

Measuring Payments for the Use of Intellectual Property  
In an Input-Output Framework

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ABSTRACT

The paper describes the relationship between Intellectual Property and Intangible Assets as described by the System of National Accounts. Using the North American Product Classification System for service commodities, the paper presents a simplified Input-Output framework for improving the estimates for licensing payments for the use of intellectual property, commonly called royalties, for 2002. 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) a trademarked business format used under a franchise agreement.

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## **Introduction**

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 billion in royalty receipts in 2002 (IRS (2005)); this amount has grown at an average rate of over 11% per year since 1994. Annual investment in the intangible assets used in exchange for these royalties has been estimated at one trillion dollars a year (Corrado, Hulten, and Sichel (2002)). Despite the large sums involved, these royalty and licensing payments are measured in the national accounts with relatively limited source data, particularly at an industry level. Further, detailed knowledge about the flow of these payments and receipts across industries and national borders can help trace the diffusion of technology, creative works, and commercial brands through the use of the underlying intellectual property.

This paper describes IP and the transactions for its use in terms of commodities. It provides a framework for identifying the industries where these commodities are produced and where they are used in production. The framework used here links IP to intangible non-financial assets in a manner consistent with the System of National Accounts. The service commodities that represent the use of IP are based on the concepts developed in the North American Product Classification System (NAPCS).

This paper describes a research project to be completed for the April 2006 NBER/CRIW Conference on International Service Flows. First, using these service

commodity definitions, industry resources, and an analysis of a special tabulation of unpublished BEA data, the project will develop improved estimates of the payments and receipts for the use of IP that can be used as a useful guide for the 2002 Benchmark Input Output (I-O) tables. Second, using the BEA data on international service transactions in the commodity framework developed in this paper, the component of IP that relates to the international transactions for use of technology-related IP will be compared with the international transactions for R&D services.

### **The benefit of improved measurement**

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-related constructs like trademarks. IP is property because a legal authority provides the owner with the exclusive right to benefit from its use. While the value of IP is challenging to measure, expenditures for its creation and defense provide an indication of its importance in economic activity.

A recent paper by Corrado, Hulten, and Sichel (2002) estimates 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> These estimates of the value of this capital are difficult because much of it is created for “own-account.” Improving the measurement of payments for the use of IP provides a means to estimate the value of the

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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.

stock of these intangibles as well as a means to trace the flow of these intangibles between industries.

Payments for the use of IP-related intangible assets have the potential to be used to measure intangible outputs independently of inputs.<sup>2</sup> This would be particularly important, for example, if R&D is capitalized in some future version of the national accounts. The value of R&D output that is not sold on the market may be estimated as the sum of its inputs or production costs. For goods or services valued in this way, productivity measurement is a trivial but uninformative exercise. While much of the R&D may not be sold directly on the market as an asset, there are many observable transactions for its use in the form of licensing fees for the use of technology, patents or trade secrets.

A second important use of improved measures of payments for the use of patents, trade secrets, and industrial processes is to trace both the international and inter-industry structure of technology diffusion. The pattern of this activity and the creation of new technology leave a kind of footprint that can be compared to the spread of innovative activity through R&D expenditures. In industries like chemical manufacturing the process of international technology diffusion owes much to the role of technology licensing through specialized engineering firms (Arora, Fosfuri, and Gambardella

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<sup>2</sup> The standard 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.

(2001)). By analyzing the BEA international transactions data for industrial processes by industry, other such patterns of technology diffusion can be identified.

This paper is organized as follows: First the basic components of IP rights in the United States are summarized. Next, these legal protections are linked to produced and non-produced intangible assets in the System of National Accounts. A framework developed for the North American Product Classification System (NAPCS) is then used to identify four commodities related to the use of IP and one related to the use of other intangible assets. These commodities will be used to structure existing statistical, administrative, and other data to produce an improved set of estimates for transactions in the use of IP. The industries and commodities that will be estimated are presented in a supply table and use table structure that is based on BEA's 2002 annual I-O table. Finally, the research plan calls for BEA data on international transactions for the use of IP to be used to compare R&D service transactions with payments for the use industrial technology.

### **Intellectual Property Rights in the U.S.**

Laws related to patents, copyrights, trademarks, trade secrets, and sui generis rights form the core of IP protection in the United States. The general distinction between patents and copyrights is that useful works are protected with patents, while original works of authorship are protected with copyrights. With either patents or copyrights, the work eventually moves into the public domain. Legal protections for trademarks and trade secrets, on the other hand, have the potential to be continually

renewed. Franchises represent a kind of quasi-intellectual property, a bundled good of IP and business services.

**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 and business services.

### **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, et al par. 10.7 –10.8). The next section of this paper describes the treatment of intangible assets in the SNA and links them to IP protection under United States law.

Broadly speaking, assets are entities 1) over which ownership rights are enforced and 2) from which the owners can derive economic benefits (CEC par 10.2). The SNA identifies non-financial assets with the taxonomy illustrated in Table 1. Within non-financial assets there are produced and non-produced non-financial assets. Produced assets are characterized as outputs of production processes, while non-produced assets come into being in other ways (CEC, 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. The rightmost column of Table 1 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.



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 6.143).<sup>3</sup>

**Table 1 Nonfinancial Assets**

Produced Assets			
Valuables	Inventories	Fixed Assets	
		Tangible Fixed Assets (goods)	Intangible fixed Assets (services)
Gold and precious gems, for example	Output for further processing, intermediate consumption, or resale	Structures, machinery, and equipment	Mineral Exploration, computer software, artistic, entertainment and literary originals
Non-produced Assets			
		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 14.114)

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 2 lists the

<sup>3</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.

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

**Table 2, 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 2 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>4</sup>

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.

### **Payments for the Use of Intangible Assets**

Produced intangible assets in the SNA currently include literary and artistic originals and computer software. Non-produced intangible assets currently include patents, trademarks, trade secrets and franchises. Payments for either type, commonly called royalties, are payments for the use of these assets and are considered payments for a service rather than property income (CEC Annex 1, paragraph 69). This treatment of intangible assets is similar to the way the SNA treats payments for the use of other fixed

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<sup>4</sup> This treatment will likely change if and when R&D is capitalized in a future version of the SNA. Patents would not 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)).

assets in production. These payments are considered expenditures for intermediate inputs (CEC. 6.148).

Rights to license 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 some 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 intermediate consumption.

### **Identifying IP-related Commodities**

As described above, payments for the use of intangible assets are a transaction involved in purchasing a service commodity. Improving the current estimates for the payments and use of IP requires a way to separate out related transactions, like 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 treatment of tangible assets described earlier in this paper. Some variation of these new definitions for commodities is currently being developed

and introduced for a limited number of industries in the Service Annual Survey and the 2007 Economic Census. 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. Applying Mohr and Murphy's three commodities to different types of IP allows a set of service commodities reflecting the use of IP in production to be identified that would be something like this:

- 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.

In the remainder of this paper these four commodities will be referred to as the IP-licensing service commodities. Two related types of final use products are considered separately, these are products with IP embodied in them and end-use licensing.

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. Currently, limited data are available to estimate flows for these types of service commodities. In some cases, payments for the purchase of IP-assets are commingled with payments for licensing the rights to use these assets.

BEA's Input-Output accounts currently use data that provides good totals for the overall corporate receipts of royalties, a category that includes payments for all these types of IP as well as payments for the use of some natural resources. However, the aggregate nature of the data makes it difficult to estimate properly output by industry and

by the four commodities described above. The next section of this paper describes the data problem involved in tracing these flows in an Input-Output format.

### **An Input-Output Framework for the Use of Intangible Assets**

BEA's benchmark Input-Output (I-O) accounts provide the most detailed view available of the technological structure of the United States economy. 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.

Table 3 illustrates a simplified version of a supply table with three industries, 1) goods, 2) services and other, and 3) trade and transport. The output of these three industries is the sum of the first three columns, and the total output of the commodities produced by these industries is the sum in the rows in these three columns. The far right column tallies the total supply of each commodity after adding imports, trade and transportation margins, and taxes.

Table 4 provides a matching use table for the same three industries. Again, the industries are in the columns, but now the rows represent the commodities that the industries use to produce their output rather than the commodities they produce. The shaded portion of the table is the intermediate use, and the Final Use columns represent the familiar components of GDP, Consumption, Private Investment, Government Expenditures, and Exports.

Table 3, Simplified Supply Table, Commodities by Producing Industry

	Output of industries at basic prices			Imports (4)	Total product supply at basic prices (6)	Total trade margins & transport costs (7)	Total taxes less subsidies on products (8)	Total product supply at purchasers' prices (9)
	Services and Other		Trade and transport (3)					
	Goods (1)	(2)						
Goods								
Services and other								
Trade and transport								
Total industry output								
Commodities								
Noncomparable imports								
Direct purchases abroad by residents								
Total supply at basic prices								

Table 4, Simplified Use Table, Commodities by Using Industry

Commodities	Intermediate Uses				Final Uses				Total use of products purchasers prices	IM	Total final Uses GDP	Total domestic commodity output
	Goods	Services and Other	Trade and Transport	Total Intermediate Uses	C	I	G	X				
Goods												
Services and Other												
Trade and Transport												
Noncomparable imports												
Direct purchases abroad by residents												
Direct purchases at home by nonresidents												
Total Intermediate uses												
Total value added												
Total inputs at basic prices												
Taxes on products and imports, less subsidies												
Total domestic industry output												
Total commodity output-total intermediate uses = GDP												



## **Economic Census data and payments for the use of IP**

Most of the data used to create the Benchmark I-O tables are collected by the United States Census Bureau in the Economic Census. 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 and franchising and the use of natural resources. For 2002 these royalty receipts are shown in Table 5.

**Table 5, 2002 Royalty Receipts from the Economic Census**

	NAICS Industry	2002 Census Royalties (\$thousands current)
511	Publishing industries	<b>434,064</b>
512	Motion picture and sound recording industries	<b>1,584,451</b>
533	Lessors of nonfinancial intangible assets	<b>11,363,205</b>
551	Management of companies	<b>7,011,992</b>
711-712	Arts, Entertainment, and Recreation	<b>2,666,795</b>
	All industries shown above	<b>23,060,507</b>

The largest contributor to these is the NAICS industry 533. This industry, Lessors of Nonfinancial Intangible Assets (except Copyrighted Works) “includes

establishments that 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 subsector 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 (OMB (2002)).” This industry definition makes it clear that copyright receipts must be classified as a separate type of output.

Given appropriate separation of commodities, Census information of this type could be used to create the industry output column totals in the I-O table shown in Table 3. The row cells within each column would reflect the different commodities each industry produces. Table 6 expands the commodity structure of the Supply Table to show the detailed IP-licensing service commodities and the expanded industry structure for just the industries that produce these commodities.

Since the Economic Census data for industry 533, Lessors of Non-financial Intangible Assets, provide product level receipts for copyrights as well as for oil royalties, patent leasing, and franchising, the copyright related receipts would be in separate rows from the other receipts. This separation allows the row totals of Table 6 to sum to correct totals of commodity output. While most of the royalties associated with the publishing industries can be considered to be copyright related, the royalty receipts for 551, Management of Enterprises are likely to contain receipts for many different types of licensing-related commodities. Since a portion of the \$23 billion in royalty receipts is due to copyrights on literary, entertainment, and artistic originals, this must somehow be separated from the output classified with the 533 commodity.

Table 6. Industry and Commodity Detail for Supply Table

		312 Beverage and Tobacco Manufacturing	335 Electrical Equipment, Appliance, and Component Manufacturing	336 Transportation Equipment Manufacturing	All Other Goods	511 Publishing industries (Including Software)	512 Motion picture and sound recording industries	515 Radio and television broadcasting, cable networks and program distribution	517 Telecommunications	518 Internet service providers, web search portals, and data processing services	533 Lessors of Nonfinancial Intangible Assets	54 Professional, Scientific and Technical Services, Entertainment and Recreation	72 Accommodation and Food Services	All Other Services and Other	Trade and Transport	Total Intermediate	IMPORTS	Total Supply at Basic Prices
COMMODITIES	Goods																	
	Licensing of Rights to Use Intellectual Property Protected as Industrial Property																	
	Licensing of Rights to Use Intellectual Property Protected by Trademarks																	
	Licensing and Royalty agreements to exploit natural																	
	Licensing of Rights to Use a Franchised Business Format																	
	Licensing of Rights to Use Intellectual Property Protected by Copyrights																	
	All Other Services and Other Commodities																	
	Trade and transport																	
	Total industry output																	

Table 7, Industry and Commodity detail for Use Table

	312 Beverage and Tobacco Manufacturing	335 Electrical Equipment, Appliance, and Component Manufacturing	336 Transportation Equipment Manufacturing	All Other Goods	511 Publishing Industries (Including Software)	512 Motion picture and sound recording industries	515 Radio and television broadcasting, cable networks and program distribution	517 Telecommunications	518 Internet service providers, web search portals, and data processing services	533 Lessors of Nonfinancial Intangible Assets	54 Professional, Scientific and Technical Services	71 Arts, Entertainment and Recreation	72 Accommodation and Food Services	All Other Services and Other	Trade and Transport	Total Output	EX	IM
Commodities																		
Goods																		
Licensing of Rights to Use Intellectual Property Protected as Industrial Property																		
Licensing of Rights to Use Intellectual Property Protected by Trademarks																		
Licensing and Royalty agreements to exploit natural resources																		
Licensing of Rights to Use a Franchised Business Format																		
Licensing of Rights to Use Intellectual Property Protected by Copyrights																		
All Other Services and Other Commodities																		
Trade and Transport																		

Turning to the Use side, this commodity output must be distributed across the using industries and components of final demand in the expanded commodity and industry detail in Table 7.

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

Tables 6 and 7 show several additional suppliers of IP-licensing service commodities that are not included in the Census summary of royalty receipts above. For BEA's Benchmark I-O accounts estimate of the Lessors of Nonfinancial Assets and its commodities, IRS's Statistics of Income (SOI) data are used in place of Economic Census data because they are considered to be a more comprehensive measure of receipts for the use of IP-licensing commodities.

The IRS data report an aggregated line, royalties, from the corporate income tax form 1120-S. While the scope of these royalties matches well with three of the four the receipt components for industry 533<sup>1</sup>, there is no component breakdown to separate out copyright royalties. Additionally, the IRS data reflects a much higher total for royalty receipts, \$114.9 billion in 2002 compared with \$23 billion in Census measured receipts. Table 6 shows the 22 three-digit industries with more than one billion dollars in royalty receipts in 2002. These industries collectively make up \$102 billion of the total \$114.9 billion in royalty receipts. Notably, the three largest recipients of receipts are in the manufacturing industries, followed by the publishing subsector and the professional, scientific and technical and services subsector.

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<sup>1</sup> These are: 1) Industrial Royalties – This category of income includes royalties for the use of, or the right to use, patents, trademarks, secret processes and formulas, goodwill, franchises, “know-how,” and similar rights. 2) Motion Picture or Television Copyright Royalties – This category refers to royalties paid for the use of motion picture and television copyrights. 3) Other Royalties (e.g., copyright, recording, publishing) – This category refers to the royalties paid for the use of copyrights on books, periodicals, articles, etc., except motion picture and television copyrights. 4) Natural Resources Royalties – This category includes royalties from mines, wells, or other natural deposits.

**Table 8 SOI Corporate Royalty Receipts, 2002**

<b>NAICS</b>	<b>Major industries -- 2002 NAICS Subsector</b>	<b>2002 Royalties (thousands of dollars)</b>
334	Computer and electronic product manufacturing	23,317,357
325	Chemical manufacturing	20,447,291
336	Transportation equipment manufacturing	9,405,614
511	Publishing industries	4,755,182
541	Professional, scientific, and technical services	4,692,492
312	Beverage and tobacco product manufacturing***	4,279,666
722	Food services and drinking places	3,563,991
422	Nondurable goods	3,190,081
333	Machinery manufacturing	2,516,092
512	Motion picture and sound recording industries	2,421,889
515	Broadcasting and telecommunications	2,307,517
335	Electrical equipment, appliance, and component manufacturing	2,245,571
444	Building and garden equipment and supplies dealers	2,226,393
332	Fabricated metal product manufacturing	2,168,144
339	Miscellaneous manufacturing	1,995,981
518	Internet service providers, web search portals, and data processing services	1,951,863
517	Telecommunications	1,921,937
311	Food manufacturing	1,863,709
721	Accommodation	1,450,428
445	Food, beverage, and liquor stores	1,434,406
421	Durable goods	1,364,183
561	Administrative and support services	1,355,275
452	General merchandise stores	1,350,465
	All other industries	12,706,590
	Total of Above	114,932,117

\*\*\* Supressed value: estimated with sector total and 2001 values.

Two factors begin to explain the gap between the IRS and Census estimates of royalties. First, census has not identified royalties in the definition of operating receipts for all of the establishment-based industries that are likely to receive these payments. Second, it is likely that many establishments that collect and pay out royalties are not

filling out Economic Census forms. Complicating matters further, the IRS data are collected on a company basis, while Census data are collected on an establishment basis. Relating this information to the industry detail in Table 6, an accurate accounting would need to transform these company-based industries into establishment based ones for the correct column totals. No data are currently available to make this estimate directly.

For the industry/commodity detail of the Use Table (Table 7), establishment-based data pose an even larger challenge. None of the Census surveys separately request royalty expenses; instead they are included with categories like other operating expenses.

### **Improving the Estimates of Supply and Use**

A comprehensive solution to this measurement problem will require a substantial improvement in the survey data for receipts and payments for the use of IP.<sup>2</sup> Using the kind of commodity structure outlined by Mohr and Murphy, this project proposes an interim set of estimates based on incomplete data that will highlight what is measurable and where broad approximations may be necessary. The distribution of royalty receipts to types of assets cannot be known with certainty and will be developed based on existing surveys, academic research, proprietary data, and occasionally some heroic assumptions.

The tasks in this approximation process are 1) separating copyright payments from the payments for the use of industrial property, 2) estimating the share of IP

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<sup>2</sup> 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 first year of the survey was for 2003, and results have not yet been released. The survey is directed at the firm level, and includes questions about marketing and advertising, innovation and research policy, research and development in France, 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 in France from third parties for the use of intellectual property rights, 2) the net amount of fees and royalties paid by the group in France 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.

licensing payments received by manufacturing establishments, and 3) estimating the use of IP-licensing service commodities by industry.

### **BEA International Royalties Data**

A unique data set from the International Division of BEA will be used as part of this estimation process. BEA data on international transactions in intangible assets are particularly valuable for understanding the commodity and industry structure of the use of IP since a portion of these BEA data can be classified by industry of transactor. One of BEA's specialized international service surveys, *Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and In Intangible Assets*<sup>3</sup> separates royalty payments and receipts into types of IP that can be linked to the newly created North American Product Classification Codes (NAPCS) for service commodities already described in this paper.

For this BEA survey, the types of intangible property that are separately identified are 1) industrial processes and products, 2) books, records, and audio tapes, 3) trademarks, 4) performances and events prerecorded on motion picture film and TV tape, 5) general use computer software 6) business format franchising and 7) other intangibles. This project will use a special unpublished tabulation of these transactions by U.S. industry making payments and U.S. industry receiving payments. For similar international transactions between multinational corporations and their affiliates, the BEA data do not identify the different types of IP, but royalty payments can still be analyzed

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<sup>3</sup> This survey was preceded by the Annual Survey of Royalties, License Fees, and Other Receipts and Payments for Intangible Rights between United States and Unaffiliated Foreign Persons.



on an industry basis. These tabulations will be used in a way that does not violate the confidentiality arrangements of the source data.

### **IP–licensing related Commodities: the Industries that Supply and Use them**

The exercise proposed here is to use publicly available data together with the analysis of BEA data to approximate the allocation of supply and use of four IP-related commodities. The distribution of these payments across types of IP can be used to estimate the following components of royalty payments: 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, and 4) Licensing of Rights to Use a business format under a franchise.<sup>4</sup>

For industries that are either large suppliers or large consumers of IP-licensing service commodities the breakdown above will be estimated in modified supply and use tables based on BEA data from the 2002 annual I-O accounts.<sup>5</sup> Existing industry and commodity output for the 2002 annual I-O accounts will be modified to break out only the relevant commodities and industries. Tables 6 and 7 display the commodity and industry detail proposed for this project. The IRS royalty data provide a known total for royalty receipts. Backing out an estimate of output Lessors of Nonfinancial Intangible Assets, industry 533, can be done by using the distribution of IP commodities from international services transactions to allocate shares of domestic transactions.<sup>6</sup> This

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<sup>4</sup> Licensing and royalty agreements to exploit natural resources must also be estimated because these payments are part of royalties.

<sup>5</sup> While the 2002 annual I-O accounts are currently available, the more comprehensive 2002 Benchmark I-O accounts, based on primarily on Economic Census data will not be available until 2007. Further, the estimates developed in this research project will be useful in filling in the gaps in the 2002 benchmark data.

<sup>6</sup> Because these data include payments for the purchase as well as the use of intangible property, they can be used for understanding industry and commodity distributions, but not the volume of commodity-based

allocation is based on the assumption that for any given industry, similar commodity distributions are reasonable for domestic industries.<sup>7</sup>

These initial distributions will be confirmed and adjusted with academic research, industry and professional association data, proprietary data, and information from Securities and Exchange Commission (SEC) filings. Useful but non-comprehensive survey data from IP-related industry and professional associations will be used to refine the allocation of commodities to industries of supply and use. Annual or periodic surveys are available from the Association of University Technology Managers, the Intellectual Property Owners Association, and the Licensing Executives Society. A substantial literature exists within the business community of licensing and technology transfer professionals on average royalty rates for different types of IP, usually based on a percentage of gross sales. The International Franchise Association has provided data on average franchise royalty rates and the share of industry receipts that are from franchisee-operated establishments; these can be used to estimate the franchise component of the use table.

For some manufacturing industries there are existing studies of proprietary data on licensing transactions that will be useful. Arora, Fosfuri, and Gambardella (2001, Table 2.4 ) provide a matrix of world-wide inter-industry technology licensing flows based on data for 1988 – 1997. The matrix is aggregated at the level of two-digit SIC. At this level of aggregation the majority of the interactions are on the diagonal cell, indicating that most of the payments for use of licensed technology are made and

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service transactions directly. The reporting instructions for BE –93 instruct the respondent to report “all receipts and payments accrued during the reporting period for the use, sale, or purchase of intangible assets or proprietary rights (BEA 1999 Instructions for BE-93).

<sup>7</sup> Arora, Fosfuri, and Gambardella conduct a similar exercise to estimate technology licensing receipts ((2001) page 32).

received in the same industry. The matrix shows the predominance of chemical manufacturing, business services (contains R&D services, specialized engineering firms, and software services), electrical manufacturing, and industrial machinery manufacturing in both making and receiving payments for the use of technology.

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

One of the benefits of an improved classification structure for IP-related commodities is that it can separate two kinds of services produced by IP-producing firms. These are the creation of IP under contract and the licensing of IP. Firms that conduct research and development as a market activity could choose to sell their R&D services or, alternatively, sell the use of the underlying innovation or process. Looking at both commodities together will provide a better understanding of the processes at work in the internationalization of R&D and international diffusion of technology. The industry-by-commodity analysis of BEA international service transactions for the use of intangible assets will be combined with available data on international trade in R&D services to compare these two types of services—contract R&D and payments for the use of technology related intellectual property.

### **Conclusion**

This paper has described the research that will be completed by the April conference in International Service Transactions. The project begins to develop improved estimates for IP-licensing service commodities by industries of supply and use. The commodities are developed based on the North American Product Classification

System and will be estimated for the major subsectors. Additionally, the resulting estimates of the use of intangible assets that are protected as industrial property will be compared with international R&D transactions. The final paper will also contain recommendations for improving the survey data for measuring payment and receipts for the use of IP, a longterm but essential effort.

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