

The Impact of Innovation and the Role of Intellectual Property Rights on U.S. Productivity, Competitiveness, Jobs, Wages, and Exports



EXECUTIVE SUMMARY

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ABSTRACT

This report analyzes the economic impacts of innovation and IP protection on the U.S. economy. Findings of the report demonstrate innovation is a crucial driver of competitiveness, growth, and value. Consequently, IP-intensive industries create jobs and spur economic growth as results from high investments in research and development (R&D). Data of 27 U.S. exportable and importable industries during 2000-07 shows: (1) IP-intensive industries created highly-skilled jobs during the entire business cycle and low-skilled jobs during the economic downturns while non-IP-intensive industries lost jobs in all levels; (2) IP-intensive industries paid their highly- and low-skilled employees nearly 60 percent more than non-IP-intensive industries; (3) Output and sales per employee in IP-intensive industries were more than double that of non-IP-intensive industries; (4) IP-intensive industries promoted exports and enhance competitiveness; (5) IP-intensive industries generated trade surplus and therefore reduced U.S. trade deficits; (6) IP-intensive industries spent almost 13 times the on R&D expenditure per employee that non-IP-intensive industries spent, which directly creates jobs and economic activities in R&D industries as well as in their supporting industries; and, (7) IP-intensive industries allocated over 2.2 times on capital expenditures per employee that non-IP-intensive industries, did which in turn stimulated jobs and economic activities in the U.S. economy. As such, protecting the intellectual property derived from innovation is essential to the future of a wide range of American industries.

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Creativity and innovation are critical to the success of business, industry, and the economy. When ideas are developed into constructive goods and services and are protected through strong intellectual property (IP) rights, consumer interest and demand are spurred. As a result, jobs are created, economies grow, and societies advance. Studies have shown that innovation magnified growth during the upturns and led economies out of downturns.

This report reconfirms these maxims. In brief, our findings showed that of over two dozen U.S. tradable industries during 2000-07¹ : (1) IP-intensive industries created highly-skilled jobs during the entire business cycle and low-skilled jobs during the economic downturns while non-IP-intensive industries lost jobs in all levels; (2) IP-intensive industries paid their highly- and low-skilled employees nearly *60 percent more* than non-IP-intensive industries; (3) Output and sales per employee in IP-intensive industries were *more than double* that of non-IP-intensive industries; (4) IP-intensive industries promoted exports and enhance competitiveness; (5) IP-intensive industries generated trade surplus and therefore reduced U.S. trade deficits; (6) IP-intensive industries spent almost *13 times more* on R&D expenditure per employee than non-IP-intensive industries; and, (7) IP-intensive industries allocated over *2.2 times* the amount on capital expenditures per employee that non-IP-intensive industries allocated, which in turn stimulated jobs and economic activities in the U.S. economy. As such, protecting the intellectual property derived from innovation is essential to the future of a wide range of American industries.

The protection and enforcement of IP rights are imperative for creating strong incentives for innovation and safeguarding it from counterfeiting, piracy, and other forms of IP theft. According to industry estimates, IP theft costs the American economy billions of dollars and hundreds of thousands of jobs per year. The Organisation for Economic Co-operation and Development (OECD) estimated in 2007 that global cross-border trade in tangible, counterfeit and pirated products could have been as high as \$250 billion. Since the OECD report does not take into account domestically produced and consumed products or non-tangible pirated digital products, the actual economic impact of counterfeiting and piracy is much more severe. These costs are expected to grow exponentially, if enforcement is not improved, as the United States continues its transition into a knowledge-based IP-reliant economy.

Given the importance of this ideas-based ecosystem, this study assesses the impact of innovation and the role of IP rights in 27 U.S. tradable industries between 2000 and 2007. We use industrial research and development (R&D) expenditures as a measure of the intensity of IP across industries since such expenditures are direct inputs for innovation and are the most widely used measures. We identify 15 IP-intensive industries—such as pharmaceuticals, aerospace, and petroleum—that have R&D expenditure per employee that exceed the national average. Similarly, we identify 12 non-IP-intensive industries—such as wood, textile, and paper—that spend less on R&D than the national average.

¹This study covers 27 tradable manufacturing and non-manufacturing industries that the U.S. International Trade Commission reports export and import values during 2000-07.

Relative to non-IP-intensive tradable industries, U.S. IP-intensive tradable industries enjoy higher labor productivity, as measured by sales and value-added per employee. Consequently, they are more competitive in global markets as reflected in their higher exports. Since workers in IP-intensive industries are more productive by generating more output per person, IP-based firms pay higher salaries for both highly-skilled and low-skilled production jobs. With higher sales and higher wages, IP-intensive industries create highly-skilled jobs (including scientists, engineers, and above line-supervisor level) as well as low-skilled production jobs (up through line-supervisor level).

Innovation in IP-intensive industries also generates products and services and employment in non-IP-intensive industries. IP-intensive industries far outspend non-IP-based industries on research and development (R&D) and capital investments (such as buildings and equipment) per employee. IP-intensive industry investment in R&D and capital has a cascading effect on jobs and economic growth in their own, as well as in related industries. In every case, IP-intensive industries outperform non-IP-intensive industries in economic performance for job creation, wages, sales, value-added, exports, R&D expenditure, and capital spending.

**Table 1. Economic Performance per Employee,
15 IP-Intensive versus 12 Non-IP-Intensive Industries, 2000–07**

	Wages	Sales	Value-Added	Exports	R&D Spending	Capital Spending
IP-Intensive	\$59,041	\$485,678	\$218,373	\$91,607	\$27,839	\$15,078
Non-IP-Intensive	\$37,202	\$235,438	\$115,239	\$27,369	\$2,164	\$6,831
Difference	\$21,839	\$250,240	\$103,134	\$64,238	\$25,676	\$8,246
(times)	1.6	2.1	1.9	3.4	12.9	2.2

Key findings of the report are summarized in Table 1 and are as follows:

1. *IP-intensive industries create jobs and spur economic growth resulting from high investments in research and development (R&D) in comparison to non-IP-intensive industries.* While the direct outputs of R&D are typically the development of new forms of intellectual property, R&D spending also affects the economy by creating jobs and economic activities in R&D industries as well as in their supporting industries. During 2000-07, IP-intensive industries spent almost *13 times* the R&D per employee that non-IP-intensive industries spent—averaging \$27,839 and \$2,164 per employee per year, respectively.
2. *IP-intensive industries sustain greater long-term economic growth.* During 2000-07, workers in IP-intensive industries generated more than *two times* the output and sales per employee that workers in non-IP-based industries generated. Annual output (as measured by value-added) was \$218,373 per employee in IP-intensive industries and only \$115,239

THE IMPACT OF INNOVATION AND THE ROLE OF INTELLECTUAL PROPERTY RIGHTS ON U.S. PRODUCTIVITY, COMPETITIVENESS, JOBS, WAGES, AND EXPORTS

in non-IP-intensive industries. During the same period, annual sales averaged \$485,678 per employee in IP-intensive industries versus \$235,438 in non-IP-intensive industries. This revenue is a contributing factor to economic growth and job expansion in other areas of the economy as well.

3. ***IP-intensive industries promote exports and America's competitiveness abroad.***
Investment in IP creates new products and services that strengthen America's competitiveness in global markets. IP-intensive industries, which made up nearly half of output and sales of all 27 U.S. tradable industries and employed more than 30 percent of American workers in all 27 tradable industries, accounted for about 60 percent of total U.S. exports. During 2000-07, the annual value of exports per employee in IP-intensive industries was 235 percent higher (3.4 times) than in non-IP-intensive industries, \$91,607 and \$27,369, respectively. Employment and economic activities to support exports in IP-intensive industries were also higher than in non-IP-intensive industries.
4. ***IP-intensive industries generate trade surplus and therefore reduce U.S. trade deficits.***
Of the 27 U.S. tradable industries, the collective trade deficit averaged nearly \$540 billion per year during 2000-07; more than half of the deficit was attributable to non-IP-intensive industries. However, five of six industries that reported a trade surplus during 2000-07 were IP-intensive industries (basic chemicals; resin, synthetic rubber, fibers; navigational; aerospace; and, software). As a result, trade deficits during 2000-07 widened by only \$112 billion in IP-intensive industries (55 percent from the 2000 level) compared to \$150 billion in non-IP-intensive industries (76 percent from the 2000 level).
5. ***IP-intensive industries create jobs during tough economic times and are better positioned to successfully emerge from economic downturns than non-IP industries.***
During the 2000-07 business cycle, IP-intensive industries created 114,500 highly-skilled jobs for scientists and engineers (a 20.9 percent increase over the 2000 level) while non-IP-intensive industries cut 4,800 highly-skilled jobs for scientists and engineers (3 percent below the 2000 level). Since the economic downturns from 2004 and the aftermath of the dot-com bubble collapse, IP-intensive firms gained 8,019 low-skilled jobs (0.3 percent above the 2004 level), while non-IP-intensive industries continued cutting 76,194 low-skilled jobs (1.1 percent below the 2004 level).
6. ***IP-intensive industries pay both highly-skilled and low-skilled employees more than non-IP-intensive industries.*** IP-intensive companies have higher output and sale per employee and therefore pay their workers more than non-IP-intensive companies. During 2000-07, the annual salary of all workers in IP-intensive industries averaged about 60 percent higher (1.6 times) than the workers at similar levels in non-IP-intensive industries (\$59,041 versus \$37,202 per employee per year, respectively). Low-skilled production workers (up through the line-supervisor level) account for 65 percent of total employment in all U.S. tradable industries. Annual salaries of low-skilled workers in IP-intensive industries averaged about 40 percent higher than in non-IP-intensive industries (\$43,478 and \$31,345 per employee per year, respectively).

7. *IP-intensive businesses are strong consumers for other IP-intensive and non-IP intensive industries.* IP-intensive industries allocated over 2.2 times (121 percent) the amount on capital expenditure per employee that non-IP-intensive industries allocated. During 2000-07, capital expenditure averaged \$15,078 per employee in IP-intensive industries and \$6,831 per employee in non-IP-intensive industries. Since capital acquired by firms includes such tradable products as machinery and equipment, and non-tradable items like buildings and other structures, IP-intensive industries also exert positive effects on supporting industries that add to job creation and economic growth.

Undoubtedly, intellectual property is an essential element enabling U.S. industries to grow and compete globally, which in turn creates jobs, improves the economy, and advances living standards. As a result of the critical importance of IP to American businesses, workers, and the economy, IP theft—whether by criminal organizations or countries that fail to honor their treaty obligations—is a growing concern for all. IP criminal and civil laws seem to be vague and less severe than traditional criminal statutes, arguably having less deterrent effect on persons and organizations engaged in these crimes. Meanwhile, the threats to IP have been growing exponentially and becoming more sophisticated, with the potential to reach \$1 trillion globally over the next several years. The theft of patents, copyrights, trademarks and other forms of IP directly reduces sales and employment in IP-intensive companies and enterprises, hampering their productivity and growth. At the same time, some countries are undermining IP rights for their own competitive gain by failing to enforce current rules and norms. As such, efforts to ensure compliance with IP provisions in bilateral and regional free trade agreements and enforcing these obligations in multilateral fora are essential. The vulnerability of IP-intensive companies to theft also undermines the performance of non-IP-intensive industries.

In summary, our empirical findings reconfirm the literature and underscore the role of innovation and intellectual property in creating jobs, paying higher wages, driving exports, and sustaining economic growth. In all categories, IP-intensive industries outperform non-IP-intensive sectors, recovering more quickly during economic downturns and driving U.S. global competitiveness. As such, policymakers and government officials need to give higher priority to strengthening IP rights and laws internationally, while working to improve enforcement both at home and abroad. Such policies are urgently needed to ensure a more hospitable environment for innovation, which is so important for the future success of U.S. companies and industries, and for a more productive and rapidly expanding global economy.

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