

METHODOLOGY

The research methodology of this study is built upon the Global Intellectual Property Center's previous research projects including: *IP Creates Jobs across America* (2012), *Employment and Gross Output of Intellectual Property Companies in the United States* (2011), and *The Impact of Innovation and the Role of Intellectual Property Rights on U.S. Productivity, Competitiveness, Jobs, Wages, and Exports* (2010).

Our previous reports found that IP supports thousands of jobs in each state. As described in these reports, three common tangible IP products are patents, trademarks, and copyrights. Evidence from economic literature suggests research and development (R&D) investments are positively correlated with the number of patents and the number of trademarks in both large and small firms. Therefore, we used the R&D investment indicator to identify the IP-intensive companies that have IP products in the form of patents and trademarks. Since R&D investments are not correlated with copyright ownership, we identified IP-intensive companies as those companies in six copyright-concentrated industries (motion pictures, newspapers, performing arts, broadcasting, independent artists, and software).

Direct IP jobs are people who work in IP-intensive companies that have patents, trademarks, or copyrights. We defined IP-intensive companies as those companies who reported R&D investment in any industry. We obtained R&D investment, employment, wages, value-added, and sales data from the National Science Foundation, U.S. Census Bureau, and the Bureau of Economic Analysis. For IP holdings we used data from the U.S. Patent and Trademark Office and the U.S. Copyright Office. For exports, we used data from the International Trade Administration.

Three main contributions of this report are: (1) to allocate direct IP jobs, wages, value-added and sales by industry across 50 states and the District of Columbia; (2) to estimate the indirect effects of IP on jobs, wages, and sales; and (3) to estimate IP products and related jobs associated with U.S. exports.

First, we obtained the latest 2013 data, published by government agencies, of private sector employment, wages, and GDP by state and by industry. Our estimated direct IP jobs represent the number of workers employed by companies that are spending resources on R&D or operate in a copyright-concentrated industry (i.e., IP-intensive companies). Next, to demonstrate economic contribution per worker, we calculated a weighted-average of GDP per worker in IP-intensive companies in each state (i.e., total GDP of IP-intensive companies divided by the total number of workers in IP-intensive companies in all industries

within a state). Similarly, we calculated a weighted-average of wage paid to a worker in IP-intensive companies in each state (i.e., total wages paid to workers in IP-intensive companies divided by the number of workers in IP-intensive companies in all industries within a state). To estimate total private sector sales and IP sales, we applied the ratio of GDP to sales by industry at the national level to total and IP GDP for each industry by state.

We used industry economic multipliers by state, produced by the U.S. Bureau Economic Analysis (BEA's RIMS II), to estimate the indirect jobs associated with the direct IP jobs, wages, and sales. Our estimated indirect IP jobs, wages, and sales represent additional jobs, sales, and wages that are created to support those direct IP jobs along the supply chain. The BEA's RIMS II multipliers estimate the direct and indirect effects of an initial economic activity on a selected region. As defined by BEA, direct effects are the dollar amount of inputs required by an industry to produce a dollar of the industry's output, while indirect effects are the dollar amount of inputs required by all other industries in the supply chain to meet the industry's initial demand for the dollar of its output.

Mary Streitwieser of the Industry Benchmark Division at the U.S. Bureau of Economic Analysis illustrates this concept using the example of motor vehicles to demonstrate the direct and indirect effects associated with the final outputs.¹ The direct effects are the input production requirements such as the paint, steel, and plastic for the motor vehicles industry to provide additional motor vehicle outputs. The indirect effects are those "trickle down" production requirements for all other industries necessary in the supply chain to support the additional demand for intermediate inputs from the motor vehicles industry, such as the additional requirement for tire cord and synthetic rubber by the plastics and rubber industry to provide the additional tires required by the motor vehicles industry. A subset of indirect effects, called the "induced effects," are the impacts of household expenditures on goods and services from the income earned by all direct and indirect employees.

Lastly, we use export receipts by state and by industry published by the U.S. Census Bureau and the International Trade Administration. We then divide exports by our estimated sales of IP-intensive companies and sales per worker by state and by industry to estimate exports and associated employment of IP-intensive companies.

Selection of Industries

Our dataset covers all manufacturing and non-manufacturing industries in the private sector in the U.S. economy. Manufacturing industries and their corresponding North American

¹ Streitwieser, Mary L. 2010, "Measuring the Nation's Economy: An Industry Perspective – A Primer on BEA's Industry Accounts," Bureau of Economic Analysis.

Industry Classification System (NAICS) code (inside the parentheses) include food, beverage and tobacco products (311-312); textiles, apparel, and leather (313-316); wood products (321); paper and printing (322-323); petroleum and coal products (324); chemicals (325); plastics and rubber products (326); nonmetallic mineral products (327); primary metals (331); fabricated metal products (332); machinery (333); computer and electronic products (334); electrical equipment and appliances (335); transportation equipment (336); furniture (337); and miscellaneous manufacturing (339). Non-manufacturing industries and their corresponding NAICS codes (inside the parentheses) include mining (21); utilities (22); construction (23); wholesale (42); retail (44-45); transportation and warehousing (48-49); publishing (511); telecommunications (517-518); motion picture and sound recording (512); broadcasting (515); finance, insurance, and real estate (52-53); professional, scientific, and technical services (54); management of companies and enterprises (55); administrative, support and waste management services (56); education services (61); health care and social assistance (62); arts, entertainment and recreation (71); accommodation and food services (72); and other private sector services (81).