

# Measuring Payments for the Supply and Use of Intellectual Property

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## ABSTRACT

The market for the licensing of Intellectual Property and other intangibles is rapidly growing in the United States. Although many intangibles are not sold directly at measurable prices, royalty and licensing fees provide direct, market-based measures of transactions for the use of intellectual property and technology in the form of patents, trade secrets, trademarks, copyrights, and franchises. Such economy-wide measures are rare and provide a means to measure the value of intangible outputs independently of inputs. This paper first uses BEA's international survey data on trade in services to develop an estimate of market transactions for supply and use of innovation and technology between the U.S. and the rest of the world. Second, it uses these data to trace the supply of technology and other intellectual property-related services that cannot be directly identified in domestic economic surveys because they are bundled with other receipts and expenses. Preliminary estimates of industry-based supply of licensing of intellectual property for 2002 for the domestic economy are presented using the North American Product Classification System for service commodities developed by Census, IRS data on royalty receipts, Census data, BEA data and other sources. The types of service commodities included in the analysis are licensing of the right to use: 1) intellectual property protected as industrial property (for example patents and trade secrets); 2) intellectual property protected by copyright; 3) intellectual property protected by trademark; and 4) trademarked business formats used under a franchise agreement.

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## **I. Introduction**

For economists and policymakers interested in understanding the role of intangibles and intellectual property in international trade and in the domestic economy, developing a clear set of metrics is one of the first steps. In a recent paper, Corrado, Hulten, and Sichel (2005) estimate that business investment in intangible capital is as large as business investment in tangible capital, approximately \$1 trillion per year or about 10% of GDP.<sup>1</sup> A recent Economist article suggests that up to three-quarters of the value of publicly traded companies in the U.S. comes from intangibles.<sup>2</sup> In large part, these intangibles are not treated as investment in either corporate accounting standards or national income accounts. The suggestion that U.S. economic statistics are missing a substantial component of business investment in an era of declining rates of national saving has captured the attention of the business press; a recent Business Week article suggests that investment in unmeasured intangibles implies the U.S. economy is much stronger than traditional measures reflect.<sup>3</sup>

Although estimates indicate that the value of intangibles is very large, these measures are often made indirectly because many intangibles are created for internal use and are not traded in the market. Their value must be imputed, often based on estimates of the cost of production or based on the difference between market capitalization and the value of tangible assets. While the cost of production has been used for estimating the value of investment in own-account software in the National Income and Product

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<sup>1</sup> The scope of this estimate of intangible capital is broader than just IP. It includes firm-specific human and organizational resources in addition to trademarks, brand names, patents, copyrights, software, and databases.

<sup>2</sup> Economist. October 22, 2005: A Survey of patents and technology, page 3

<sup>3</sup> Mandel, Hamm, and Farrell (2006).

Accounts (NIPAs), and for investment in research and development in the satellite accounts produced by BEA, the method has limitations. With the exception of the comprehensive expenditure data on R&D available from National Science Foundation, there is limited information on expenditures for the creation of intangibles. In U.S. Census-reported data, most of these costs of creation and purchase are bundled together with other business receipts and expenses. Some analysts have recommended increased disclosure of information about intangibles in accounting statements but have met resistance from industry. Legitimate concerns include the difficulty in valuing assets that are not traded on the market and whose future benefits are both uncertain and not fully excludable from appropriation by competitors (Lev (2001)).

While many intangibles are not sold directly at measurable prices, there are observable transactions for their use in the form of royalties and licensing fees for the use of technology, patents, trade secrets, trademarks, copyrights, and franchises that measure intangible outputs independently of inputs. These are direct, market-based measures of transactions for the use of intangibles, and such economy-wide measures are rare. Payments and receipts for the use of intellectual property (IP), commonly called royalties and licensing fees, are substantial and growing rapidly. Internal Revenue Service data from corporate income tax returns indicate that U.S. corporations received \$115.8 billion in royalty receipts in 2002 (IRS (2005)); this amount has grown at an average rate of over 11% per year since 1994.

The most detailed set of data available on these types of transactions is collected by BEA -- international payments and receipts of royalties and licensing fees between unaffiliated parties. Data on domestic transactions are less complete and do not separate

royalties and license fees by type of intangible for most of the economy.<sup>4</sup> These international data show the substantial role of U.S. firms in technology services trade. International transactions for the use of patents, trade secrets, and industrial processes can be used to improve estimates of the international market for innovation and technology and to trace both the international and inter-industry structure of technology diffusion. The pattern of this activity and the creation of new technology are indicators that can be compared to the spread of innovative activity through R&D expenditures in the domestic economy.

This paper first examines BEA international data on royalties and licensing fees to provide an estimate of market-based trade in technology and innovation services, based on two components: licensing of industrial processes and trade in research, development, and testing services. An industry sector-level breakdown of international payments and receipts of royalties and licensing fees for industrial processes and other types of intangibles between unaffiliated parties is presented along with a similar industry-sector breakdown of trade in research, development, and testing services.

Second, these transactions for technology and innovation are then related to a framework that can be used for the domestic economy for identifying the industry where these commodities are produced. The framework used links IP to intangible non-financial assets in a manner consistent with the internationally accepted standard for national accounting, the System of National Accounts. The service commodities that

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<sup>4</sup> Industry surveys have been conducted by the Licensing Executives Society (LES), and the Intellectual Property Owners Association (IPO). These surveys provide rich detail about the provisions of the licensing agreements of the survey respondents as well as information about royalty rates and the industry distribution of the survey respondents. However, the survey populations are insufficient to produce unbiased and comprehensive measures of the economy wide transactions for the use of IP-licensing commodities.

represent the use of IP are based on the concepts developed in the North American Product Classification System (NAPCS) that have begun to be introduced as product codes in the U.S. Economic Census and Service Annual Survey.

Third, this IP commodity classification and information contained in the international data are then used to structure existing statistical, administrative, and other data to identify supply patterns of market-transactions for IP-licensing service commodities in the domestic economy. A preliminary version of an industrial sector cross-section supply analysis is presented for 2002, the year to be covered by the next BEA benchmark I-O accounts. An appendix to the paper includes a discussion linking types of intellectual property with the categories of produced and non-produced intangible assets used in the System of National Accounts.

## **Overview of Results**

In this paper I present previously unpublished industry sector breakdowns of payments and receipts for two types of technology and innovation transactions. These are licensing of industrial processes, which include patents and trade secrets, and exports and imports of research, development, and testing services for transactions between unaffiliated parties using data from BEA's International Investment Division. Using these data, I estimate that U.S. corporations' purchases of international industrial process licensing and research, development, and testing services totaled \$12 billion dollars in 2002, while U.S. corporations received \$23 billion dollars from foreigners for industrial process licensing and research, development, and testing services.

For the domestic economy, I then present estimates by industrial sector for U.S. corporate royalty income by four types of service commodities that are derived from the

type of intangible that is licensed. These estimates should be taken as preliminary approximations. They are based on Census data where it was available, supplemented with franchise industry royalty estimates. For the remainder of the industries, IRS-based royalties were spread across the types of IP using the ratios from BEA international receipts for the purchase and use of intangibles based on the assumption that domestic demand for the licensing of U.S. intellectual property has a similar structure to international demand for U.S. intellectual property. The largest subcomponent of these royalty payments is industrial process licensing receipts. For U.S. corporations, I estimate these receipts totaled approximately \$67 billion dollars in 2002, and that the majority of this sum, approximately \$60 billion, was received by manufacturing firms. I estimate U.S. corporate licensing receipts for the use of four types of intellectual property -- industrial processes, trademarks, copyrights, and franchises to be approximately \$114.5 billion in 2002. For an order of magnitude comparison, Census receipts for rental and leasing services from establishments with employees, which includes the rental of automobiles, machinery, computers, and other equipment was \$95.1 billion dollars in 2002.

## **II. International Transactions Data on Technology and Innovation**

### **A. BEA International Royalties Data**

For the U.S., international transactions in royalties and license fees are an important part of technology trade in services. Affiliated transactions are conducted

between multinational parent firms and their subsidiaries in a different country.

Unaffiliated transactions are conducted between unrelated parties in different countries.

The component of these transactions that represents trade between unaffiliated parties can be analyzed by type of intangible, and show the U.S. supplying IP-licensing to foreign entities at a greater level than they are obtaining IP-licensing from foreign entities.

U.S. companies received in 2002 about twice the volume of receipts for the use of intangibles than they paid out (\$44.5 billion in receipts compared to \$19.3 in payments, Table 1). For transactions between unaffiliated parties, where the breakdown by type is currently available, receipts are dominated by receipts for the use of industrial processes (patents and trade secrets), and for general use software.<sup>5</sup> On the purchase side, the unaffiliated transactions are also dominated by payments for the use of industrial technology, followed by payments for broadcasting and recording of live events, while payments for general use software come in a distant third.

The data in Table 1 representing transactions between unaffiliated parties are particularly valuable for understanding the commodity and industry structure of the use of IP since these data are collected by industry of transactor as well as type of intangible. Although the volume of the affiliated royalties (transactions between multinational parents and their subsidiaries) is substantially higher than that of unaffiliated transactions, the unaffiliated data are also preferable for an additional reason. These unaffiliated transactions are “arms length,” and therefore less likely to be distorted by differences in international tax treatments that may provide an incentive for firms to move IP to other countries.

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<sup>5</sup> This breakdown by type of intangible is likely to be included in future affiliated trade surveys.

**Table 1: Royalties and License Fees, 2002, millions of dollars\***

	Total	Industrial processes <sup>1</sup>	Books, records, and tapes <sup>2</sup>	Broadcasting and recording of live events <sup>3</sup>	Business format Franchise fees <sup>4</sup>	Trademarks <sup>5</sup>	General use computer software <sup>6</sup>	Other intangibles <sup>7</sup>
<b>Receipts</b>								
Between Unaffiliated Parties	11,738	4,039	516	296	542	1,284	4,408	651
By U.S. parents from their foreign affiliates	29,656							
By U.S. affiliates from their foreign parents	3,095							
Receipts Total	44,489							
<b>Payments</b>								
Unaffiliated Payments	4,219	2,049	301	906	3	283	487	190
By U.S. parents to their foreign affiliates	2,925							
By U.S. affiliates to their foreign parents	12,191							
Payments Total	19,335							
<p>* These data are from BEA's International Investment Division and are available on the BEA website as U.S. International Services: Cross Border Trade, 1986-2004; Table 4, Royalties and License Fees 1986-2004. These data are collected on BE-577 for transactions between U.S. parents and their foreign affiliates and the BE-605 for transactions between U.S. affiliates and their foreign parents.</p> <p>1. This includes the use, sale or purchase of intangibles that are used in connection to the production of goods as well as technology licensing fees, royalties, and payments for the use of patents, trade secrets, and other proprietary rights used in the production of goods. The category includes payments to foreign governments for the maintenance of patent rights.</p> <p>2. This includes the rights to perform, broadcast, reproduce and sell copyrighted material and other intellectual property in the form of books, compact discs, audiotapes, ect.</p> <p>3. This includes the rights to record and or broadcast "live" artistic performances, sports events, and other live events.</p> <p>4. Business format franchising is an ongoing business relationship between a franchisor and franchisee that includes not only the product, service, or trademark, but also the business format.</p> <p>5. This includes the rights to sell products under a trademark, brand name, or signature, including domain name registration for the internet.</p> <p>6. This includes the rights to distribute general use software and rights to reproduce or use general use computer software that was electronically produced from a master copy. It includes licensing fees for reproducing copies of general use software for local area network computer systems and excludes prepackaged software as well as custom software and programming services.</p> <p>7. Intangibles not elsewhere classified, including rights to secure capacity for communications carriers.</p>								



For the analysis in this paper, data from the mandatory, confidential Annual Survey of Royalties, License Fees, and Other Receipts and Payments for Intangible Rights between U.S. and Unaffiliated Foreign Persons (BE-93) were analyzed by the author under an agreement with BEA's International Investment Division not to disclose respondent specific information. Tables 2 and 3 below provide a previously unpublished summary of the industry distributions of unaffiliated payments and receipts prepared BEA's International Investment Division for 2002. To insure confidentiality, intangibles are divided into only two components, royalty and licensing fees for industrial processes and royalty and licensing fees for all other intangibles. The observations below are based on analysis of the underlying data.

The sector collecting the largest amount of royalty receipts is information and the majority of these royalties are for general use software. The information sector also collects a substantial share of its receipts for industrial processes, a category that includes payments for the use of patents and the use of trademarks. The manufacturing sector receives \$2.8 billion, or about three quarters of its \$3.6 billion in unaffiliated international receipts for industrial processes. Within business and professional services, about half of the receipts are for general use software, and a bit more than a quarter is for industrial processes. The industry within the sector receiving the largest share of industrial process royalties is the Scientific Research and Development industry (NAICS 5417), followed by Architectural, Engineering, and Related Services (NAICS 5413).

**Table 2. Receipts of Royalties and License Fees From Unaffiliated Foreigners,  
by Industry Sector and Type of Intangible, 2002**  
(millions of dollars)

	Total	Industrial processes	Other /1/
All industries	11,738	4,039	7,699
Manufacturing	3,585	2,809	777
Distributive services /2/	271	29	242
Information	(D)	(D)	4,368
Finance and insurance	(D)	-	(D)
Professional, scientific, and technical industries	1,159	342	818
Other industries /3/	(D)	(D)	(D)

(D) Suppressed to avoid disclosure of data of individual companies.

1. Other consists of receipts for rights related to books, records, and tapes; broadcasting and recording of live events; franchise fees; trademarks; general use computer software; and other intangibles.

2. Distributive Services include Wholesale and Retail Trade and Transportation.

3. Other industries include unallocated receipts.

**Table 3. Payments of Royalties and License Fees to Unaffiliated Foreigners,  
by Industry Sector and Type of Intangible, 2002**  
(millions of dollars)

	Total	Industrial processes	Other /1/
All industries	4,219	2,049	2,170
Manufacturing	2,933	1,776	1,157
Distributive services /2/	66	(D)	(D)
Information	596	2	594
Finance and insurance	(D)	-	(D)
Professional, scientific, and technical industries	(D)	(D)	85
Other industries /3/	332	59	273

(D) Suppressed to avoid disclosure of data of individual companies.

1. Other consists of payments for rights related to books, records, and tapes; broadcasting and recording of live events; franchise fees; trademarks; general use computer software; and other intangibles.

2. Distributive Services include Wholesale and Retail Trade and Transportation.

3. Other industries include unallocated payments.

While information industries receive a large share of the unaffiliated royalty receipts, the substantially smaller volume of unaffiliated international royalty payments for intangibles is predominantly paid out by manufacturing industries (Table 3). This sector paid out in 2002 \$2.9 billion of the total of about \$4 billion, with 61% of that going for industrial processes. The majority of these payments are reported by firms in the pharmaceutical industry. Although overall for unaffiliated transactions U.S. firms receive substantially higher royalty receipts from foreign parties than they pay out, for the pharmaceutical industry this pattern is reversed. U.S. pharmaceutical firms make substantially higher payments to foreign parties for industrial processes than they receive from unaffiliated foreign parties.

#### **B. International R&D Services and the Use of Industrial Technology**

A substantial body of data on the performance of R&D by industry, academic institutions, non-profits, and government entities has been collected by the National Science Foundation and this performance data is enhanced by data collected by BEA on R&D performance by multinational corporations. National Science Foundation data for 2002 indicate that industries performed \$190.8 billion of R&D within the U.S. BEA data on R&D performance by multinationals indicate that approximately \$27.5 billion of this was performed by majority-owned U.S. affiliates of foreign companies. Performance of R&D by majority-owned foreign affiliates of U.S. parent companies was estimated by BEA at \$21.0 billion in 2002.

U.S. international data on royalties and licensing fees are used here in combination with trade data to estimate an additional dimension of the international

technology flows. Table 4 provides a previously unpublished breakdown prepared by BEA's International Investment Division of unaffiliated trade in research, development, and testing services (RD&T) by industry sector based on confidential, firm level data.

**Table 4. Unaffiliated Trade in RD&T Services by industry, 2002 (\$millions)**

	Exports of RD&T services	Imports of RD&T services
All industries	1,142	1,028
Manufacturing	199	696
Distributive services	(D)	(D)
Information	(D)	7
Finance and insurance	(D)	(D)
Professional, scientific, and technical industries	748	217
Other industries*	118	86

(D) Suppressed to avoid disclosure of data of individual companies.

Manufacturing industries import more than half of the RD&T services represented in unaffiliated trade, with large shares of these imported services being purchased by firms in Pharmaceutical and Medicine Manufacturing. The majority of RD&T exports are attributed to industries within the Professional, Scientific, and Technical Services industries sector, particularly Scientific Research and Development Services.

The table below provides data on direct acquisition of R&D and royalties and licensing payments for industrial processes.<sup>6</sup> For trade in research and development and

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<sup>6</sup> Trade in research and development and testing services in the BEA international services data covers "laboratory and other physical research, product development services, and **product testing services**." The inclusion of product testing services may make its scope a bit broader than other measures of R&D activity collected by BEA and the National Science Foundation. A frequently used standard for the scope of R&D activity is the OECD's Frascati Manual, which states: "Research and experimental development (R&D) comprise creative work undertaken on a systemic basis in order to crease the stock of knowledge, including knowledge of man, culture, and society, and the use of this stock of knowledge to devise new applications (OECD (2002) paragraph 63)." This definition is generally understood to exclude some types of testing services.

testing services as well as transactions for the licensing and sale of intangibles, the majority of transactions are between multinational corporations and their affiliates.

**Table 5. International Transactions in Technology and Innovation, 2002<sup>7</sup>**

	Receipts	Payments
	In millions of dollars	
Trade in Research and Development and Testing Services		
Unaffiliated Transactions	1,142	1,028
Affiliated Transactions	6,500	1,600
Industrial Process Licensing and Sale		
Unaffiliated Transactions	4,039	2,049
Affiliated Transactions, estimated by author	11,269	7,341
Total	22,950	12,018

The share of affiliated royalty receipts and licensing fees attributed to industrial processes are not currently available from the source data. The ratio for licensing of industrial processes to total royalties from the unaffiliated data (calculated from data in Table 1) provides an estimate of an additional \$11.3 billion in receipts for the purchase and use of industrial processes, and \$7.3 billion in payments.

International service trade data indicate an important role for market-based transactions in technology and innovation. The next section of this paper links transactions for the use of intangibles to a structure that classifies them as service commodities. This commodity structure can, in turn, be used to identify industry patterns of supply and use.

<sup>7</sup> The complicated issue of the overlap between software, technology, and innovation is not addressed here. An alternate view of this table could include some types of software transactions.

### **III. Linking Transactions for Intellectual Property to Service Commodities**

#### **A. Intangible Assets and Payments for their Use in the System of National Accounts**

Intangibles are sources of future benefit that do not have a physical or financial embodiment (Lev (2001) pp. 5). IP is a subset of intangible assets that includes artistic creations, technological innovations, scientific discoveries, and reputation or brand-related constructs like trademarks. IP is property because a legal authority provides the owner with the exclusive right to benefit from its use. Appendix Section 1 discusses these legal protections in the U.S.

Within the System of National Accounts payments for intangible assets, commonly called royalties, are payments for the use of these assets and are considered payments for a service rather than property income (CEC (1993) Annex 1, paragraph 69). This treatment of intangible assets is similar to the way the SNA treats payments for the use of other fixed assets in production. These payments are considered expenditures for intermediate consumption (CEC (1993) 6.148). Appendix Section 2 discusses the relationship between IP and Intangibles in the SNA.

Computer software is an intangible that can be patented, copyrighted, and licensed. Software licenses are not generally the same type of transaction as the payments for the use of assets described above. Rights to software take two basic forms, the right to its use and the right to its reproduction. Payment for the right to use software with a useful life of a year or more without the additional right to reproduce it is considered the purchase of a fixed capital asset; in this case the asset is the copy of the original. On the other hand, payment for the right to reproduce software, for example to

enhance it in some way and re-license it to an end user is a different kind of production activity. It is payment for the services of the software original (Lequiller, et. al (2002)). The first type, licensing for end use is a final expenditure, while the second type, licensing for reproduction, is payment for the use of an asset.

## **B. Identifying IP-related Commodities**

As described above, payments for the use of intangible assets are transactions for the purchase of a service commodity. Improving the current estimates for the payments and use of IP requires a way to separate out related transactions, such as the contract production of IP, purchases of IP assets, and commodities with IP embedded in them. A recent North American Product Classification System (NAPCS) discussion paper by Mohr and Murphy (2004) of the Census Bureau provides an example of a readily available, detailed framework for identifying IP-related commodities based on their use. Their production-based approach proposes a treatment of IP-related assets that is generally consistent with the SNA treatment of intangible assets described in the appendix to this paper. Mohr and Murphy identify three basic types of IP-related products: 1) Contract Production of IP assets, 2) Speculative Production of IP asset, and 3) Leasing and subleasing for economic use. A fourth IP-related commodity is a good with IP embedded in it, for example a computer. The table below provides some examples of the different types of transactions that apply to two types of IP, industrial property that may be protected by patent or trade secret, and creative work protected by copyright.

### Examples of Receipts for Different Types of IP-Related Transactions <sup>8</sup>

	IP protected as Industrial Property	IP Protected by Copyright
Contract Production of IP	R&D to improve an industrial process	Writing a theme song under contract
IP Assets	Sale of a patented industrial process and all future rights	Sale of a copyrighted song and all future rights
<b>Licensing of IP Assets</b>	<b>Receipts for licensing a patented industrial process for use in production</b>	<b>Receipts for licensing the right to use a musical score in commercial advertising</b>
IP-Derived Products	Receipts for products produced with IP—example chemicals	Receipt for purchase of a recording of the soundtrack

The line of the table above in bold typeface presents the type of IP-related transactions that can be identified as receipts in the form of royalties and license fees. Contract production of IP is a service commodity, with the purchaser usually gaining the rights to the IP. Speculative production of IP involves creation without a pre-existing contract for sale. Licensing of rights to use IP-assets involves the use of IP in further production without relinquishing ownership rights to the IP. The last category is for commodities that have IP-embedded in them; in this case the right to reproduce the IP for further sale is not part of the transaction. End-use licensing of software is in this final category.

Applying Mohr and Murphy's transactions to different types of IP allows a set of service commodities reflecting the use of IP in production to be identified:

- 1) Licensing of Rights to Use IP Protected as Industrial Property (including patents and trade secrets)
- 2) Licensing of Rights to Use IP Protected by Trademarks
- 3) Licensing of Rights to Use IP Protected by Copyright
- 4) Licensing of Rights to Use a business format under a franchise

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<sup>8</sup> Similar columns and examples could be created for IP protected by trademarks and for franchise-related transactions. Since this table describes economic transactions, it leaves out an important activity – creation of own-account IP assets. This activity is economic production when the IP is also considered to be a produced intangible asset, for example the current treatment of software in the U.S. national accounts.



These four commodities are referred to as IP-licensing service commodities in this paper. Contract production of IP, speculative production of IP, final use products and the four IP-licensing service commodities form a structure that can be used to improve the current estimates of transactions for the use of IP and develop improved survey measures.<sup>9</sup> The remainder of this paper describes a way to estimate these IP-licensing commodities.

#### **IV. Who supplies intangible service commodities for the Domestic Economy?**

##### **A. Lessors of Non-financial Intangible Assets and the I-O Accounts.**

Although intangible assets are created throughout the economy and many industries receive licensing payments for their use, for one industry this activity is primary—Lessors of Non-financial Assets (excluding copyrights)—NAICS 533.<sup>10</sup> This industry rents intangibles and intellectual property such as patents, trademarks, brand names, and franchise agreements. One example of a firm in this industry comes from a review of publicly available Securities and Exchange Commission filings. Competitive Technologies of Fairfield, Connecticut describes itself as a full service technology

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<sup>9</sup> This product structure is currently reflected in some of the survey forms collected by Census in the Economic Census and the Service Annual Survey. For the 2002 Economic Census, licensing-related payments are specifically collected for establishments in the information sector and the arts, entertainment and recreation sector, and for establishments in two specific industries, Lessors of Non-financial Intangible Assets (NAICS 533) and Management of Enterprises (NAICS 551). Census's Service Annual Survey (SAS), which is collected on a company basis and thus combines the activity of all the domestic locations of the enterprise, also has licensing-related receipt questions for firms in the information sector. These questions have also been included on the SAS form for scientific research and development services industry (NAICS 5417). For the product questions on NAICS 5417 form, the important product distinction is made between payments for licensing the right to use intellectual property and payments for new intellectual property works produced without contract for sale. This distinction separates the creation of IP from payments for its use. These service products are further distinguished from research and development activities produced for sale under contract; in the latter case the intellectual property rights are usually conveyed to the purchaser.

<sup>10</sup> Establishments within this industry sub-sector are primarily engaged in assigning rights to assets such as patents, trademarks, brand names, and/or franchise agreements for which a royalty payment or licensing fee is paid to the asset holder. Establishments in this sub-sector own the patents, trademarks, and/or franchise agreements that they allow others to use or reproduce for a fee and may or may not have created those assets.

transfer and licensing provider, representing technologies invented by corporations, individuals, and universities. Its income is mainly derived from license and royalty fees. The firm also gains some of its income as shares of royalty legal awards that result from litigation.<sup>11</sup> It is this latter activity that has earned firms in this industry their characterization as “patent trolls.” Unlike most other industries, for NAICS 533, the majority of the output eventually attributed to this industry in the I-O framework is actually produced by establishments in other industries. Examples of these establishments are the intellectual property management units of newspaper publishing companies.

Since BEA’s benchmark Input-Output (I-O) accounts provide the most detailed view available of the technological structure of the United States economy, it can be a useful tool to trace the flow of the IP-licensing commodities from their suppliers to their users. Suppliers and users of commodities are classified into industries based on establishments rather than enterprises. Either the standard Make Table, or its SNA-consistent analog, the Supply Table, show the production of commodities by industry. The companion to either the Make or Supply Table is the Use Table. The Use Table shows where commodities end up in the production process—they appear either as intermediate inputs to industry, or as components of final demand. Accurate structural representation of the output of industries calls for a full accounting of each commodity by all the industries that produce it in what is called the “standard” make table of the I-O accounts. A second step in the production of the set of I-O tables is to move secondary commodities (those commodities or products that are not the primary output of the

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<sup>11</sup> The 10-Q filing for Competitive Technologies, Inc is found at <http://www.sec.gov/edgar/searchedgar/webusers.htm>.

industry that produces them) to the industry where they are primary in order to produce a use table with a homogeneous input structure. An often used example of this is to move the output of hotel restaurants out of the accommodation industry and into the restaurant industry. This additional output is generally a small share of the receiving industry's output.

For Lessors of Non-financial Assets, the commodity that is primary to this industry is the provision of patents, trademarks, brand names and/or franchise agreements in exchange for a royalty or licensing fee, and can be represented by three of the four IP-licensing service commodities described in Section 3 of this paper. Licensing of rights to use IP protected by copyright, as well as the end use licensing component of software, would be excluded.<sup>12</sup> For this industry, BEA's Input-Output accounts currently use source data that provide reasonable totals for the overall corporate receipts of royalties. However, the aggregate nature of the data makes it difficult to properly estimate output by establishment and by the IP-licensing commodities that the industry produces. The next section of this paper describes the available source data and their limitations.

### **Economic Census Data and Payments for the use of IP**

Most of the data used to create the Benchmark I-O tables are collected in the Economic Census, which is collected on an establishment basis. Payments for IP-licensing service commodities are reported for several industries as royalty receipts. These royalties reflect payments for the use of copyrighted material as well as patents, trademarks, franchising, and the use of natural resources.

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<sup>12</sup> A methodological issue related to the conversion of classification systems from SIC to NAICS posed the following challenge. The old SIC industry, 6794, Patent Owners and Lessors, included copyright buying and selling in addition to other types of intangibles. The new NAICS industry excludes copyrights, since they are sold and leased primarily in the information sector. The kind of analysis summarized in this paper is required in order to improve the estimates for the upcoming 2002 Benchmark I-O accounts.

**Table 5. 2002 Economic Census Data on Royalty Receipts, in millions of dollars<sup>13</sup>**

Industry	Total Royalties
	24.039
1) Publishing Industries Except Internet (511)	.460
Sale or licensing of rights to content	.460
2) Motion Picture and Sound Recording Industries (512)	2.408
Royalties, license fees and other payments for authorizing the use of musical compositions	1.665
Receipts for sales, leasing, and licensing fees for master recordings	.743
3) Telecommunications (517)	5.207
Television program rights	5.207
4) Internet Service Providers, Web Search Portals, Data Processing Services (518)	.071
Sale or licensing of rights to content	.071
5) Other Information Services (519)	.080
Sale or licensing of rights to content	.080
6) Lessors of Non-financial Intangible Assets (533)	15.959
Oil and Petroleum	.366
Patent Leasing/Licensing	7.761
Franchise Leasing/Licensing	5.960
Copyright Leasing/Licensing	1.490
All Other	.382
7) Management of Companies and Enterprises (551)	5.055
Sales, license fees, royalties and other payments from the marketing of intangible property such as software, music, motion pictures, and other intellectual property	3.788
Franchise Sales and Fees	1.267
8) Performing Arts, Spectator Sports, and other related works (711)	2.686
Amounts received from royalties, licensing fees, and residual fees from literary works, musical recordings and compositions, filmed entertainment and other cultural works	2.686
9) Museums, Historical Sites, and Similar Institutions (712)	.046
Amounts received from royalties, licensing fees, and residual fees from literary works, musical recordings and compositions, filmed entertainment and other cultural works	.046

<sup>13</sup> These royalty receipts are found in the 2002 Economic Census publications titled "Subject Series," and are drawn in each case from Table 1, Product Lines

For 2002 these royalty receipts are shown in Table 5. The \$24 billion in Census-measured royalty receipts are received by establishments in four areas of the economy: Information (51), Real Estate and Rental Leasing (53), Management of Companies and Enterprises (551), and Arts, Entertainment, and Recreation (71). Census product lines for these industries identify the IP-licensing service commodities at varying levels of aggregation. For the establishment-based industry with the most royalty receipts, NAICS industry 533, product lines are identified based on type of intangible.

### **Royalty Receipts from Corporate Tax Returns**

Although Census provides royalty receipts for these information and service industries, BEA's Benchmark I-O accounts use the Internal Revenue Service's Statistics of Income (SOI) data from corporate income tax returns in place of Economic Census data because the IRS data appear to be a more comprehensive measure of receipts for the use of IP-licensing service commodities. However, the use of administrative records data like the SOI data for statistical purposes carries substantial limitations. First, since the data are drawn from corporate income reports of taxable income, there is an incentive for domestic income in general to be underreported. Second, there is a potential for double-counting in cases where a corporation both receives and pays royalties, for example in a sub-licensing arrangement with franchisees. Finally, royalty income is payment for the use of books, stories, plays, copyrights, trademarks, formulas, and patents as well as from the exploitation of natural resources, such as coal, gas, oil, copper, or timber (Code of Federal Regulations, Title 26, Section 1.61.8). The inclusion of royalties for exploitation of natural resources prevents a clean separation of royalties for the use of IP. Despite these many caveats, SOI data on royalty income by industry are the most comprehensive

publicly available information on the magnitude and industry distribution of corporate royalty income.

Royalty receipts are estimated from a sample of the 2002 corporate income tax returns by the Statistics of Income staff based on the gross royalties income line of the U.S. Corporation Income Tax Return Form 1120.<sup>14</sup> According to the SOI data, for 2002 the returns of active corporations reported gross royalty receipts of \$115.8 billion dollars. Table 6 below presents royalty income by industry sector and then sorted by magnitude of industry royalty receipts. All manufacturing industries together receive \$72.7 billion dollars in royalty income and three manufacturing industries, computer and electronic product manufacturing, chemical manufacturing, and transportation equipment manufacturing, make up 46% of the \$115.8 billion total, or \$53.3 billion dollars. Information industries receive \$13.4 billion dollars in royalties. The wholesale and retail trade industries within the Distributive Services sector receive \$11.8 billion dollars in royalties.

The right-hand column of the table below presents the share of total receipts that are comprised of royalties. This gives an indication of the role of licensing of intangibles and intellectual property as a source of direct income. For all industries the average is 0.6%, with most of the higher shares coming from industries in the manufacturing and information sectors. Two more industries have above average shares of receipts from royalties: Food Services and Drinking Places (1.3%), and Accommodation (1.2%).

Census and industry specific information can be used to identify royalties in these two

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<sup>14</sup> Additional royalty income is collected domestically by partnerships, S-corporations and individuals. According to the IRS's Statistics of Income, in 2002 partnerships reported an estimate \$8.0 billion dollars in royalty income, while S-corporations reported \$598 million dollars in royalty income. Individual income tax returns reported an estimated \$29 billion dollars in net rental and royalty income in 2002. These data are available at <http://www.irs.gov/taxstats/>.

industries as predominantly franchise licensing fees. However, the industry in the IRS data that receives the largest share of receipts from royalties is Lessors of Non-financial Assets. In 2002, according to the SOI data, this industry received 34% of its IRS reported income from royalties.

**Table 6. 2002 IRS Royalties by Industry and Percent of Total Receipts from Royalties, in thousands of dollars**

Sector	
Manufacturing	72,767,027
Distributive Services (Wholesale, Retail, and Transportation)	13,111,872
Information	13,462,811
Finance and Insurance	2,361,519
Professional and Business Services	6,653,847
Total Royalty Income from All Industries	115,860,141
Average Percent of Total Receipts from Royalties	0.59%

Industry	Royalty Receipts	Percent of Receipts from Royalties
Computer and electronic product manufacturing	23,317,433	4.3%
Chemical manufacturing	20,481,612	3.1%
Transportation equipment manufacturing	9,405,614	1.1%
Publishing industries	4,755,484	2.2%
Professional, scientific, and technical services	4,692,492	0.7%
Beverage and tobacco product manufacturing	4,305,087	2.0%
Food services and drinking places	3,563,991	1.3%
Wholesale Trade, Nondurable goods	3,190,204	0.3%
Machinery manufacturing	2,516,092	0.8%
Motion picture and sound recording industries	2,421,889	2.8%
Broadcasting, radio and television, cable networks and program distribution	2,307,517	3.2%
Electrical equipment, appliance, and component manufacturing	2,245,571	0.9%
Building Materials and Garden Equipment and Supplies Dealers	2,226,393	1.2%
Fabricated metal product manufacturing	2,168,144	0.8%
Miscellaneous manufacturing	1,995,981	1.1%

**Table 6, continued. 2002 IRS Royalties by Industry and Percent of Total Receipts from Royalties, in thousands of dollars**

Internet Service Providers, web search portals, and data processing services	1,951,863	2.4%
Telecommunications	1,921,937	0.5%
Food manufacturing	1,863,709	0.5%
Accommodation	1,455,912	1.2%
Food, beverage, and liquor stores	1,434,406	0.3%
Administrative and support services	1,369,930	0.5%
Wholesale Trade, Durable goods	1,364,520	0.1%
General merchandise stores	1,350,465	0.3%
<b>Other Royalty Intensive Industries</b>		
Industry	Royalty Receipts	Percent of Receipts from Royalties
Paper manufacturing	923,410	0.6%
Mining	922,994	0.6%
Other transportation and support activities	805,485	0.6%
Apparel manufacturing	641,317	0.9%
Sporting goods, hobby, book, and music stores	482,214	0.6%
Printing and related support services	480,625	0.5%
Lessors of nonfinancial intangible assets	384,202	34.1%
Educational services	215,271	0.8%
Other information services	86,685	0.4%
Leather and allied product manufacturing	68,139	0.7%
Internet Publishing and Broadcasting	17,436	0.5%
All Other Industries	8,526,117	

## **B. Identifying Supply and Use**

Because IP-licensing commodities are produced in many industries, each industry that supplies them must be identified in order to develop a comprehensive I-O measure of output for NAICS 533. For Census-covered industries in Information (51), Real Estate



and Rental Leasing (53), Management of Companies and Enterprises (551), and Arts, Entertainment, and Recreation (71), Table 5 (Census Receipts) provides detail to make these estimates. For the publishing industry (Line 1) the establishments in this industry receive a small share of the enterprise-based IRS measure of royalties (\$0.4 billion out of \$4.8 billion). The remainder of the royalties is collected either in NAICS 533, NAICS 551, or is not separately identified by Census. For the next Census reported industry, Motion Picture and Sound Recording, the Census data line up closely with the enterprise-based total (\$2.4 billion), suggesting that most of the royalty receipts in this industry are collected in establishments with the same classification.

For Lessors of Non-financial assets, the difference between company-based reporting and establishment-based reporting is evident from a comparison of IRS and Census receipts. IRS-based receipts total just \$384 million dollars compared to the Census receipts of \$16 billion. The IRS-based receipts represent all the corporations that identify their primary source of receipts as leasing of non-financial intangible assets. These include the technology transfer firms discussed earlier. For the Economic Census, the \$16 billion represents establishments that may be attached to any industry but perform the economic activity of leasing the firm's intangibles and managing its intellectual property portfolio. This suggests that most of the Census receipts in NAICS 533 are collected in establishments that are part of other industries and exist to license the industry's intangibles.

Overall, the gap between total royalty receipts in the IRS data and the sum of licensing receipts in the Census data is large. Census recognizes \$24 billion in licensing and royalty receipts, while IRS recognizes \$115.8 billion in royalties. The next three

sections of this paper use alternate data sources and the Mohr-Murphy IP-licensing commodity definitions to identify the source of this gap.

### **Estimating Franchise Licensing Fees**

Franchise licensing fees represent substantial royalty income for several industries, most prominently the Food Service and Drinking Places industry and the Accommodation industry. One indication of the role of royalties income in the fast food industry is that hedge fund manager William Ackman has repeatedly advocated breaking the McDonald's Company into two parts because the company owned restaurants underperform relative to the most profitable component of the corporation—its income from franchisee royalties.<sup>15</sup>

Royalties for the use of business franchises are estimated for this paper with data on total receipts, the share of total industry receipts represented by franchisee-operated establishments, and average annual royalty payments. Since this type of information is not generally available from statistical agencies, data from the franchise industry are used here to develop estimates of payments for the use of franchised business formats.<sup>16</sup>

For Food Service and Drinking Places, the franchisee share of the industry is available in the 2002 Economic Census, using the franchisee share of industry receipts for full and limited service restaurants and industry association royalty rates yields an estimate of \$3.2 billion for 2002.<sup>17</sup> This suggests that the IRS reported royalties for this

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<sup>15</sup> Horsley, Scott. "McDonald's Worth More than the Sum of Its Parts?" National Public Radio Morning Edition broadcast, January 19, 2006.

<sup>16</sup> A summary of royalty fees developed from the Uniform Franchise Offering Circulars that twelve states require for business format franchise offerings is combined with information on the share of industry payroll in establishments that pay franchise royalties. Because the published level of industry aggregation of the data is not particularly detailed, this information is most useful for Food Service and Drinking Places and Accommodation, the two industries with very large royalty receipts.

<sup>17</sup> 2002 Economic Census, Sector 72, Accommodation and Food Service, Miscellaneous Subject Series Table 7. Frandata Corporation (2000) provides annual royalty rate estimates of 4.2% for full service

industry of \$3.6 billion can be attributed almost entirely to franchise royalties and that the establishments making these payments are the establishments in NAICS 722.<sup>18</sup> For the Accommodation industry, using franchise industry estimates of the share of industry represented by franchisee-owned businesses and the average royalty rate, the Accommodation industry (NAICS 721) received franchise royalties of about \$1.2 billion in 2002.<sup>19</sup> This compares to an IRS royalty receipts total of \$1.6 billion for NAICS 721, Accommodation. It is likely that Census will substantially expand its collection of franchise-related receipts for the 2007 Economic Census, leading to a substantial future improvement in this component of IP-related service transactions.

For the rest of the industries in Table 6, statistical data are absent to make estimates of either the supply or the use of IP-related commodities such as payments for the use of patents, trade secrets, and trademarks. Since the IRS royalties data indicate that about \$73 billion in royalties are received by manufacturing firms, another approach must be used to separate IP-related commodities by type and assign them to industries. I create a proxy distribution for the IP-licensing commodities by industries based on BEA International data on receipts of royalties and licensing fees between unaffiliated parties.

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restaurants and 4.7% for limited service restaurants as part of its royalty analysis in the Profile of Franchising. For more information on franchise royalty structure, see pages 122- 151. Because the initial study was created for 1998, Frandata provided the author with updated royalty rates for 2004, and the rates were averaged to create a usable royalty rate for 2002.

<sup>18</sup> Full and Limited Service restaurants account for 80% of the receipts of NAICS 722, Food Service and Drinking Places.

<sup>19</sup> Economic Impact of Franchised Businesses, PriceWaterhouseCoopers (2004), these data were created for 2001. A reality check for Full and Limited Service Restaurants suggests that the EIFB numbers are in the right range, EIFB suggests that 10.8% of payroll for full service restaurants was in franchisee-operated establishments. The Census ratio based on receipts is 12.4%. For Limited Service restaurants the EIFB ratio is 44.3% and the Census ratio is 43.9%. These EIFB estimates are based on three sources: U.S. Census's County Business Patterns, Nonemployer Statistics, and the IMPLAN model.

## **Comparing BEA International Royalties Data with the IRS Royalties**

Assuming that domestic demand for IP-licensing commodities is similar to international demand for U.S. IP-licensing commodities, the BEA data described earlier by type of intangible can be used to create a proxy distribution for royalties.<sup>20</sup> For this type of distribution of intangibles, two issues affect the comparison between IRS royalties and BEA unaffiliated royalties and license fees. These are the match between intangibles and inclusion of payment for the purchase of intangibles together with payments for use. IRS reported royalties are assumed to be a combination of 1) licensing of rights to use IP protected as industrial property, 2) licensing of rights to use IP protected by trademarks, 3) licensing of rights to use IP protected by copyright, 4) licensing of rights to use a business format under a franchise and 5) royalties for the use of natural resources.

The BEA data on international royalty transactions for unaffiliated entities cover a somewhat different spectrum of intangibles. Six of the seven types of intangibles covered in the BEA data match the available definition of scope of the IRS royalties; however this definition has not changed since the late 1950s. Although royalties for the use of patented software would be in scope for IRS royalties, licensing fees for general use computer software do not appear to be. The BEA category includes payments and receipts for both the rights to reproduce software and for the general use of electronically transmitted software. While the rights to reproduce software are clearly within the scope of the IP-related service commodities, the latter use is more closely aligned to the licensing of software for end use as a final expenditure and more likely to be the majority

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<sup>20</sup> In a related exercise, Degnan (1998) used the IRS industry distribution of royalties to parse out the likely industry distribution of unaffiliated receipts. This paper estimates types of IP-licensing commodity by industry.

of the payments and receipts. As discussed earlier, this final use software would be outside of the scope of licensing of the rights to use IP in the service commodities above. For these reasons general use computer software licensing receipts and payments are not included in the estimation of IP-licensing commodities.

BEA data also combine some payments and receipts for the use of intangibles with payments and receipts for the purchase of intangible assets. The survey form asks for payments and receipts for purchase as well as use of intangibles. While the inclusion of some payments and receipts for the purchase of intangible assets with use suggests that the BEA royalty receipts may not be an ideal level measure of trade in IP-related service commodities, they are valuable for inferring the distribution of the commodities across industries.

### **Approximating the Supply of IP-licensing Commodities by Industry**

Table 7 below presents a set of approximations for the supply of four IP-related service commodities by industrial sector based on the totals from IRS corporate royalty receipts. The underlying distributions were created at the level of the IRS industries in Table 6. Licensing of the rights to use IP protected as industrial property and trademarks, franchise fees, and licensing of rights to use natural resources are the commodity output of NAICS 533, Lessors of Non-financial Intangible Assets. Licensing the rights to use copyrighted material is not.

The industry totals are directly from the IRS data while the distributions across types of intangible are created by the author based on the available Census data, the distribution of BEA receipts from unpublished data aggregated to match the IRS

industries, and estimates based on franchise industry data.<sup>21</sup> They provide a rough indication of the distribution of IP-licensing receipts, but they should not be taken as definitive estimates.

**Table 7: Author's Distribution of IRS Receipts for Types of IP-Licensing Service Commodities across Industry Sectors, 2002, Billions of Dollars**

Sector	Licensing of Rights to Use IP Protected as Industrial Property	Licensing of Rights to Use IP Protected by Trademarks	Licensing of Rights to Use IP Protected by Copyright	Licensing of Rights to Use a business format under a franchise	Payments for rights to use Natural Resources and Other intangibles	IRS Royalties Total
Manufacturing	59.5	9.4	1.0	2.9	-	72.8
Distributive Services (Wholesale, Retail, and Transportation)	1.0	6.9	0.1	5.1	-	13.1
Information	1.9	4.9	6.6	0.0	0.1	13.5
Finance and Insurance	0.2	0.7	0.0	1.4	0.0	2.4
Professional and Business Services	3.0	0.2	1.6	1.5	0.4	6.7
Other Industries	1.0	0.7	0.1	4.8	0.8	7.5
Total	66.6	22.8	9.4	15.7	1.3	115.9

If these distributions are valid, then there are substantial IP-related receipts outside of the industries identified by Census as receiving royalty receipts that cannot be

<sup>21</sup> These estimates are based on Census data where it was available, supplemented with franchise royalty estimates. For the remainder of the industries, IRS-based royalties were spread across the types of IP using the ratios from BEA international receipts for the purchase and use of intangibles based on the assumption that domestic demand for the licensing of U.S. intellectual property has a similar structure to international demand for U.S. intellectual property. For industries without international transactions, mostly in the service industries, royalties were evenly split between trademarks and franchise royalties. Payments for right to use natural resources are combined with "Other Intangibles," a category that includes spectrum rights for broadcasting. This category represents payments for the use of non-IP intangibles. All IRS royalties in agriculture and utilities were attributed to natural resources as well as a large share of mining royalties.

identified by size or type in survey data for domestic transactions.<sup>22</sup> My estimate suggests that enterprises in the manufacturing sector receive the vast majority of all licensing receipts for the right to use industrial property. The largest recipients are the chemical manufacturing industry and the computer and electronic product manufacturing industry. Industries in manufacturing also receive substantial receipts for both the use of trademarks and franchises. Both of these appear to be in large part due to manufacturing firms in the beverage industry. For the Distributive Services sector, the largest share of IP-licensing service commodity receipts are from the use of trademarks and franchises. While retail trade receipts are divided between trademarks and franchise receipts, wholesale trade receipts are predominantly trademark related and appear to be linked to apparel wholesalers and grocery wholesalers. Within professional and business services, the scientific research and development services industry receives a large share of the licensing receipts for the use of IP protected as industrial property. Within the “other industries” category, franchise-licensing receipts are particularly large for accommodation and food service industries.

There are few alternate data sources to evaluate the reasonableness of these estimates. Arora, Fosfuri, and Gambardella (2002) estimate the average value of the global market for technology licensing and related transactions at \$36 billion dollars a year in 1990s, a value they suggest is likely an underestimate. They note that available estimates for the late 1990s, including Degnan (1998) are in the range of \$35 to \$50 billion dollars. The method I used for 2002 produces estimates of \$27.4 billion dollars

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<sup>22</sup> Economic Census collects royalty receipt information for the Information sector (51), Real Estate and Rental Leasing (53), Management of Companies and Enterprises (551), and Arts, Entertainment, and Recreation (71)

for 1995, \$29.4 billion dollars for 1996, and \$31.8 billion dollars for 1997 for U.S.

corporate supply of IP-licensing of industrial processes.

The results from one of the questions on a 2003 survey of intellectual property managers by Cockburn and Henderson (CH 2004), can also be used for comparison purposes and suggest that the distribution of my proxy estimates are in the right range. IP managers were asked to estimate the fractions of total monetary value represented by their different IP assets, and the distribution was as follows: patents, 44.5%; trade secrets, 15.7%; copyrights, 8.8%; trademarks, 18.2%; know-how, 13.9%.<sup>23</sup> The approximations in Table 7 of IP-licensing receipts (excluding payments for natural resources and other intangibles) are distributed similarly. The share represented by industrial property licensing (patents and trade secrets) represents 58.1% of the total, compared to 60.2% in the CH survey for patents and trade secrets; copyrights represent 8.2% of the total, compared to 8.8% in the CH survey. The comparison for trademarks differs, 8.2% compared to 18.2% in the CH survey. Since franchise licensing is the use of both a trademark and a business format, a comparison between the estimates can be made by combining my franchise licensing share with the trademark share. For my estimate, the sum of franchising and trademarks is 21.9%. On the whole this evidence suggests that the IP-licensing commodity distributions are in the right range.

Since this analysis is based on corporate income tax receipts, a total view of the supply of IP-licensing commodities will include additional sources of supply. In the for-profit sector these are partnerships, S-corporations, and individuals. Royalty income for

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<sup>23</sup> They had 81 usable surveys from managers of intellectual property and reported that 44% of these identified their corporations as IT and communications, 22% from the chemical industry, 14% from life sciences, 16% from mechanical sectors, and less than 7% from financial and service sectors. These total these shares slightly exceeds 100% as do the shares of IP assets, likely due to rounding and some respondents not claiming all types of IP assets.



partnerships and S-corporations was \$8.6 billion in 2002 while total rental and royalty income for individual income tax returns was \$29 billion. Additionally, academic institutions receive licensing fees and royalties. The 2002 survey of the Association of University Technology Managers indicated that running royalties received by surveyed universities totaled \$787 million dollars, cashed in equity and other related income bring the licensing-related total to \$1,020 million (AUTM (2003)).

### **Potential Sources of Error**

There are several ways these estimates can be off— two main ones are in the starting royalty level for each industry and in the distribution across types of intangible. The IRS data are gross royalty income and are subject to potential double-counting, particularly for franchise royalties where a corporate entity may both receive royalties from sub-franchisee and pay royalties to a larger corporate entity. If industries outside of mining, agriculture, forestry and utilities earn royalties from natural resources, this would bias my numbers upward. If IRS royalties contain substantial receipts for software license fees that are not patent-related royalties, again, my current estimates of IP-licensing commodities are too large. The next section describes a set of issues that would bias the estimates downward.

### **Cross-Licensing and imputed Transactions**

In addition to own use and direct licensing, a large share of the value of intangibles comes from cross-licensing of patent portfolios. Cross-licensing agreements between firms allow the parties to the agreement to use each other's patents or other intellectual property. Where the estimated value of the patent portfolios differ, a net royalty is paid by the owner of the lesser valued portfolio. If the value of each party's relevant

intellectual property is considered to be equivalent, then the cross-licensing agreement involves no direct exchange of payment. Grindley and Teece (1997) describe these agreements as particularly important in industries like electronics, semiconductors, aircraft, and automobiles, where product development is dependent on a cumulative process of related and interconnected technologies. In these industries firms typically establish a field of use and cross-license their entire related set of patents to each other. Low cost access to the technology of other firms then becomes an important additional reason for innovation and patenting. Cross-licensing agreements are imputed transactions that should, theoretically, be reported in both the BEA's international service transactions data and as IRS income, since the latter includes barter income within the scope of taxable receipts. To the extent that these cross-licensing transactions are under-reported, the estimates of technology-licensing in this paper under-estimate the full extent of the market.

### **C. Royalty receipts for manufacturing**

The evidence above suggests that manufacturing industries supply a large share of the IP-licensing commodities reflected by royalty payments in the IRS data. The receipts for these transactions do not appear directly in existing domestic economic survey data. There are two potential locations in the Economic Census for the missing receipts for manufacturing; these are miscellaneous receipts and non-employer establishments. The unidentified or miscellaneous receipts received by U.S. manufacturing establishments are a small fraction of the IRS-reported royalties for the manufacturing sector, and thus, even if manufacturing establishments were asked to break out their receipts for IP-related

service commodities from miscellaneous receipts, this would not locate all the missing receipts. The likely establishment-based recipient of these royalty receipts is either the corporate headquarters (NAICS 551) or an establishment set up for the purpose of leasing IP and intangible assets (NAICS 533).

For 2002, the sum of patent leasing and licensing for Lessors of Non-financial Assets (533) and all of the payments for intangibles other than franchise fees for Management of Enterprises (551) is \$11,549 million dollars (Table 5). This is a fraction of the receipts for Industrial IP as identified from the IRS data. Although this suggests that non-employer establishments may be collecting the licensing receipts, estimates of non-employer receipts are not large enough to contain all the missing royalties. Census reports broad aggregates for non-employer receipts, for Sector 53 as a whole, real estate and rental and leasing, total non-employer receipts are \$161.8 billion. However, BEA also receives unpublished estimates for the industries within Sector 53, and the amount of these receipts coming into the non-employer component of NAICS 533 is not large enough to account for the unidentified IP-licensing commodities. Locating these transactions would involve an enterprise-based survey that specifically tracked IP-licensing commodities payments.

#### **D. Estimating the Use of IP-related service commodities.**

A similar exercise could be conducted to develop estimates of the use of IP-licensing service commodities. Given the international variation in intellectual property protection, the underlying assumption of the distribution process—that international demand for U.S. intangibles is similar to domestic demand for U.S. intangibles, is harder to justify for the case of payments of royalties and licensing fees to foreigners.

Information about inputs for the I-O accounts comes from a variety of sources, but the Annual Survey of Manufactures, the Economic Census surveys on Materials Consumed for Mining, the Business Expense Surveys for Wholesale Trade, Retail Trade, and selected services provide the foundation for these input estimates. None of the Census surveys separately request royalty expenses; instead they are included with aggregate categories such as other operating expenses.

Licensing payments for the use of a franchised business format can be directly tied to establishment-based industries. Franchise fees for full service and limited service restaurants can be assumed to be paid by these establishments. While data are sparse for the 2002 I-O accounts, the likely additional franchise-related questions in future Economic Censuses for a broad group of industries will enable the use of this IP-related service commodity to be partially identified.

The other three IP-related commodities -- licensing of industrial processes, copyrighted works, and trademarks -- are much harder to tie to an establishment, especially without additional information from Census breaking payments for the use of these intangibles out of the rest of business expenses. Intangibles can be paid for once and used multiple times, and need not be used where they are paid for. Thus payments for the use of an industrial process could be made from a company headquarters, yet the industrial process could be used in a manufacturing establishment.<sup>24</sup>

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<sup>24</sup> Proprietary data on technology transactions have also been used to estimate the market for technology transfer and the inter-industry patterns of supply and demand. Arora, Fosfuri, and Gambardella (2002) used a proprietary database of technology transactions from the Securities Data Corporation to estimate both the inter-industry patterns of supply and use of technology and the approximate size of the international market. The data they used included R&D expenditures reported in Security and Exchange Commission filings in the United States, and industry announcements about the value of transactions. This included information about licensing and royalty payments as well as R&D funding in exchange for licensing rights, and equity purchase of firms.

This suggests that appropriate data on use must be collected on an enterprise basis rather than an establishment basis. One effort in this direction is an intangible assets survey has been recently developed by Industrial Statistics and Studies Division (SESSI) of the Ministry for the Economy, Finances, and Industry of France. The survey, initiated in 2003, is directed at the firm level, and includes questions about marketing and advertising, innovation and research policy, research and development, and management of intellectual property rights. The survey asks about both management costs and income from intellectual property rights. Specifically, the survey asks for 1) the net amount of fees and royalties received by the group from third parties for the use of intellectual property rights, 2) the net amount of fees and royalties paid by the group to third parties for the use of IP rights, 3) other costs connected with IP rights, including the costs of registering and maintaining patents, and 4) the number of employees involved in maintaining IP rights.

### **Summary**

Using a variety of sources, broad estimates of IP-licensing and related transactions have been presented for 2002 using a readily available product taxonomy created by Census. For manufacturing enterprises, which receive the vast majority of these royalty receipts for IP-licensing, detailed statistical data are scarce. In terms of identifying the users of IP-licensing service commodities, statistical data are even harder to come by. While BEA data on international service transactions between unaffiliated parties provide an indication of what the patterns of supply and use might look like, there are many reasons to suspect that domestic supply and demand will differ from international supply and demand. However, both payments and receipts for these

unaffiliated royalties and license fees emphasize the importance of manufacturing industries as both suppliers and users of intellectual property in market-based transactions. Yet, as has been demonstrated, to the extent that these transactions are accounted for in Census-based measures, the majority of them are in either miscellaneous receipts or non-employer receipts that cannot be directly identified.

Some of the unique aspects of intellectual property itself will frustrate improved measurement on the establishment basis at which the Economic Census is conducted. First, it is likely that many royalty payments are received in small establishments that are either hard to identify or out of scope of the Economic Census. Second, the characteristic aspects of intangibles -- absence of physical embodiment and non-rivalness (their ability to be used repeatedly by multiple producers) -- make it difficult to identify the establishments where they are actually used.

Measurement of royalties and licensing fees for the domestic economy is an important component of improved measurement of intangibles and intellectual property. Improving statistical collection of these direct, market based measures provide a means of estimating the stock of intangibles as well as tracing their flow between industries.<sup>25</sup> More accurate accounting will likely require enterprise-based surveys that focus directly on the creation of IP assets and transactions for their use, including cross-licensing. This kind of information would resolve a great deal of the ambiguity surrounding the estimates

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<sup>25</sup> The widely used equation for the value of a capital asset when new,  $V_0$  shows that measurement of the service flow or payment for the use of the asset,  $f$ , together with the rate of depreciation,  $\delta$ , which includes obsolescence, and the discount rate,  $r$ , could provide an independent measure of the value of the asset :

$$V_0 = \sum_{t=1}^{\infty} \frac{(1 - \delta)^{t-1} f}{(1 + r)^t}$$

This formulation is appropriate for an asset with an infinite life. For patents and copyrights, the limited term of legal protection would modify the expression to the sum of the protection period.

of unmeasured components of economic activity and provide a means to trace technology flows across industries. For economists and policy makers interested in understanding the impact of intangibles on the economy, improved measurement is the essential next step.

## **Appendix Section 1: Types of IP**

**Copyrights:** Copyrights are rights that protect original works of authorship. In the United States, these rights are granted by registering the original work with the Copyright Office of the Library of Congress. The types of works protected are (1) literary works; (2) performing art works, such as musical works, dramatic works, motion pictures and pantomimes and choreographic works; (3) periodicals and magazines; (4) visual art works; (5) sound recordings; (6) architectural works; and (7) computer programs. Copyright protection expires 70 years from the death of the last surviving author. For works created for hire, the period of protection is the shorter of 95 years from publication or 120 years from creation (United States Copyright Office (2004)).

**Patents:** There are three types of patents issued in the United States: utility patents, design patents, and plant patents. A utility patent is a legal grant for a limited time of the exclusive right to a non-obvious invention with a practical application. These inventions can be processes, machines, manufactures, and compositions of matter. In addition to utility patents, the United States grants patents on designs and on newly invented or developed species of plant. In each case, the characteristic quality of a patent is novelty. Patents are issued to the inventor, but the title may be assigned to an employer or sponsoring organization. Patents are granted by the U.S. Patent and Trademark Office in the Department of Commerce after patent inspectors determine that the invention is non-obvious and has not been previously patented. Patent protection lasts 20 years from filing. Since this exclusive right is property, it may be sold, given away, or transferred to others (USPTO (2005)).



**Trade Secrets:** A trade secret is any valuable and not generally known information kept secret by its owner that has economic value attached to its secrecy. The secret may be a formula, pattern, compilation, program, device, method or technique. The protection granted by the Uniform Trade Secrets Act is fundamentally different from that of a patent or copyright. Trade secrets do not expire after a period of time as patents do. Unlike patents, the owner of a trade secret cannot prevent an independent reinventor from using their discovery. Thus reverse engineering can successfully destroy trade secret protection but not patent protection (NCCUSL (1985)).

**Trademarks:** Trademarks are brand names and the symbols associated with them. Like patents, trademarks are granted by the U.S. Patent and Trademark Office of the Department of Commerce. The characteristic quality of a trademarked good is distinctiveness; trademarked goods or services must be able to be distinguished from those of another producer. Trademarks differ from copyrights and patents because the right to exclusive use of the symbol does not expire. However, trademarks that become a generic term lose their right to protection; for example “aspirin” and “thermos” have lost their right to protection (Besen and Raskind (1991)).

**Sui Generis Rights:** These are laws that provide legal protection to industrial designs. In the United States, protection for the layout of microelectronic circuitry on a semiconductor chip mask is established by the Semiconductor Chip Protection Act (SCPA) of 1984, which grants the owner exclusive use for ten years. Similarly, the Vessel Hull Design Protection Act (VHDPA) of 1998 provides legal protection for the design of ship hulls (United States Copyright Office (2004)).

**Franchises:** A business format franchise is a combination of a trademark and a system of doing business that is used through a licensing agreement. It is a combination of intellectual property, business services, and know-how. Product distribution franchises are supplier-dealer relationships. Examples of this type of franchise are soft drink distributors, automobile dealers, and gas stations.

## **Appendix Section 2**

### **Intellectual Property and Intangible Assets in the System of National Accounts**

The legal concept of IP overlaps with a subset of the intangible assets described in the System of National Accounts ((CEC (1993), et al par. 10.7 –10.8). Broadly speaking, assets are entities 1) over which ownership rights are enforced and 2) from which the owners can derive economic benefits (CEC (1993) par. 10.2). The SNA identifies non-financial assets with the taxonomy illustrated in Table A1. Produced assets are characterized as outputs of production processes, while non-produced assets come into being in other ways (CEC (1993), et al par. 10.6). Within produced assets there are fixed assets, inventories, and valuables. A second distinction between tangible and non-tangible assets is used for both produced and non-produced assets. The intangible components of non-produced assets gain asset status by way of legal or accounting actions. An important distinction between produced and non-produced assets is that produced assets are considered as part of economic output and non-produced assets are not, although non-produced assets do count as economic wealth. Thus produced assets count as investment in estimates of gross domestic product and non-produced assets do not. The rightmost column of Table A1 shows the intangible assets identified in the SNA and their current characterization as produced or non-produced. Computer software and

artistic, entertainment, and literary originals are currently considered to be intangible fixed, produced assets. Patented entities, trademarks, and franchises are considered non-produced intangible assets.

<b>Table A1 Nonfinancial Assets</b>	
<b>Produced Fixed Assets*</b>	
Tangible Fixed Assets (goods)	Intangible fixed Assets (services)
Structures, machinery, and equipment	Mineral Exploration, computer software, artistic, entertainment and literary originals
<b>Non-produced Assets</b>	
Tangible Non-produced Assets (naturally occurring)	Intangible Non-produced Assets (legal constructs)
Land, Subsoil Assets, Non-cultivated biological resources, water resources	Patented Entities, Leases and other transferable contracts, goodwill, other intangible non-produced assets, such as trademarks, industrial processes, and franchises (CEC (1993) 14.114)

\*Valuables and Inventories are produced assets that are not presented in this table.

The scope of IP covers portions of both produced intangible assets and non-produced intangible assets within the SNA. Intangible fixed assets are products that have a sort of dual existence; once as originals and again as the copies that can be made of them. Ownership of the original can be established by copyright, patent or secrecy (CEC (1993) 6.143).<sup>26</sup> The practice of the SNA has been to consider either the underlying produced asset or the legal construct that confers ownership as an asset, but not both. Table A2 lists the types of IP discussed in this paper, the United States legal framework that confers ownership rights, and the corresponding characterization in the SNA as either a produced or non-produced intangible asset. In its current form, the System of

<sup>26</sup>This mention of patenting as a means of establishing ownership to an intangible fixed asset currently can refer to software, an intangible fixed asset, but not to R&D.

National Accounts is not entirely consistent in its treatment of the IP components of intangible assets.

**Table A2, Intellectual Property, Intangible Assets and Related Commodities**

Type of Intangible	UNITED STATES Legal Authority	Produced or Non-produced	Comment
Technological or Scientific Originals	Patent Law	non-produced	
Artistic, Entertainment, and Literary Originals	Copyright Act	produced	
Semiconductor Masks	Semiconductor Chip Protection Act (SCPA) of 1984.	non-produced	These masks are not specifically mentioned in the SNA, but "other non-produced assets" are mentioned along with patents
Trademarks, Service Marks, and other Certifications	Trademark Act of 1946 (Lanham Act)	non-produced	
Trade Secrets	Uniform Trade Secrets Act, a relatively unified set of state laws	non-produced	Industrial processes are specifically included and separate from patents
Software Originals	patent, copyright, or both	produced	
Franchising	Trademark Act, and possibly patent law or trade secret law	non-produced	

In Table A2 an asymmetry is evident in the treatment of scientific originals on one hand and artistic and literary originals. As of the 1993 SNA artistic and literary originals are intangible fixed (produced) assets, but scientific originals (and R&D) are not.<sup>27</sup>

<sup>27</sup> This treatment will likely change if and when R&D is capitalized in a future version of the SNA. Patents would no longer appear as separate assets. Instead they would become a special form of R&D assets, those that have been provided legal ownership rights of a particular type (Muller (1990)).

Trademarks, industrial processes and franchising are specifically identified in the SNA as non-produced intangible assets, while trade secrets and other sui generis IP rights are not specifically mentioned. The latter two belong in this category because of their similarity with the concept that identifies intangible, non-produced assets-- protection of ownership rights through a legal construct.

Computer software used in production for a year or more is considered an intangible produced asset in the SNA. It has been capitalized in the National Income and Product Accounts (NIPAs) since 1999. In 2003 the NIPAs capitalized software originals. This capitalization of software originals recognized the two kinds of products associated with intangibles described here, the original and the copies made from it.

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