sector. About 22% of all companies in manufacturing industries reported one or more product innovations in the 2006–08 period, as did 30% of businesses in the information sector. By comparison, the incidence of product innovation for all U.S.-located businesses was 9% during this period.[8]

Manufacturing Sector

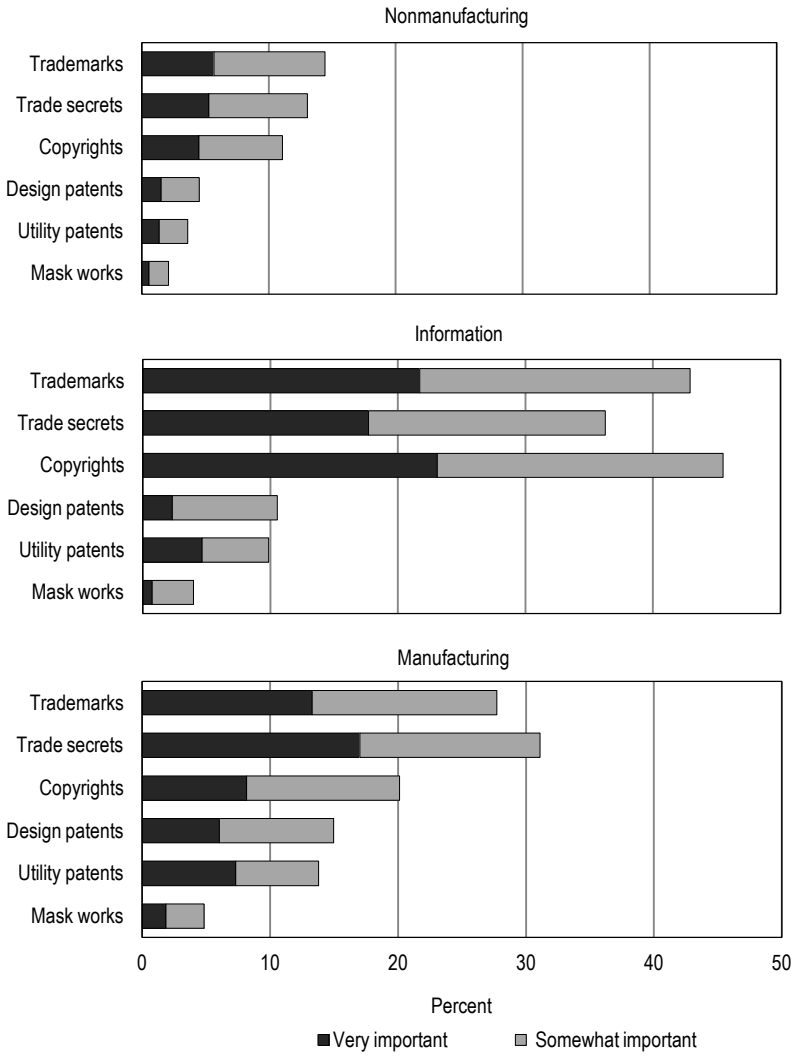
A higher share of businesses in the manufacturing sector (NAICS 31–33) than in the nonmanufacturing sector (NAICS 21–23, 42–81) reported each of the individual types of IPR as important. Manufacturers were three times as likely as nonmanufacturers to rate patents (both design and utility) as important to their business during 2008 (14%–15% versus 4%–5%) (figure 1).

Within manufacturing industries, 31% of businesses reported trade secrets as an important type of IP protection, 17% of which reported this type of IPR as very important. Twenty-eight percent of manufacturers reported trademarks as important. Overall, they were twice as likely as nonmanufacturers to rate trade secrets and trademarks as important (13% and 14%, respectively, for nonmanufacturers).

Information Sector

Businesses in the information sector—including notably software publishers (NAICS 5112); telecommunications (NAICS 517); and Internet service providers, Web search portals, and data processing services (NAICS 518) (hereafter, Internet services)—rated copyrights, trademarks, and trade secrets as considerably more important than did businesses in the manufacturing sector. Indeed, copyrights and trademarks were reported by more than 20% of the information sector businesses as very important (figure 1, middle panel),

FIGURE 1. Businesses reporting IPR as very or somewhat important, by type of industry sector and type of IPR: 2008



IPR = intellectual property rights.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Business R&D and Innovation Survey: 2008.

an indication of worth unmatched for any other type of IPR by any other economic sector. This suggests that consumer awareness and identification of product ownership is considered extremely valuable by these information industries.

In the aggregate, information sector businesses were less likely than manufacturing sector businesses to rely on patents for their IP protection (10%–11% versus 14%–15%). An equal proportion of information sector businesses reported utility patents as being very important (5%) and somewhat important (5%). By comparison, one-fourth as many information sector businesses reported design patents as very important (2%) than as somewhat important (8%).

Individual IPR Forms

Different industries rely on different sources of IP protection to varying degrees. Several industries reported that they rely relatively heavily on all forms of IPR collected on the BRDIS survey, whereas others reported that they rely primarily on a single form of IP protection. Table 1 details, for each form of IPR, the six 3-digit NAICS industries[9] in which the largest percentages of businesses reported that the type of IPR was very or somewhat important during 2008 ("top six industries"). The table also differentiates between businesses with and without R&D activity (described below).

By IPR

More so than for other forms of IPR, a diverse group of industries reported trade secrets as very or somewhat important to their businesses. Included among the top six industries are both high-technology manufacturers (electrical equipment, appliances, and components) and low-technology manufacturers (food), manufacturing industries serving well-established industrial bases (chemicals) as well as more recent entries to the economic landscape (computer and electronic products), and businesses most directly representative of the knowledge-intensive service economy (publishing and Internet services providers). Among 4-digit NAICS industries, more than 70% of software publishers (NAICS 5112), pharmaceutical and medicine manufacturing businesses (NAICS 3254), and basic chemical manufacturing businesses (NAICS 3251) reported trade secrets as important to their operations. Further, 98% of businesses in the semiconductor machinery industry (NAICS 333295) reported trade secrets as important—no other NAICS industry reported a higher share of any type of IPR as important.

Trademarks were similarly important to a wide mix of businesses, but as opposed to trade secrets, which depend on secrecy, trademarks identify and distinguish one's products (goods or service) from those of other companies. More than 50% of the businesses in the publishing and chemicals industries reported this type of IPR as important, including multiple chemical subsectors: basic chemicals (NAICS 3251); pesticide, fertilizer, and other agricultural chemicals (NAICS 3253); pharmaceuticals and medicines (NAICS 3254); and soap, cleaning compound, and toilet preparations (NAICS 3256).

All of the top six industries in the utility patents category were from the manufacturing sector, led by computer and electronic products (NAICS 334) and chemicals (NAICS 325). They were also among the industries that were likely to report design patents as important. Not coincidentally, these two industries accounted for more than 40% (41,000 and 18,000, respectively) of all patent applications (137,000) reported on the survey. Navigational, measuring, electromedical, and control instruments (NAICS 3345) alone accounted for more than 20,100 applications; 50% of its businesses noted the importance of utility patents, and 30% noted the importance of design patents—which were among the largest shares reported for any 4-digit NAICS industry.

By far, a larger share (61%) of businesses in publishing (NAICS 511) than in other industries reported copyright protection as important. In no other 3-digit NAICS industry did more than 40% of the businesses report copyrights as an important type of IPR. About 19% of the computer and electronic products businesses (NAICS 334) reported mask works as very or somewhat important—leading all other 3-digit NAICS industries. Not surprisingly, 78% of semiconductor machinery businesses (NAICS 333295) reported this form of IP protection as very important to their operations.

By Industry

Three industries—chemicals; computer and electronic products; electrical equipment, appliances, and components—appear in all six IPR groupings. A relatively large share of businesses in each of those industries reported the importance of employing a variety of IP protection strategies, running the gamut from invention disclosure through patent filings to maintaining name recognition via the use of trademarks.

Six industries appear in two or three different IPR groupings. Publishing and Internet services are each listed in the

trade secrets, trademarks, and copyrights groupings; machinery appears in utility patents, design patents, and mask works. Petroleum and coal products, plastics and rubber products, and telecommunications each appear in two IPR groupings, differing by industry.

Three industries are listed among those reporting a high share of importance to only one form of IPR:

- Textile, apparel, and leather: design patents
- Beverage and tobacco products: trademarks
- Food: trade secrets

Companies with R&D Activity

Finally, one of the clearest findings in the BRDIS data is the large difference in the importance of IPR when companies with R&D activity are compared with those without any R&D activity. A much larger share of companies with R&D (either performing R&D or funding others to perform R&D) than of those without R&D reported each of the individual IPR forms as important (figure 2). With very few exceptions (e.g., the use of trademarks by beverage and tobacco products [NAICS 312]), this pattern holds for all forms of IP protection at the 3-digit NAICS industry level (table 1).

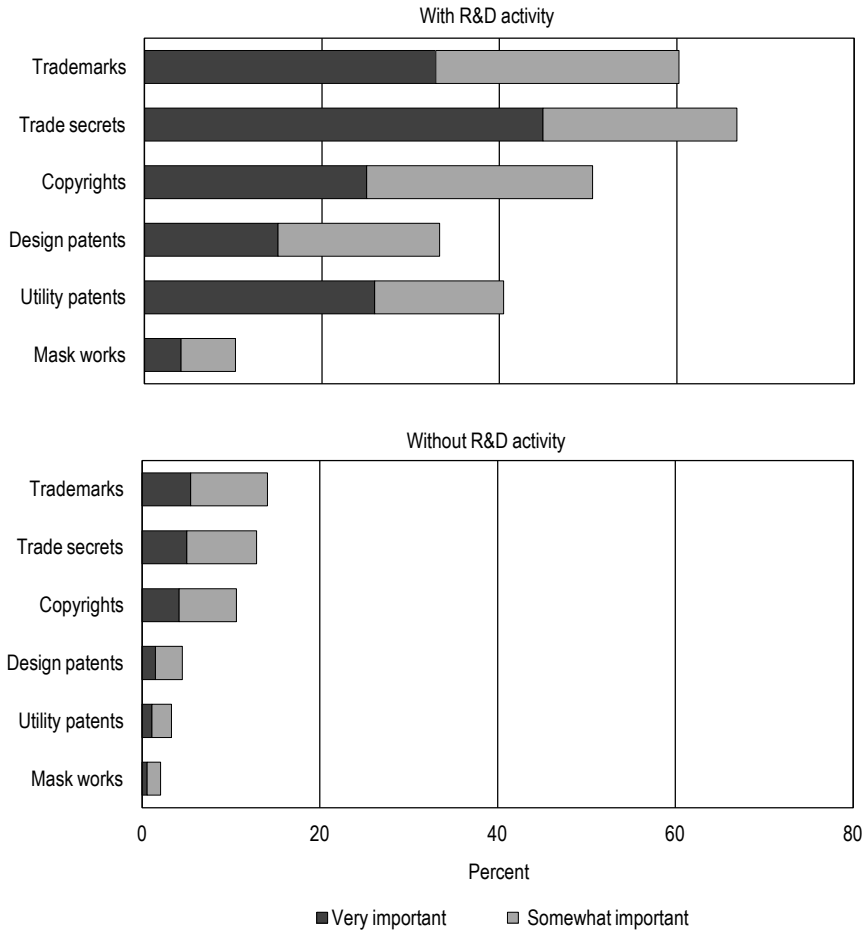
Only about 3% of the estimated 1.9 million for-profit companies represented in the survey performed and/or funded R&D in 2008. According to the survey data more than 50% of all these R&D-active companies reported trade secrets, trademarks, and copyrights as important to their business in 2008; 40% reported utility patents as important; and 33% reported design patents as important. By comparison, less than 15% of the non-R&D active companies reported any one of the possible forms of IP protection as important.

Definitions

Copyright. As defined in the 1976 Copyright Act, the term "copyright" comprises original works of authorship, including literary works; musical works; dramatic works; pantomimes and choreographic works; pictorial, graphic, and sculptural works; motion pictures; sound recordings; and architectural works. Originally applied to only the copying of books, copyright now covers a wide range of works, including computer programs. Copyright protection is available to both published and unpublished works (15 U.S.C. § 102).

Industry. Industry refers to the 6-digit NAICS code used to identify and organize types of industries and to aid the collection and publication of industry statistics. The first two digits in a code refer to the economic sector, the third digit refers to the economic subsector, the fourth refers to the industry group, and the fifth and sixth refer to the

FIGURE 2. Businesses reporting IPR as very or somewhat important, by presence of R&D activity and type of IPR: 2008



IPR = intellectual property rights.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Business R&D and Innovation Survey: 2008.

industry. The statistics in this InfoBrief primarily reference codes at the 2-, 3-, and 4-digit levels.

Mask work. As defined in the Semiconductor Chip Protection Act of 1984, limited (10 year) copyright-like IPR protection is available for a mask work—that is, the two- or three-dimensional layout of a semiconductor chip product (17 U.S.C. §§ 901 and 908).

Patent. As defined by the U.S. Patent and Trademark Office, a patent is a type of IPR granted (in the United States) to an inventor "to exclude others from making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States" for a limited time in exchange for public disclosure of the invention when the patent is granted. This right was established in Article 1, Section 8 of the U.S. Constitution. There are three types of patents:

(1) Utility patents may be granted to anyone who invents or discovers any new and useful process, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof;

(2) Design patents may be granted to anyone who invents a new, original, and ornamental design for an article of manufacture; and

(3) Plant patents may be granted to anyone who invents or discovers and asexually reproduces any distinct and new variety of plant (www.uspto.gov/patents/). (Plant patents are not covered in BRDIS.)

Trademark. As defined in the Lanham Act (the U.S. Trademark Act), the term "trademark" includes any word, name, symbol, or device or any combination thereof that identifies and distinguishes the source of the goods, used or intended to be used in commerce, of one person from those of others. A "service mark" assigns similar rights to the source of a service rather than goods, although the term "trademark" is often used to refer to both trademarks and service marks (15 U.S.C. § 1127).

Trade secret. As defined in the Uniform Trade Secrets Act, the term "trade secret" means all forms and types of financial, business, scientific, technical, economic, or engineering information that (a) the owner has taken reasonable measures to keep secret and (b) derives independent economic value, actual or potential, from not being generally known to the public (18 U.S.C. § 1839).

Data Availability

An initial BRDIS report on the 2008 worldwide R&D expenses of companies located in the United States was released in May 2010. Detailed statistical tables for 2008 will be available in early 2012 in the report *R&D and Innovation in Business: 2008* at http://www.nsf.gov/statistics/industry/. Individual tables may be available in advance of publication of the full report.

More detailed information about the survey sample and methodology will be available in the forthcoming survey description at http://www.nsf.gov/statistics/survey.cfm. Copies of the BRDIS questionnaires and comparisons of BRDIS with the predecessor survey are available at http://www.nsf.gov/statistics/srvyindustry/about/brdis/. Coefficients of variation for the statistics in this InfoBrief are available from the author.

Notes

1. John E. Jankowski, Research and Development Statistics Program, National Center for Science and Engineering Statistics, National Science Foundation, 4201 Wilson Boulevard, Suite 965, Arlington, VA 22230 (jjankows@nsf.gov; 703-292-7781).

2. Government similarly is concerned with the enforcement of intellectual property rights (IPR) as a tool to strengthen the economy, support jobs, and promote exports. See, for example, Espinel VA. 2010. *2010 Joint Strategic Plan on Intellectual Property Enforcement*. Washington, DC: Office of the U.S. Intellectual Property Enforcement Coordinator.

3. See www.nsf.gov/statistics/industry/ for background information and summary statistics obtained from BRDIS.

4. Businesses with R&D activity are those that either fund or perform R&D.

5. According to the World Trade Organization, intellectual property rights are the rights given to persons over the creations of their minds. They usually give the creator an exclusive right over the use of his/her creation for a certain period of time. Intellectual property rights are customarily divided into two main areas: (i) copyrights, which include rights of authors of literary and artistic works, and (ii) industrial property. The later includes the protection of distinctive signs, in particular trademarks, the purpose of which is to stimulate and ensure fair competition and to protect consumers by enabling them to make informed choices between various goods and services, and types of industrial property that are protected primarily to stimulate innovation, design, and the creation of technology. In this category fall inventions (protected by patents), industrial designs, and trade secrets (http://www.wto.org/english/tratop_e/trips_e/intel1_e.htm). Throughout this InfoBrief, the terms intellectual property protection and

intellectual property rights are used interchangeably.

6. Complete details for many individual nonmanufacturing industries not shown here will be available in the forthcoming detailed statistical tables report, *R&D and Innovation in Business: 2008.*

7. Wolfe RM. 2010. *U.S. Businesses Report 2008 Worldwide R&D Expenses of $330 Billion: Findings from New NSF Survey.* InfoBrief NSF 10-322. Arlington, VA: National Science Foundation, Division of Science Resources Statistics.

8. Boroush M. 2010. *NSF Releases New Statistics on Business Innovation*. InfoBrief NSF 11-300. Arlington, VA: National Science Foundation, Division of Science Resources Statistics.

9. Table 1 and explanatory text do not include the 3-digit NAICS industry 339, miscellaneous manufacturing. Information for businesses in that industry was collected, but the miscellaneous business composition of that industry confounds analyses. There are other 3-digit NAICS industries for which IPR data were not separately tabulated in BRDIS. Also, the BRDIS sample combined businesses in textiles, leather, and apparel industries into a single sector (NAICS 313–316). Consequently, that grouping is treated as a single 3-digit NAICS industry here as well.

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