IRLE
Institute for Research on Labor and Employment

IRLE WORKING PAPER
#101-22
January 2022

Trends in inter-firm transactions across industries in the U.S.

Jessie HF Hammerling

Cite as: Jessie HF Hammerling (2022). "Trends in inter-firm transactions across industries in the U.S.". IRLE Working Paper No. 101-22.
http://irle.berkeley.edu/files/2022/01/Trends-in-inter-firm-transactions-across-industries-in-the-us.pdf

Berkeley
UNIVERSITY OF CALIFORNIA

Trends in inter-firm transactions across industries in the U.S.

Exploring new concepts and implications for research on domestic outsourcing

Jessie HF Hammerling, PhD[1]

December 2021

Abstract: This paper explores trends in inter-firm transactions (IFT) in the U.S. in relation to the varied approaches that researchers have used to study domestic outsourcing. I develop a typology of IFT that references distinct definitions of outsourcing, and I generate a new methodology for measuring domestic IFT using the Bureau of Economic Analysis National Input-Output Accounts data. I analyze IFT trends for individual industries and for three groups: all goods and services, all services, and only services that could feasibly be produced in-house by the purchaser. Trends in IFT vary considerably across industries, but IFT for services and for feasibly in-house services have increased in recent decades, both as a portion of total economic output and as a portion of services output. This study offers the first comprehensive assessment of changes in domestic IFT in the U.S., and establishes a conceptual and empirical foundation for further research on domestic outsourcing.

Keywords: input-output, outsourcing, subcontracting, fissuring, organization of production

Acknowledgments: Thank you to Chris Benner and Annette Bernhardt for the many years of support and guidance on this project, and to the many others who have given me helpful feedback and advice along the way. Source data is publicly available online via the U.S. Bureau of Economic Analysis. Please contact the author at jesshf@berkeley.edu for additional results and data analysis files. Supplemental Technical Appendix is included herein.

[1] Research Specialist, UC Berkeley Labor Center. Contact: jesshf@berkeley.edu

Research has suggested that production in certain industries in the U.S. now involves a greater number of transactions between firms, and that changing relationships between firms may have negative consequences for some workers' wages and job quality (Appelbaum 2017; Berlinski 2008; Flecker and Meil 2010; Weil 2014). Despite growing interest in this trend and growing concern about its impacts, we have limited evidence about how production between firms is changing across the U.S. economy. Moreover, we continue to lack clear consensus on common definitions of the processes we seek to understand. Research on this topic has been constrained by the lack of availability of comprehensive data on firms and establishments in the U.S., and by conceptual variation across existing studies that impedes comparison. The urgency to better understand trends in inter-firm transactions and their implications for workers has intensified with the onset of COVID-19, as some evidence suggests that the pandemic-induced recession may accelerate these kinds of changes (McKinsey Global Institute 2020; World Economic Forum 2020).

In this study I address the questions: how much economic activity in the U.S. is engaged in inter-firm transactions (IFT), how has this changed over time? In answering these questions, I develop a typology of IFT, and I generate a new methodology for measuring domestic IFT at the industry level. The typology includes three groupings of industries that vary in scope: the broadest group includes transactions for all goods and services; the next group includes transactions for services only. In the narrowest grouping, I include transactions only for a subset of industries identified as providers of services that could feasibly be produced in-house by the purchaser. For each of these groupings, I use the methodology to measure changes in IFT output in the U.S. over time.

I use the Bureau of Economic Analysis (BEA) National Input-Output Accounts data for my analysis. These data capture market-based transactions at the industry level, allowing us to track changes in how much each industry in the U.S. purchases from or produces for each other industry or end-user. The BEA data offer a unique opportunity to examine changes in IFT across the U.S. economy; while a handful of other researchers have used these data to answer related questions, this study represents the first attempt to comprehensively measure trends in IFT across industries in the U.S. I analyze IFT trends for individual industries and for groupings of industries corresponding to my typology of IFT. The purpose of this exercise is to deepen our knowledge of changes in the organization of production across firms in the U.S., and to help us situate our understanding of processes like domestic outsourcing in this broader context in order to enhance conceptual clarity and empirical precision in this critical area of research.

Literature review

The focus of this paper is changing transactions between firms, or **inter-firm transactions (IFT).** I define IFT as **the sale of goods or services from one firm to another firm** for use as an input to production. Firm in this case can also refer to another type of organization or government entity. My approach builds off foundational concepts from transaction cost economics (TCE), which expanded the framework for analyzing firms' decisions to "make" or "buy" inputs beyond a simple comparison of the prices of inputs. Specifically, TCE proposes that firms will "make" versus "buy" a particular good or service based on the relative costs of transactions between firms (such as difficulty coordinating activities), compared to the costs of producing the good or service in-house (such as inefficiencies associated with bureaucracy) (Coase, 1937; Chandler, 1977; Williamson, 1981).

The process of producing goods and services has always been to some extent the result of transactions between firms. A fully independent production process is difficult to imagine; almost all goods and services produced require some purchase of goods and/or services as inputs. Firms can purchase a diverse array of services, such as cleaning, delivery, accounting, laboratory diagnostics, data processing, call centers, legal representation, catering, waste remediation, and many more. Firms can also purchase a wide range of goods, including office supplies, manufacturing components, food and agricultural products, software, equipment, or cleaning materials. Purchases of goods or services may represent long-term relationships between specific actors, or one-time events. Firms may purchase highly specialized inputs or services, or generic ones. Transactions between firms appear in a wide range of industries and take on a variety of organizational forms, such as a "top-down" supply chain structure (common in manufacturing), a franchising model (e.g. a fast food restaurant chain), or a "hub and spoke" form in which the lead firm (e.g. a hotel) contracts with several other firms for a range of support services (Barenberg, 2015; Bernhardt et al., 2016).

Given the diversity in the type of economic transactions between firms and the contexts in which they occur, establishing consensus around how to measure and interpret trends in IFT has proven challenging. Which types of transactions and organizational forms are relevant and sufficiently comparable for understanding trends? Some research in this area has focused on exploring a specific subset of IFT, such as domestic outsourcing transactions, but consensus around common definitions has been elusive even with this narrower focus. The limited data available for investigating this topic in the U.S. has of course been an important factor contributing to the lack of consistency in approaches.

This paper examines a broader range of IFT, but studies of trends in domestic outsourcing contribute in important ways to its conceptual and empirical foundation. Furthermore, one impetus for exploring trends in IFT is to help contextualize investigations of domestic outsourcing. The purpose of this analysis is not to endorse a specific definition of outsourcing, but instead to implement an analytic strategy for studying IFT in general, which will help us construct a clearer picture of the landscape in which the various definitions of outsourcing and related processes sit. A defining feature of any outsourcing process is that it involves a transaction between firms – a "buy" versus "make" decision. Because of this, analyzing changes in IFT is an important way to understand the context in which changes in outsourcing occur.

Evidence of trends

Increase in international IFT is a well-established aspect of increasing global trade in manufacturing, and also in services that can easily be delivered remotely, such as call centers. Within the U.S., the lack of a coherent conceptual framework and the lack of publicly-available firm-level data on transactions have limited a comprehensive investigation of trends in domestic IFT. The literature on domestic outsourcing and related processes has provided valuable insights on a trend that has proven challenging to investigate empirically, but it does not constitute a cohesive, complete body of research on domestic IFT. Researchers do not use a consistent definition or empirical strategy for estimating trends in outsourcing, and most have attempted to analyze a limited set of industries and occupations. As a result, we still lack a clear understanding of how IFT in the U.S. have changed, and the extent to which these changes involve domestic outsourcing.

More narrowly-focused empirical studies on domestic outsourcing provide evidence that certain types of IFT have grown in certain industries and occupations in the U.S. Some studies have used employer surveys to identify trends in sourcing practices, finding increases in external sourcing of services like janitorial, accounting, IT, and transportation (Abraham and Taylor 1996; Brown, Sturgeon, and Lane 2014). Several studies have documented an increase in employment in staffing support services firms and other types of "contingent" or "alternative" work arrangements that often involve IFT (Autor 2003; Katz and Krueger 2016; Segal and Sullivan 1997).[2] Other researchers have focused on specific occupations, looking at trends in whether they are employed in-house or by a supplier. These studies have identified increases in outsourcing of services like janitorial, security, food services, and transportation (Dey, Houseman, and Polivka 2009; Dorn, Schmeider, and Spletzer 2018; Dube and Kaplan 2010).

Another approach researchers have used is to start with specific industries that are determined to be suppliers of outsourcing, and examine broad compositional shifts in economic output and employment in those industries. Both Berlingieri (2014) and Yuskavage et al. (2008) use the BEA Input-Output data in their analyses. Berlingieri examines the shift in U.S. employment composition from manufacturing to services, finding that an increase in professional and business services outsourcing is responsible for a substantial portion of this trend (Berlingieri 2014). Yuskavage et al. define outsourcing as "a subset of purchased services for functions that an establishment could perform itself using its own resources" and hand-pick a list of industries in the U.S. that they determine provide these kinds of services (Yuskavage et al., 2008: 5). Using the Input-Output data to measure the output of these industries that is used as

[2] For a discussion of the limitations of the Bureau of Labor Statistics Contingent Worker Survey, used by Katz and Krueger, see Bernhardt (2018).

inputs into other firms, they estimate that domestically-outsourced services grew from 7% to 12% of U.S. GDP between 1982 and 2006 (Yuskavage et al. 2008).

No study to date has taken a broad look at changes in transactions across firms in the U.S. to assess aggregate trends in IFT or interrogate the boundaries of the scope of outsourcing-related trends. In some cases the authors deliberately select individual industries and occupations of interest, and in others they select a group of industries or occupations that they determine to be most important for understanding the trend of outsourcing, as they define it. These studies are of course valuable for many other reasons, but as a body of literature they do not provide a comprehensive assessment of domestic IFT trends.

Research Strategy

I measure domestic IFT at the industry level using the BEA Input-Output data, assessing the prevalence of IFT over time for individual industries, and for three separate groupings of industries. In this section I describe my data sources and methods.

Data

The I-O data are the core U.S. data that record economic transactions between firms and the government, at the industry level. While there are certain drawbacks to using these data to measure IFT (described in more detail below), the I-O data are one of the best sources of economy-wide data for this analysis, in the absence of proprietary data on firm-to-firm transactions. Other studies have used these data for related purposes, but with a narrower focus on designated outsourcing industries (Berlingieri 2014; Yuskavage et al. 2008). The Longitudinal Employer-Household Dynamics (LEHD) data, which links data on employers and employees, is

another good source for U.S.-based analysis of IFT (see Dorn et al. 2018).[3] Firm surveys have generated useful information on outsourcing, but have typically been one-sided – that is, gathering information on the goods and services that the responding firms contract for, without corresponding information on the firms selling those goods and services.

The I-O data capture the flow of sales and purchases of commodities (goods, services, and government output) across industries, based primarily on data from the Economic Census.[4] At the time of analysis, the I-O data had available information for 389 industries in the benchmark year, 2007; 71 industries for each year from 1997-2015; 65 industries from 1963-1996; and 46 industries from 1947-1963. Since this analysis was completed the BEA has released 2012 benchmark data for 405 industries and data on 71 industries from 1997-2019.

The I-O data feature two primary tables: the "make" (also referred to as "supply") table, which tabulates the monetary value (in dollars) of how much of each commodity is *produced* by each industry and the government; and the "use" table, which tabulates the monetary value of how much of each commodity is *purchased* by industries, government, or consumers. The transactions in the use table are classified as either intermediate or final use.[5] Intermediate use refers to goods or services that are sold by one firm to another firm or government, to be used as part of the purchaser's production process. Final use refers to goods and services consumed in their final state, by individual consumers and government. The use table can be thought of as a

[3] Dorn et al. use the LEHD data to infer outsourcing events based on large employment shifts.
[4] See Technical Appendix 1. Data sources.
[5] See Technical Appendix 2. Note on investment. Also see (Robbins et al. 2013) for an in-depth discussion of the classification of intangibles in the BEA's IO data.

"recipe" matrix because it identifies which goods and services are purchased inputs needed to produce the output of each industry (Horowitz and Planting 2006).[6]

Methods

In order to measure domestic IFT, I modify the BEA's make and use tables to construct a domestic industry-by-industry input-output matrix for each year of interest. The original make/use tables show the production and consumption (input and output) of commodities by industries, including imports and exports. I transform these tables into matrix that reflects domestic-only production and consumption between industries, as well as consumers and government.[7] This process involves removing the value of transactions for imports and exports entirely.[8] For an in-depth discussion of the relationship between imports and domestic outsourcing, see Yuskavage et al. (2008).

The modified matrix allows for detailed analysis of how much output each domestic industry produces for each other domestic industry to use as inputs. Technical Appendix 3 elaborates on the steps involved in constructing this matrix. Using the modified matrix, I calculate the *total amount of intermediate use output* produced by each industry, in dollars. This sum, divided by the *total gross output of each industry* (intermediate use and final use output combined), is the proportion of the industry's total output that is purchased for intermediate use transactions (inter-firm transactions), rather than final use transactions. The ratio of intermediate output to total gross output reflects the portion of an industry's production that is used for

[6] For retail-related industries, only the commodity sales markup is recorded as the output of the retail industry, while the value of the commodity without markup is attributed to the producer.
[7] See Technical Appendix 3. Constructing the IFT ratio.
[8] In order to remove imports, however, I must estimate the distribution of imports of each commodity across the use table rather than simply eliminating the imports column, because some imports are for intermediate consumption and some are for final consumption. This is explained in greater detail in Appendix 2.

domestic IFT. For example, a restaurant's sales to individual consumers is considered output for final use, and therefore it is *not* counted as IFT, but a caterers' sales to another company to provide food for meetings or special events is considered output for intermediate use, and therefore it is IFT.

In addition to calculating the domestic IFT for each industry, I aggregate the intermediate and total gross output of all industries to calculate the intermediate to total output ratio across the economy, and the total dollar value of domestic IFT. To measure the current prevalence of domestic IFT I use the detailed I-O data from 2007. For a time-trend analysis, I use the BEA data from 1963-2014, which are less detailed.

Typology of IFT

In this analysis, I measure the prevalence in domestic IFT across industries in the U.S. and how it has changed over time for three groupings of industries. These groupings represent a typology for considering IFT in relation to the broad, interdisciplinary literature on topics related to IFT and outsourcing. I developed this typology based on a synthesis of prior research and theory, and through original analysis using the BEA data (see Technical Appendix 6). Whereas most prior studies have adopted a particular definition of outsourcing (or a related term) and then applied that definition to a set of industries, my approach instead offers a framework that includes a range of definitions, grouped into three broad categories and applied across all industries. This allows me to analyze trends in IFT throughout the economy, and to explore the implications of this analysis for our understanding of trends in domestic outsourcing.

Each of the three industry groupings in my typology can be useful for different analyses; the purpose of this study is not to select the best approach, but instead to help us understand the

differences in trends in IFT across different sets of industries in order to build a better understanding of the landscape in which processes involving IFT (such as outsourcing) occur. I discuss each industry grouping in succession.

Group 1. Domestic inter-firm transactions for all goods and services

The first grouping is the broadest: this group includes all sales of goods and services from firms within the U.S. to other firms or the government within the U.S.[9] I measure the prevalence of IFT for this group by calculating the ratio of intermediate to total output across all industries. In calculating this ratio, I aggregate the value (in dollars) of all domestic intermediate transactions across industries in the U.S. economy – that is, all output from firms in the U.S. that is an input to other firms or the government – and I divide that sum by the total gross domestic output.

This approach is important for understanding the landscape of changes in IFT across economy, and how trends in domestic IFT may be similar to or different from trends in international IFT. However, there are limitations to what we can learn from this grouping, which potentially obscures important variation in trends in IFT for different sectors and industries. In particular, for U.S. researchers focused on domestic outsourcing, the inclusion of goods purchases in this group may seem jarring. However, it's possible that some firms are choosing to buy, rather than make, certain manufactured goods for similar reasons that some firms may choose to buy, rather than make, certain services (or vice versa). For example, a firm's desire to mitigate risk, adapt to fluctuating demand, or reduce the costs of labor or other inputs.

[9] I include intermediate government output in this group as well, though this is a small portion of total intermediate output.

Group 2. Domestic inter-firm transactions for services

The second grouping is narrower than the first: it includes only intermediate transactions between firms for commodities classified as services within the U.S. It does not include intermediate transactions for commodities classified as goods. I measure IFT for this group by calculating the ratio of the intermediate output of service-producing industries only, compared to total economy-wide gross domestic output. In calculating this ratio, I aggregate the value (in dollars) of all intermediate output in the U.S. economy that comes from industries classified by the Bureau of Labor Statistics as services (regardless of what type of industry purchases them), based on their NAICS code (Bureau of Labor Statistics n.d.).[10]

While firms in goods and service-producing industries can both engage in IFT, there may be important reasons for analyzing changes in IFT for goods separately from changes in IFT for services. For instance, other economic trends like growing international trade may affect the landscape of domestic IFT choices for goods and for services in distinct ways. Additionally, there are many goods that we might consider very unlikely to ever be produced in-house by most other industries – like specialized machines or equipment, chemical products, or agricultural goods. In contrast, there may be a wider range of services that we can reasonably consider likely to be produced either in-house, or via an IFT. As a result, it may be more appropriate to analyze IFT for goods and services separately, and to consider service-producing industries of greater

[10] See Technical Appendix 5. Detailed industries by sector for a full list of industries in the detailed I-O data, their corresponding NAICS code, and the sector in which they are classified by the BLS. It is important to keep in mind here that the distinction between "goods" and "services" is not in all cases a tidy one, and that the way these distinctions are coded into the I-O data and other data using NAICS codes is imperfect. For example, the company IBM is classified as a manufacturer of computers (a "good"), but most of its revenue now comes from the sale of services. A more precise distinction, conceptually, would be to consider tradeable versus non-tradeable production, but the data do not include this information.

interest for an investigation concerned with implications for our understanding of domestic outsourcing.

Group 3. Domestic inter-firm transactions for feasibly in-house services

The final grouping of industries is the narrowest in scope, including only the sale of services within the U.S. that could feasibly be produced by the purchasing firm (or government) in-house instead. I measure IFT for this group by calculating the ratio of intermediate output across all industries that produce services that one could reasonably envision being produced by the purchasing firm in-house, compared to total economy-wide gross output. I list the industries classified as producers of "feasibly in-house" services and I describe my classification process in Technical Appendix 6.

Group 3 is most closely aligned with the use of the terms outsourcing or subcontracting favored by researchers that define outsourcing more broadly (e.g. Yuskavage et al., 2008), rather than focusing narrowly on outsourcing events. Yuskavage et al. define outsourcing as, "a broad subset of specific purchased services that an establishment can choose in the short run either to produce and consume on its own or to acquire from other establishments, affiliated or otherwise."[11] Similarly, I focus on the reasonable possibility that a service could be produced in-house by purchasers, regardless of whether it actually was. An analysis focused on a narrow view of outsourcing would stipulate that a function was previously produced in-house, before it

[11] Yuskavage et al. use a similar but slightly narrower list of commodities in their analysis. Their list of "domestic outsourcing services" does not encompass several industries that I do consider "feasibly in-house" or categories that include services that are feasibly in-house, such as restaurants (including catering and food services) and passenger transportation. See Yuskavage et al. p. 37 and Appendix 6 of this paper for the complete lists of included industries/commodities.

was contracted out to a separate firm. Measuring such a tighter definition, however, would require longitudinal data on the production process of individual firms, which are rare in the U.S.

The purpose of group 3 is to exclude services that could not realistically be produced in-house without dramatically changing the production function of the purchasing firm. In this way, it focuses attention on the "make or buy" decisions where a true alternative exists, rather than lumping all the "buy" decisions together regardless of whether "make" is a realistic possibility. While services are more likely than goods to be feasible to produce in-house, there are certain kinds of services that are an exception. The clearest example of these are what one might call "infrastructure services" such as utilities, insurance, and financial services, which could not typically be produced in-house by most firms because they have a complex production structures that would be difficult for most purchasing firms to replicate internally without dramatically altering the scope of their work.

A clear limitation of group 3 is that it introduces some of the same challenges that have constrained other research on domestic outsourcing. Specifically, the classification of a service as feasibly in-house or not is not a straightforward task because of the diversity of production structures that exist in different producing and purchasing industries. For example, in industries with highly networked production structures, like media and technology, vertical integration is not now and has never been the norm. As a result, some services that might be feasibly in-house services for a different industry are not likely in practical terms to ever be produced rather than purchased by firms in highly networked industries. Additionally, as some industries have grown increasingly horizontally integrated – e.g. wraparound business support services firms like Aramark – it grows increasingly unclear which services should be considered infrastructure. Furthermore, certain industry categories such as restaurants or transit and ground passenger

transportation include sub-categories that are clearly feasibly in-house, and others that are not. I discuss the classification process I used in Technical Appendix 6 – while the classification process is an imperfect science, I tested multiple strategies for defining feasibly in-house services before arriving at the approach taken here, with only marginal effects on prevalence and trends.

Technical limitations

There are a few technical limitations to the BEA I-O data, some of which likely result in under-estimation of the prevalence of IFT. First, there are limitations in the way that the BEA I-O data estimate prices that likely leads to an underestimation of domestic IFT. As Houseman et al. discuss in a 2011 paper, the I-O data do a poor job of capturing changes in prices over time (Houseman et al. 2011). Specifically, if we expect that outsourced goods and services may be cheaper than in-house equivalents in some circumstances, then the measure likely underestimates the actual quantity of output being purchased at a cheaper price because the BEA I-O data measure intermediate output by volume of sales.

Second, the I-O data do not allow us to identify IFT for consumer-facing services as intermediate production, which means I am not able to include this economic activity in the measurements. One example of this scenario is a hotel that contracts with an independent on-site restaurant. Here, the restaurant is not selling its products and services to the hotel but rather to consumers; these sales are therefore not registered as inputs into the hotel's production process, unless there is a contract between the restaurant and hotel in which the restaurant pays rent and/or a commission on sales to the hotel. Similarly, the output of franchisees will not be counted as inputs to the franchisor.

Third, a related problem is that consumer-facing services paid via public or private insurance or government vouchers are captured only as consumer expenditures – for health care, subsidized child care, other social assistance, etc. This means that a sizable chunk of the health and human services sector is showing little intermediate production in the I-O data – purchases of services by this sector mainly end up being recorded as final use by consumers, who are paying via health insurance or government vouchers. This quickly raises definitional questions: what do we mean by IFT when it comes to the public sector? The straightforward examples are captured in the data (i.e. hospitals contracting for janitorial services), but some of the less straightforward examples are not. For example, one could argue that the government effectively contracts with nursing homes or home care workers for the provision of care, via Medicaid and Medicare, but BEA I-O data do not capture these purchases as inputs into government services.

Despite these data limitations, the BEA I-O data still offer an unmatched opportunity to measure IFT across a wide range of industries in the U.S. economy. Furthermore, most of the data limitations that I was unable to resolve are problems that lead to an *underestimation* of the prevalence of IFT.

Findings

Table 1 shows the estimated prevalence of domestic IFT based on each grouping in the middle column. As we would clearly expect, the broadest grouping of industries yields the highest estimate of the prevalence of domestic IFT in the U.S. economy, and the narrower groupings of industries yield successively lower estimates of prevalence. Domestic IFT for all goods and services (group 1) were 53% of the value of all economic transactions in the U.S. in 2007. Domestic IFT in industries classified in the services sector (group 2; see Technical Appendix 5) were 30% of total economic transactions. The narrowest grouping of IFT, group 3,

includes IFT only in industries producing services that could feasibly be produced in-house. 11% of all domestic IFT were part of group 3 in 2007.

These findings represent the only attempt to estimate the prevalence of domestic IFT in the U.S. broadly, across all industries. They are also unusual in that they measure IFT by the producing industries, rather than the purchasing industries. The closest comparison in the literature is Yuskavage et al., in which the authors hand-select a group of outsourced industries and use the BEA input-output data, estimating that outsourcing was 12% of U.S. GDP in 2006 (Yuskavage et al. 2008). Their results are comparable to my estimates for the prevalence of domestic IFT according to group 3, which also involved hand-selecting outsourcing industries. The much higher prevalence of domestic IFT for groups 1 and 2 raise the possibility that the causes and consequences of outsourcing identified in studies focusing on narrower groups of industries or occupations (e.g. lower wages, as in Dorn et al.) could affect a larger portion of the workforce than those studies alone would suggest.

Table 1. Prevalence of domestic IFT by industry group

Three industry groups	Percent of total output (2007)
1. Inter-firm transactions for goods and services	53%
2. Inter-firm transactions for services	30%
3. Inter-firm transactions for feasibly in-house services	11%

Source data: Author's analysis of the Bureau of Economic Analysis make and use tables, 2007

Economy-wide trends

To examine time-trends for the three groups of industries, I use the less detailed BEA data (for 65 industries) available between 1963 and 2014. Because the data are less detailed the

actual point estimates are less accurate than in table 1; therefore, the time trends data should be used mainly to understand relative changes over time.[12]

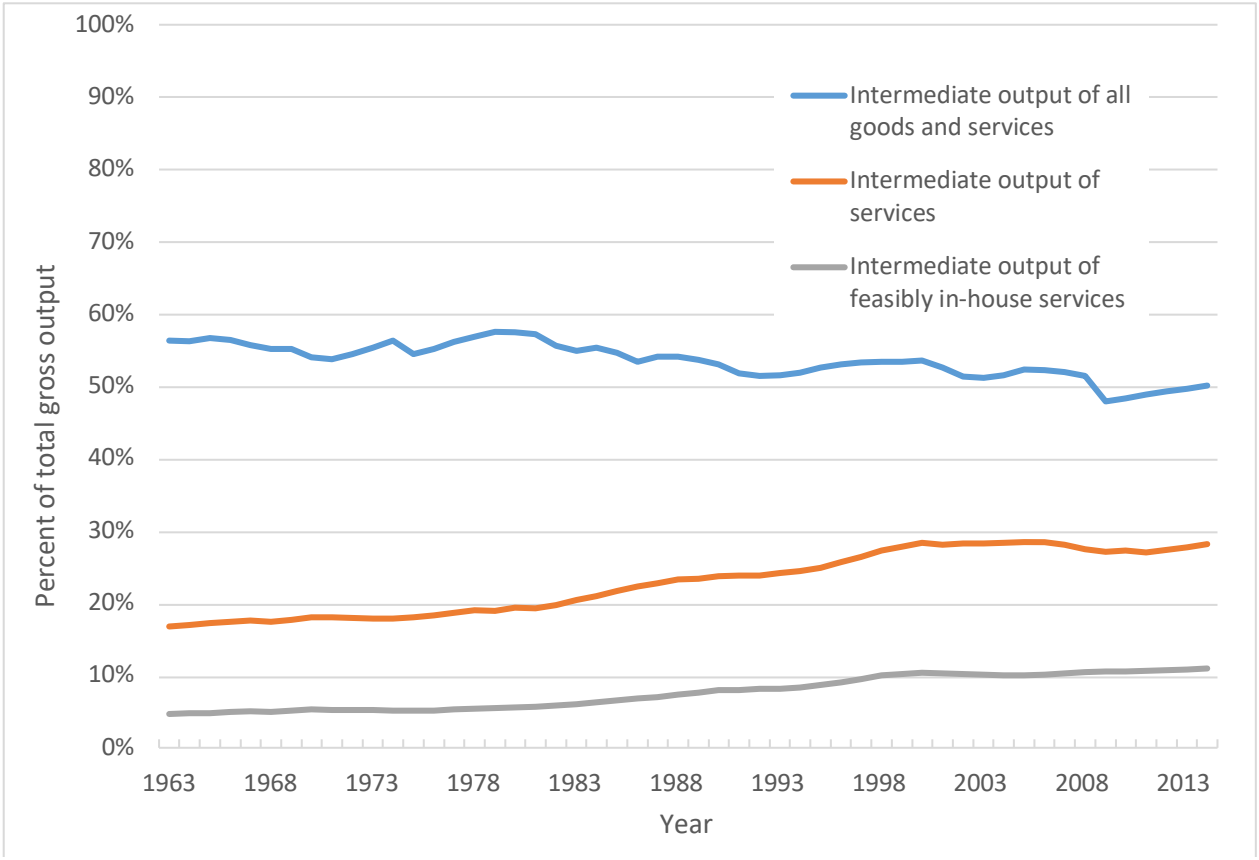
Figure 1 shows the trends in domestic IFT over time for each group, and table 2 shows the annual percent change in domestic IFT for each group, averaged across 5-year increments. Once again, group 3 aligns to some extent with other studies that have identified an increase in output for specific groups of industries identified as outsourced (Berlingieri, 2014; Dorn et al., 2018; Yuskavage et al., 2008). According to group 3, domestic IFT increased from around 5% of total output in 1963 to 11% in 2014 (a 134% increase); Yuskavage et al. similarly find that outsourcing rose from 7% of U.S. GDP in 1982 to 12% in 2006 (Yuskavage et al. 2008). The prevalence of IFT in group 2 is substantially higher than other studies' estimates at the beginning and the end of the time period: figure 1 shows that domestic IFT was 17% of output in 1963, and rose to 28% in 2014 (a 68% increase). Group 2 suggests that other studies may under-estimate services outsourcing and its growth in the U.S. by overlooking certain industries' transactions.

Group 1 tells a different story, however: group 1 shows a higher overall prevalence of domestic IFT, but in contrast to groups 2 and 3, it shows a slight decline in IFT over the time period (from 56% to 50%, or an 11% decrease overall). Thus, considering trends in IFT for all goods and services in the U.S. together leads to the conclusion that domestic IFT has in fact become *less prevalent* as a production strategy in the U.S. The difference between the trends in IFT according to group 1 and groups 2 and 3 points to important variation in IFT trends across sectors and industries.

[12] Data tables available on request.

Additionally, while the trend in IFT for group 1 does not change as dramatically over the full time period, the trend line is considerably less stable than those for groups 2 and 3. Groups 2 and 3 show a steady increase in intermediate output with a slight acceleration in the 1980s-1990s, and a leveling off around the 2000s. Group 1 trends change course much more frequently, with major inflection points in the trend line in each decade and minor shifts every few years. This indicates that trends in domestic IFT in the goods sector are likely more sensitive to economic shocks (such as recessions or changes in trade policy) compared to the services sector, but show that the overall trend in IFT over time is more stable. The aggregate trend in IFT for group 1 during the 1980s is nearly the reverse of groups 2, and 3, with an overall decline in intermediate output from 1980 until the mid-1990s – we will explore some possible explanations for this below.

Figure 1. Trends in intermediate output as a percent of economy-wide total output, by industry grouping (1963-2014)



Source data: Author's analysis of the Bureau of Economic Analysis make and use tables, 1963-2014 (using 1963-1996 industry codes)

Table 2. Five-year average annual percent change in intermediate output as a percent of economy-wide total output, by industry grouping (1965-2010)

Year	Group 1. Goods and services	Group 2. Services	Group 3. Feasibly in-house services
1970	-1.0%	0.9%	1.9%
1975	0.2%	0.0%	-0.5%
1980	1.1%	1.4%	1.5%
1985	-1.0%	2.3%	3.3%
1990	-0.6%	1.8%	4.0%
1995	-0.2%	1.0%	1.7%
2000	0.4%	2.6%	3.7%
2005	-0.5%	0.1%	-0.7%
2010	-1.6%	-0.8%	1.1%

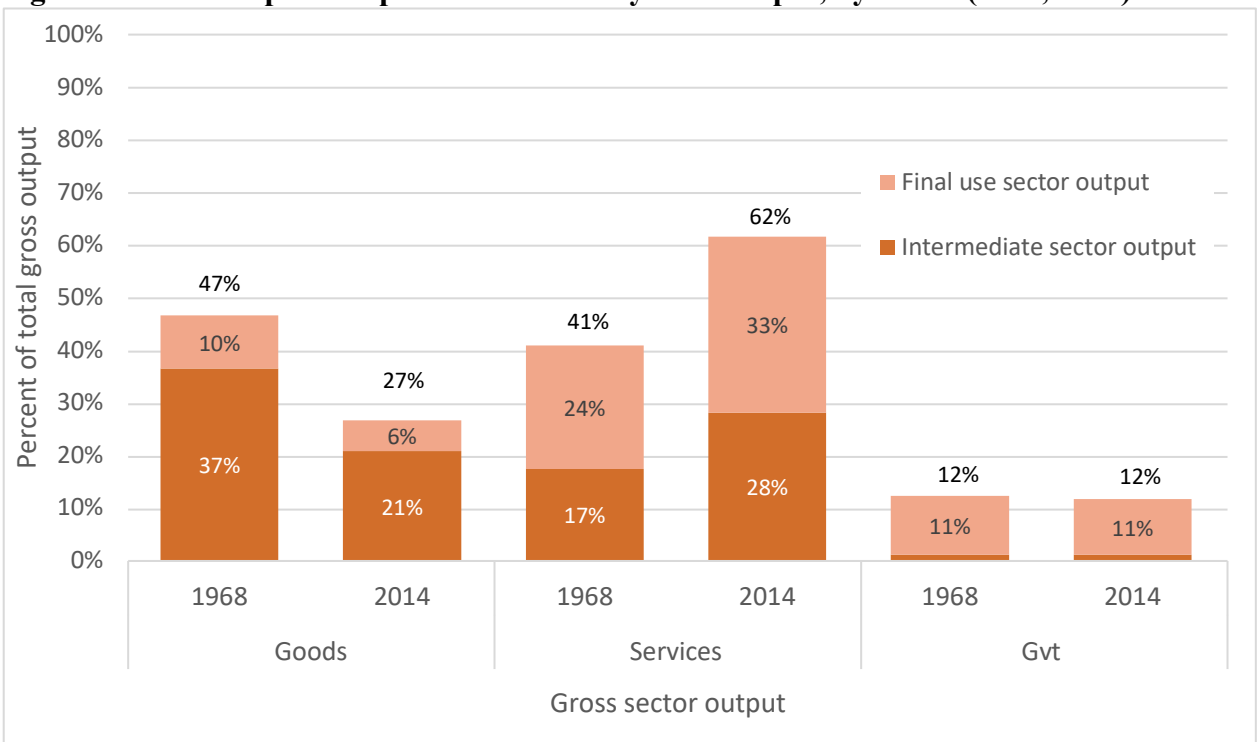
Source data: Author's analysis of the Bureau of Economic Analysis make and use tables, 1963-2014 (using 1963-1996 industry codes)

In order to understand why the trends in domestic IFT differ between group 1 and groups 2 and 3, we must consider other trends that have affected trends in the sectors classified as goods and services in the U.S. over this time period. Overall, the data show that the goods-producing industries have traditionally produced more intermediate output relative to the service-producing sector. Therefore, the compositional shift in sectors over time in the U.S., from goods production to service production, pulls down the broadest measure of domestic IFT (group 1).

Figure 2 illustrates the compositional shift from goods production to services production within the U.S. economy. Total production of goods (intermediate and final use) in the U.S. declined from 47% of output in 1968 to 27% of output in 2014. Total production of services rose from 41% of output in 1968 to 62% in 2014. (Recall that these data are based on domestic production for domestic use only; increased offshore IFT in manufacturing are not captured.)

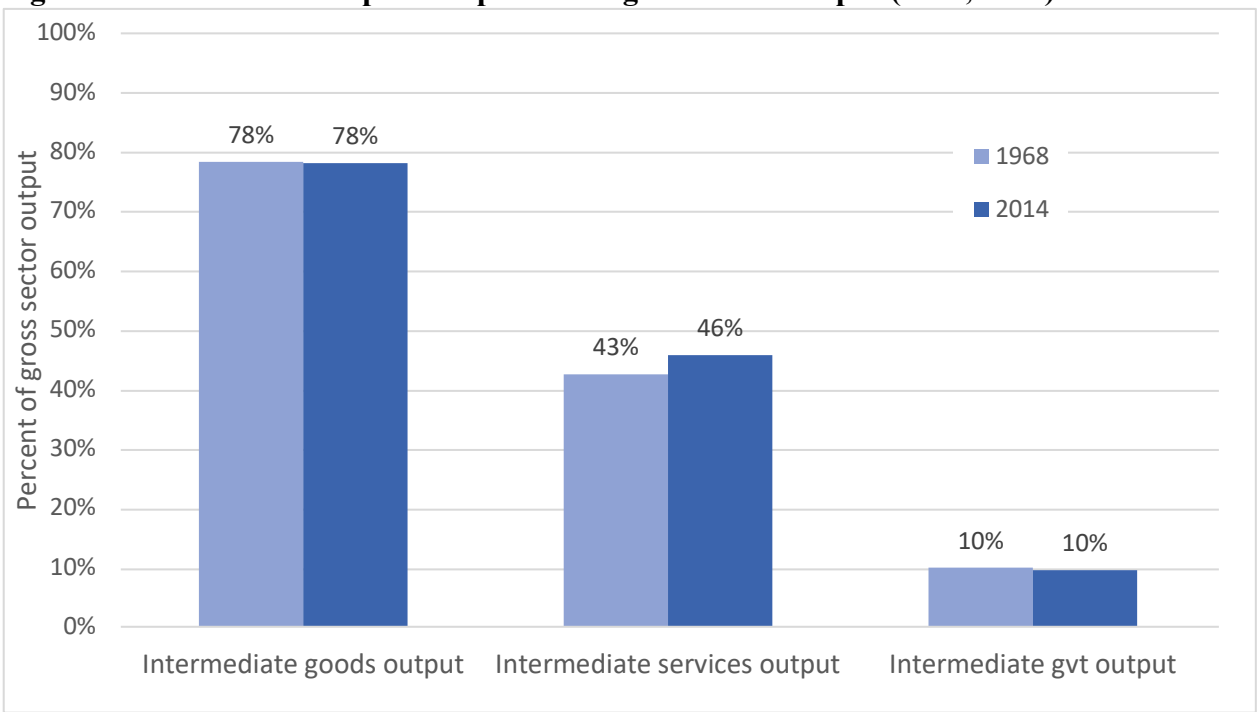
Figure 2 also shows the change in each sector's intermediate output between 1968 and 2014. Here, we can see that goods production is more concentrated in intermediate rather than final use output, compared to services production. Figure 3 shows the change in the percent of each sector's output that is intermediate, between 1968 and 2014. Goods output remained at 78% intermediate, while intermediate services output increased from 43% to 46% of total services output.

Figure 2. Gross output as a percent of economy-wide output, by sector (1968, 2014)



Source data: Author's analysis of the Bureau of Economic Analysis make and use tables, 1963-2014 (using 1963-1996 industry codes)

Figure 3. Intermediate output as a percent of gross sector output (1968, 2014)



Source data: Author's analysis of the Bureau of Economic Analysis make and use tables, 1963-2014 (using 1963-1996 industry codes)

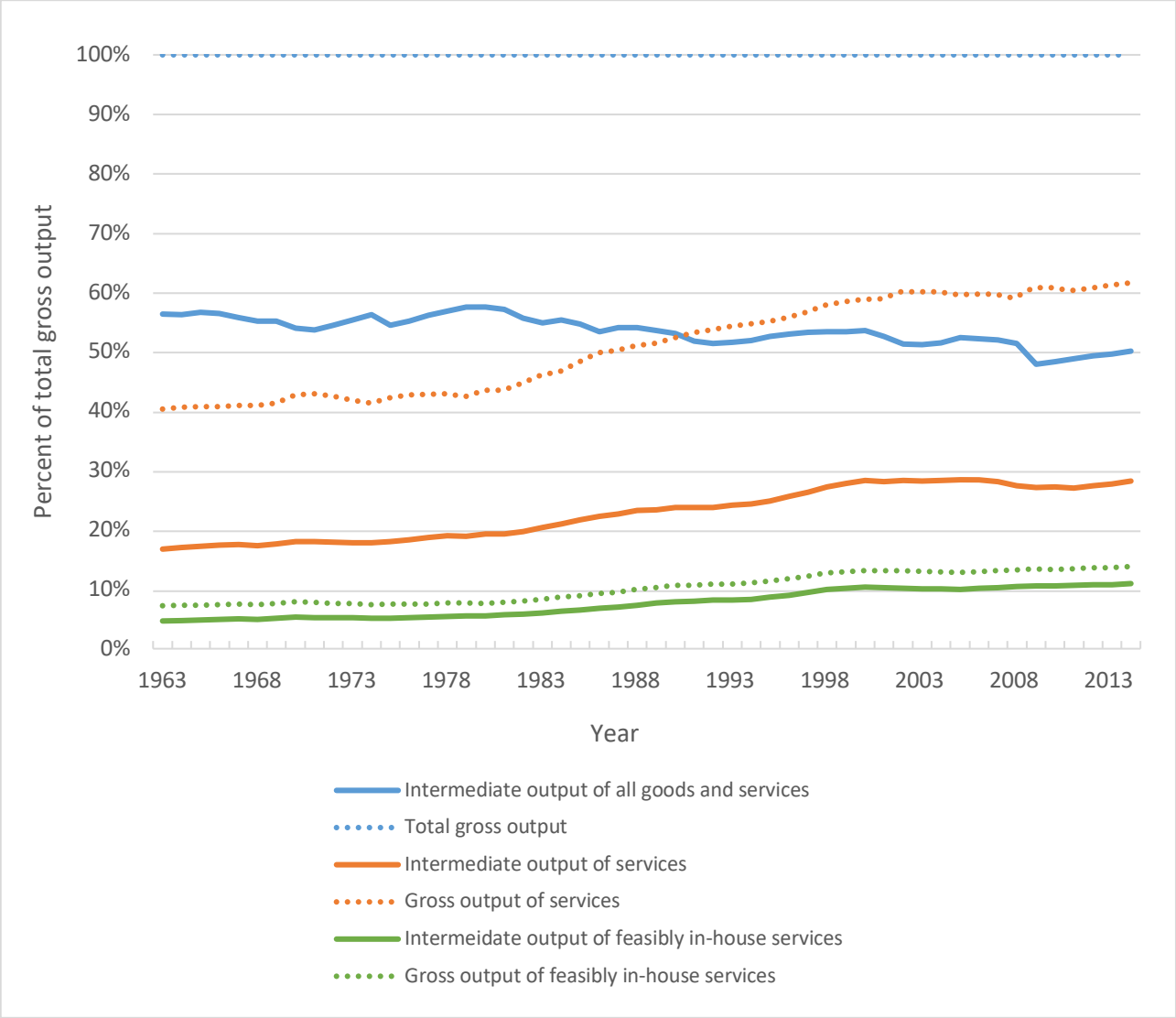
Figure 4 shows, like figure 1, the time-trend estimates for each grouping of industries, based on the intermediate output for each group as a portion of total economy-wide output. Figure 4 also shows the gross output (intermediate plus final use output) for the industries included in each group, indicated with the dotted lines. Figure 5 shows the changes in the share of gross output that is intermediate use *for the industries included in each group*. That is: all industries for group 1, only services industries for group 2, and only feasibly in-house industries for group 3. Figure 5 is similar to figure 3 but it shows intermediate output for the *groups* of domestic outsourcing rather than for sectors.

Figure 5 replicates the results of figure 3 for services: the intermediate output of services (group 2) has increased as a percentage of all services output, from 43% in 1968 to 46% in 2014. There is a similar trend for group 3: the intermediate output for feasibly in-house services increased as a percentage of all output of feasibly in-house services, from 67% to 79%. The increases in intermediate output for groups 2 and 3 are not large enough to see visually in the trend lines in figure 4, but figure 5 shows that, as services and feasibly in-house services grew as a portion of total output, the portion of that output that was intermediate versus final use grew as well.

Figures 2-5 explain the trends for each industry group shown in figure 1. These figures reveal several insights. First, the compositional shift from goods production to services production contributes to the slight decline in IFT for group 1, because goods output is more concentrated in intermediate output, compared to services. We can see the compositional shift visually in figure 4: after 1985 services output consists of over 50% of total output. Second, the

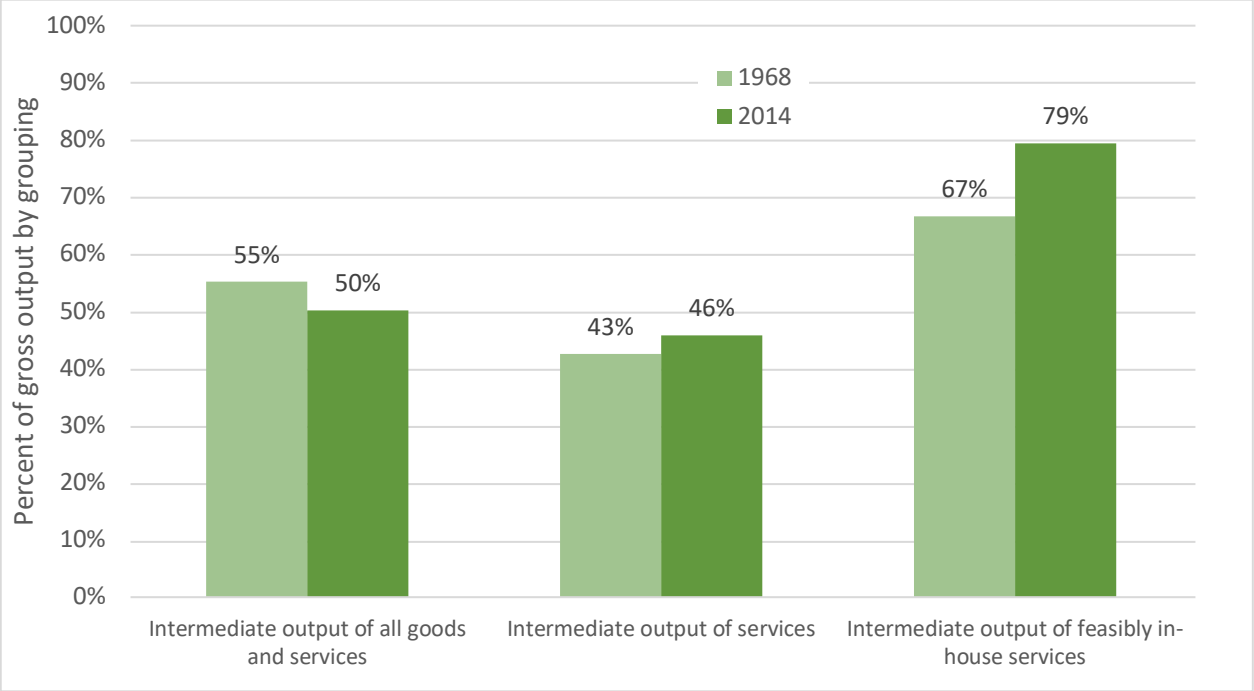
increase in IFT for groups 2 and 3 is not only due to the increase in total services (and feasibly in-house services) output in the U.S. during this time period, because the output of all services and feasibly in-house services shifted toward intermediate output as well. However, the increase in the intermediate output of services is not big enough to offset the decline in intermediate production overall due to the decline in overall goods production, which results in the slight decline over time in IFT for group 1.

Figure 4. Trends in intermediate and gross output as a percent of economy-wide output, by industry grouping (1963-2014)



Source data: Author's analysis of the Bureau of Economic Analysis make and use tables, 1963-2014 (using 1963-1996 industry code)

Figure 5. Intermediate output as a percent of gross output, by industry grouping (1968, 2014)



Source data: Author's analysis of the Bureau of Economic Analysis make and use tables, 1963-2014 (using 1963-1996 industry code)

Industry trends

In order to understand sectoral and economy-wide trends in greater detail, I next look at changes in the intermediate and gross output for specific industries. Which industries produce more intermediate than final use output, and how has intermediate output changed over time in different industries?

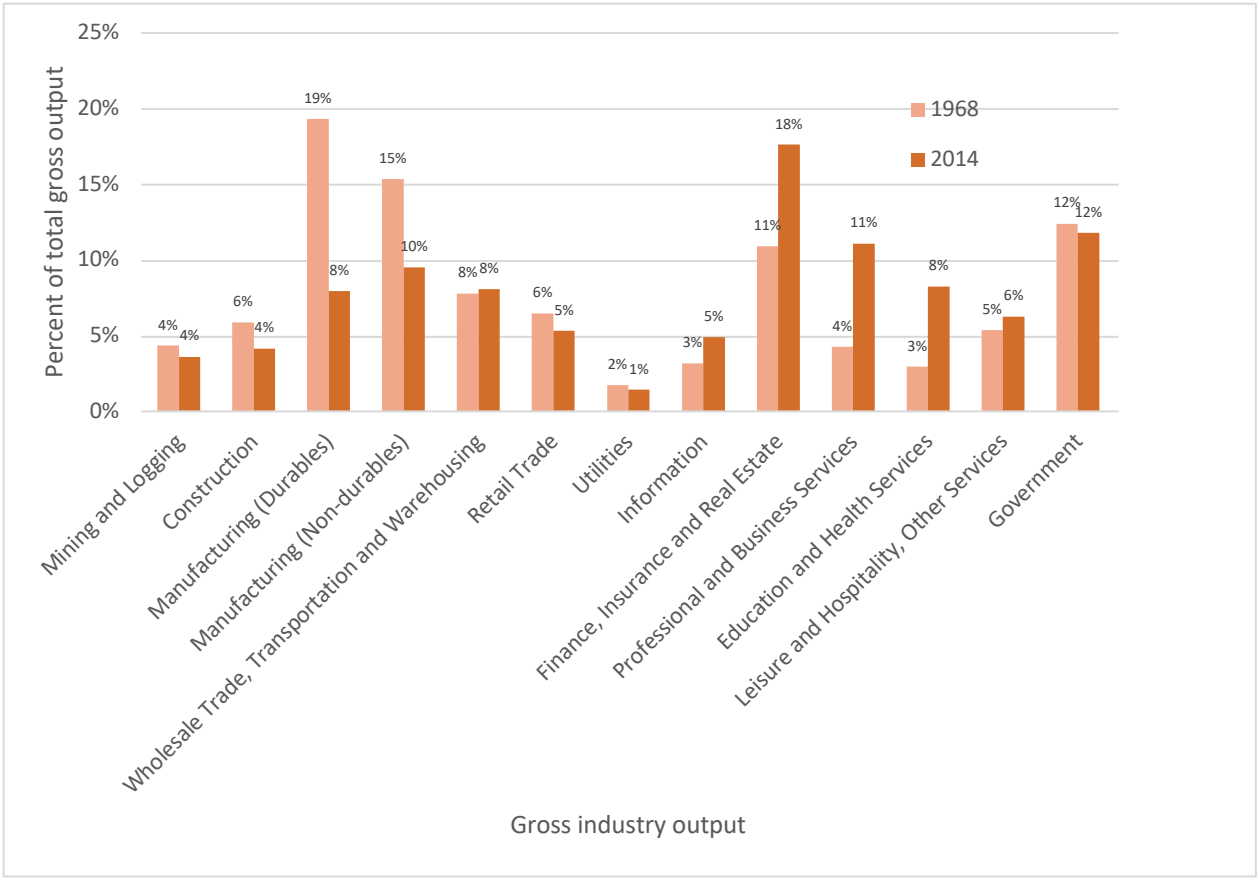
I start again by considering changes in total output over time. Figure 6 shows the change in total industry output for 13 summary industry categories as a percent of total output across all industries in 1968 and 2014. This figure shows in more detail the compositional shift away from goods production, in particular durable and non-durable manufacturing, and towards service

production. The biggest increases in the share of total production come from the finance, insurance and real estate (FIRE) industries, and professional and business services (PBS) industries. Information, leisure and hospitality, and education and health services also increased their share of total output between 1968 and 2014.

Figure 6 should not be surprising to any close observers of the U.S. economy over the last 50 years. Durable manufacturing declined sharply as a portion of total output, representing the offshoring of production in industries that were once a stronghold of the U.S. economy, like auto manufacturing and steel production, along with the growth of the services sector (Brown et al. 2014; Houseman et al. 2011; Slaper 2018). Non-durable manufacturing also declined as a share of total output as companies moved processes like textiles manufacturing overseas. However, the decline in non-durable manufacturing was less extreme than manufacturing for durables, because the higher costs and higher wages for workers in these industries increased the incentives to move production offshore.

The increase in the share of total output coming from the FIRE industries illustrates what other scholars have described as the financialization of the U.S. economy: the growing importance of the financial industry and the growing importance of financial tools and processes across the economy (Arrighi, 1994; Fligstein, 1990; Fligstein & Shin, 2007; Krippner, 2005). The growth in the PBS output is also expected: this group of industries includes those that have been the primary focus for other research on domestic outsourcing, which has documented an increase in the production of these services over time (Berlingieri, 2014; Bernhardt et al., 2016; Dorn et al., 2018; Yuskavage et al., 2008).

Figure 6. Gross output as a percent of economy-wide output, by industry (1968, 2014)



Source data: Author's analysis of the Bureau of Economic Analysis make and use tables, 1963-2014 (using 1963-1996 industry codes)

I next explore changes in intermediate output by industry. Figure 7 shows the change in intermediate output by industry as a portion of total economy-wide output. Again, most of the decline in intermediate output came from durable manufacturing, and most of the increase came from FIRE, PBS, and information. Figure 8 shows the change in each industry's intermediate output as a share of total industry output. The growth in output from industries like FIRE and PBS as a share of the economy (figure 6) is due in large part to the increase in intermediate output by firms in these industries (figure 8). Similarly, this shows that FIRE and PBS are the industries within the service sector that are most responsible for the increase in intermediate output of services – not just because these industries grew the most overall, but also because much of that growth was in intermediate output.

Figures 7 and 8 help identify where in the economy trends in intermediate output are changing. Specifically, the increase in IFT in group 2 is in large part attributable to the increase in intermediate output in the FIRE, PBS, and information industries. The growth in intermediate output for PBS is not a surprise, given prior research on outsourcing. However, the growth in intermediate output for FIRE and information services[13] raises the question whether these industries should be given greater attention in research on outsourcing.

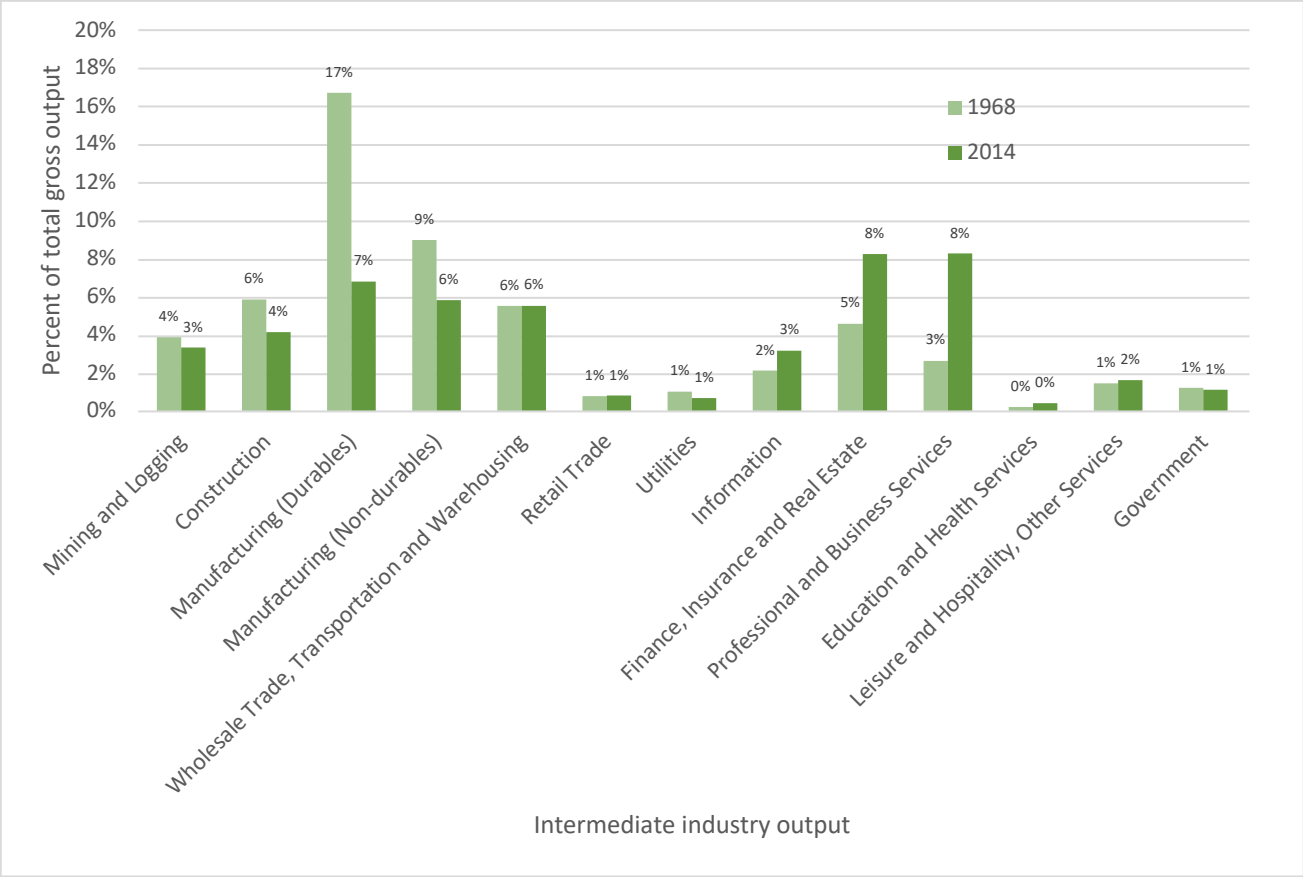
Figure 8 also highlights several features of my use of the I-O data that are important to keep in mind: First, I consider output that is classified as a purchaser's investment to be an intermediate rather than a final use (see Technical Appendix 2). This explains, for example, why the construction industry's output is essentially 100% intermediate: because construction expenditures from private, individuals are considered investment, just as a firm's construction expenditures. Second, the figures in this section show summary industry categories, which combine industries that may look very different in terms of their production patterns. For instance, the category in figure 8, "Wholesale trade, Transportation & Warehousing," combines the wholesale industry, which produces almost all intermediate output, with the transportation and warehousing industry, which is mixed. The full 2007 data includes more detailed industry categories.

However, it is important to remember that industry categories, like the broad sectoral categories, are imperfect. Even in the detailed I-O data, some industry categories represent a more alike groups of firms than others. One major limitation of the I-O data is that is has significantly more detail on manufacturing industries compared to services industries.

[13] Intermediate output for information services has been explored in some research on production networks and flexible labor markets, in particular in technology industries (Benner, 2008; Saxenian, 1994).

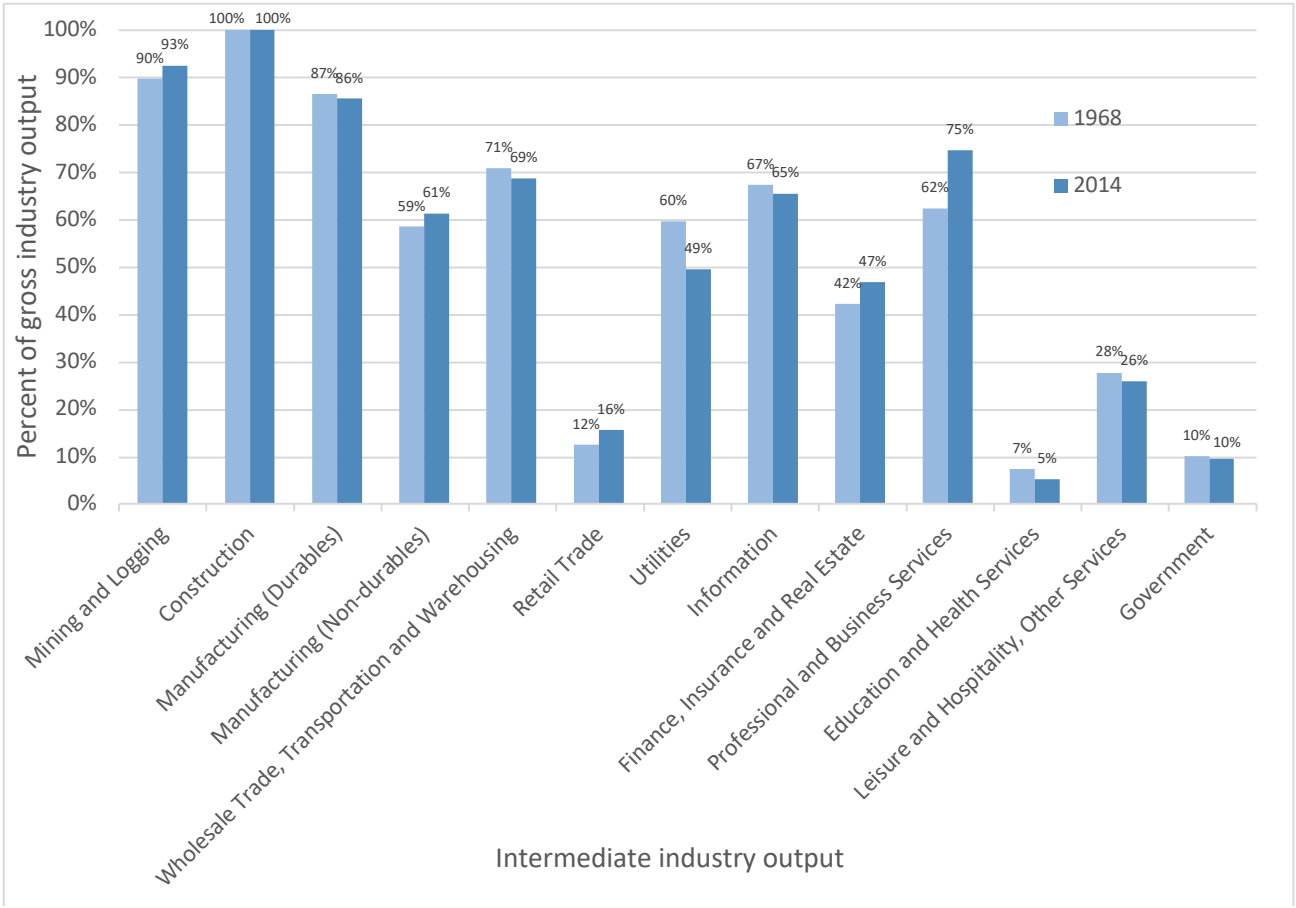
Additionally, there is insufficient detail in the categorization for some newer industries, such as those related to technology.

Figure 7. Intermediate output as a percent of economy-wide output, by industry (1968, 2014)



Source data: Author's analysis of the Bureau of Economic Analysis make and use tables, 1963-2014 (using 1963-1996 industry codes)

Figure 8. Intermediate output as a percent of gross industry output (1968, 2014)



Source data: Author's analysis of the Bureau of Economic Analysis make and use tables, 1963-2014 (using 1963-1996 industry codes)

Discussion

In this analysis we explored how different groupings of industries reveal distinct trends in IFT, based on a typology corresponding to the broad array of prior research related to IFT and outsourcing. It is self-evident that groupings that vary in scope will result in different trends, of course, but examining exactly how trends vary when looking at each of the three groups in the typology underscores the importance of specifying what we mean when we talk about domestic outsourcing and related processes, and how we understand these processes in the context of broader shifts in IFT over time.

In this section I discuss my findings in relation to existing research, assessing the advantages and disadvantages of each grouping as starting point for exploring domestic outsourcing. Again, the purpose of this exercise is not to define domestic outsourcing. The purpose is to use the IFT data to identify important concepts as we specify how and to what extent the organization of production across firms is changing, and how these changes relate to our understanding of outsourcing. The three industry groupings offer a useful starting point for this analysis.

Group 1: IFT for all goods and services

I found that over half of total economic output in 2007 was IFT for group 1 (table 1). Group 1 is much broader in scope than the bulk of research on domestic outsourcing, which has for the most part focused on specific groups of service industries; as a result I find higher levels of economic activity in our measurement of trends.

Group 1 has a conceptual foundation in the literature on international outsourcing, even if it is unusual among research on domestic outsourcing. Although most research on domestic outsourcing has focused on services, research on international outsourcing and offshoring has often included (or specifically focused on) the outsourcing of manufactured goods. The literature on global value chains and global production networks, building off foundational concepts from transaction cost economics, offers a strong theoretical justification for including IFT for goods and services in an analysis of domestic outsourcing (Gereffi et al., 2005; Gereffi & Fernandez-Stark, 2016; Sturgeon & Gereffi, 2009). If we are interested in understanding the full range of trends related to domestic outsourcing, then it is reasonable to consider all purchases between firms (all "buy" vs "make" decisions) as at least *potentially* of interest, regardless of the type of commodity being purchased.

Research on domestic outsourcing of services has documented an increase in outsourcing in the U.S., and international research has documented an increase in global outsourcing of goods production as well. However, group 1 showed that the overall trend in IFT the U.S. has been a slight decline. At first glance this finding was surprising, but examining the data more closely showed that it may be somewhat misleading if we are thinking of all IFT as possible cases of domestic outsourcing. It is of course an accurate reflection of the data to say that the overall trend in domestic IFT in the U.S. has been a mild decline since the 1960s. However, the reason for this the decline is not a decline in either sectors' production of intermediate output. Instead, the overall decline in IFT is a result of the compositional shift in the U.S. economy away from goods production, in which IFT are almost 80% of sector output, toward services production, in which IFT are less than half of all sector output (figures 2 and 3). Moreover, the share of domestic goods production that is intermediate has stayed fairly constant since the 1960s, and the share of domestic services production that is intermediate has increased (figure 3).

The IFT trend line for group 1 does not necessarily undermine the theoretical justification for potentially considering IFT for both goods and services as forms of domestic outsourcing. However, it does indicate that we need to control for other broad economic and sectoral trends, including international trade, when we analyze trends in IFT for domestic goods and services.

Group 2. IFT for services

There was a clear increase in IFT for services (group 2) since the 1960s, both across the economy and within the services sector. Since the 1960s, the overall share of services output in the U.S. economy has grown, from 41% in 1968 to 62% in 2014 (figure 2). Within services output, the share of transactions that are intermediate versus final use has also grown, from 43% in 1968 to 46% in 2014 (figure 3). This means that, as services have become a more important

part of the U.S. economy, an increasing portion of economic activity for services is IFT. Since the 1960s the portion of total output in the U.S. economy that is comprised of IFT for services has increased from under 20% of total output to almost 30% (figure 1).

Group 2 also showed that services inputs represent a large and growing share of all economic activity in the U.S. The scope of group 2 is broader than other studies on domestic outsourcing that have looked at subsets of services industries, and as a result the prevalence of domestic IFT for this group is also higher than prior estimates of domestic outsourcing. While there are certainly valid reasons why one might want to consider outsourcing within a more limited set of industries (discussed below), group 2 raises important questions about whether these narrower approaches may have led us to under-estimate domestic outsourcing and potentially overlook certain industries and workers that have also been affected by similar types of changes in firms' organization of production.

One limitation of group 2 is that it provides us with minimal information that helps us understand how to interpret the increase in IFT for services. For example, there are several possible reasons why IFT for services have grown:

- Firms are increasingly purchasing services that they once produced in-house;
- Firms are increasingly purchasing services regardless whether they ever provided them in-house;
- There has been a growth in demand for services that have always been purchased and were rarely if ever produced in-house (e.g. financial services); or
- There has been a growth in demand for a new type of purchased services (e.g. technology services).

These reasons are not mutually exclusive, of course, but the differences between them have consequences for our understanding of what type of transactions we may want to consider to be outsourcing. Unfortunately the data can offer only limited information on what inputs a firm chooses to make for itself (produce in-house). However, we can learn more about the reasons for the increase in IFT for services by examining group 3, and by looking more closely at IFT by industry.

Group 3. IFT for feasibly in-house services

Group 3 told a story about domestic IFT that is similar to group 2, with several important distinctions. In group 3, I only included industries producing services deemed feasible for a purchasing industry to produce in-house. Like in group 2, there has been a clear increase in domestic IFT in group 3 since the 1960s, both across the economy and within feasibly in-house services. IFT in group 3 grew from 7% of total economic output in 1963 to 14% in 2014 (figure 4). The share of total output for feasibly in-house services that is intermediate increased as well, from 67% of output in 1968 to 79% in 2014 (figure 5). This shows that the growth in feasibly in-house services in the U.S. economy has been in large part due to the increase in intermediate output of feasibly in-house services.

The overall prevalence of IFT in group 3 is lower than for group 2, of course, because it includes fewer industries. However, it is also important to note that within group 3, the portion of total output that is IFT is higher than for group 2: in 2014 just under half of all services output was intermediate, but almost 80% of all feasibly in-house services output was intermediate (figure 5). This showed that IFT are more concentrated within the group of industries we

identified as feasibly in-house, compared to all services.[14] Additionally, the increase in the intermediate share of all output of feasibly in-house services has increased more than the intermediate share of all output of services overall (figure 5), which suggests that one important reason why IFT for services has grown (group 2) is because firms are increasing choosing to buy rather than make services that they could feasibly produce themselves. The data show that most of the increase in IFT for services over time is due to an increase in demand for services that one could reasonably envision being produced by the purchasing firm in-house instead.

There are advantages and disadvantages to the approach taken in group 3 as we consider its merits as a starting point for exploring domestic outsourcing. On one hand, it identifies the industries in which the majority of economic activity of the industry is IFT – one could reasonably argue that these industries are the most important for understanding domestic outsourcing. On the other hand, this analysis has demonstrated that there is substantial economic activity that is IFT in other services industries (and in goods-producing industries as well), and we risk overlooking transactions that we may wish to consider in an investigation of domestic outsourcing if we restrict the industries of interest to only those where IFT are more concentrated. It is important to remember that the data are at the industry level – thus, there is heterogeneity in intermediate versus final use production across firms within each industry. There likely are firms producing almost entirely intermediate output, even in an industry in which aggregate intermediate output is low.

Another advantage of group 3, compared to 1 and 2, is that the process of identifying feasibly in-house industries also involves an assessment of the *type* of IFT. As a result, there is

[14] This is partly by design – one precondition for selecting feasibly in-house industries was that over half of the industry's output was intermediate use (see Technical Appendix 6).

reason to believe that the transactions between firms in group 3 are more alike, and more like what researchers have typically thought of as domestic outsourcing, compared to transactions between firms for services in general. Specifically, one could argue that these transactions represent a specific case of the "make vs. buy" decision, in which we can say with greater confidence that "make" is a realistic option.

There is a downside to the greater specificity of group 3, however. The process of identifying feasibly in-house industries is an imperfect science, fraught with limitations and assumptions imposed by the level of detail available in the data (see Technical Appendix 6). Group 3 illustrates how challenging it is to clearly and consistently industries according to criteria like feasibly in-house, because the category is a moving target; the kinds of services that it was feasible for a firm to produce in-house several decades ago might look completely different from the types of services that a firm could feasibly produce in-house today, for a wide range of reasons. Additionally, because firm size in many industries varies widely, what is feasible for one firm to produce in-house may not be feasible for another. Moreover, as market concentration has grown and horizontal integration has become more common in certain industries (e.g. building services) the question of what feasibly in-house means becomes more challenging.

Nevertheless, group 3 raises the important question: are there qualitative features of certain types of IFT that make them more or less relevant to include in a study of domestic outsourcing? The data do not allow us to explore this question in great depth, but group 3 illustrates the importance of considering the quality, not just the quantity, of IFT as we develop our collective understanding of domestic outsourcing.

Group 3 is most similar to prior research on domestic outsourcing, but even though it is the narrowest of our groupings is still broader in scope compared to many studies on outsourcing. For instance, several studies have looked only at professional and business services, or in some cases and even smaller group of industries. Dorn et al. consider just 4 industries – food services, cleaning, security, and logistics – and focus on the specific shifts in employment from in-house to outsourced production (Dorn et al. 2018). While each of these studies provide invaluable insights about domestic outsourcing, my analysis suggests that a different approach could be helpful in order to better understand the prevalence of domestic outsourcing across the economy, and how this has changed over time.

We do not have information in the I-O data about whether the services were in fact previously produced in-house, like Dorn et al. Thus, we are unable to identify specific outsourcing events, and therefore cannot consider a narrower view of outsourcing. That is essential information for their study, of course, but in this study I focus on the changing prevalence of IFT for feasibly in-house services over time – thus, my approach is more like studies that consider outsourcing more broadly. This allows me to consider patterns in IFT among newer firms, rather than focusing solely on those who have shifted their own production strategies over time.

Industry IFT analysis

I also considered trends in domestic IFT for individual industries and groups of industries. This revealed which industries are driving the economy-wide trends in IFT, and raised important questions for further research. Specifically, I found that FIRE and PBS industries contributed most to the increase in IFT for services. These groups of industries each increased in their overall share of output in the economy, and the portion of each industry's output that is

intermediate output increased as well. Most of the decline in intermediate output for goods came from the overall decline in domestic manufacturing, but not a decline in the share of domestic manufacturing output that was intermediate (figures 7 and 8).

The industry analysis demonstrated another benefit of my methodology: by using data on IFT as the basis for considering groups of industries, we are able to identify specific industries that fall outside of the typical examples of outsourcing that may be experiencing similar changes in the organization of production. The increase in IFT for PBS aligns with prior research on domestic outsourcing, most of which has focused on industries within this group (which includes administrative support services, waste management services, and legal services, among others) (Berlingieri, 2014; Bernhardt et al., 2016; Dorn et al., 2018; Yuskavage et al., 2008). FIRE industries have not typically been the focus of research on domestic outsourcing, but IFT in these industries has also increased, meaning that other firms are now purchasing more of these kinds of inputs[15] (including banking, investment, and other financial services; insurance, and real estate services).

I included FIRE industries in group 2 but not group 3, because I determined that it was unlikely that most firms would be able to produce FIRE-related services in-house. However, the increase in IFT in this group of industries suggests that we may want to take a closer look at these transactions – regardless whether we consider them to be a form of domestic outsourcing or not – in order to better understand how and why they are changing, and how they relate to a firm's production decisions and the consequences of those decisions.

Conclusion

[15] Or spending more on them. See "Technical limitations".

While domestic outsourcing has been investigated in diverse ways across disciplines, the literature as a whole has suffered from conceptual and methodological silos that impede our ability to advance knowledge in this area. In this paper I have offered a foundational typology and new empirical approach for exploring trends in domestic IFT, and for considering these trends in relation to domestic outsourcing. Using the BEA's I-O data, I measure domestic IFT over time at the industry level, and for three successively narrower groupings of industries: all goods and services, services only, and feasibly in-house services.

This analysis demonstrates the importance of carefully specifying terms like outsourcing, and exploring the broader context of changes in the organization of production across firms in which processes like outsourcing sit. Doing so allows us to consider a wider scope of IFT that we may consider relevant for an investigation of domestic outsourcing, and reveals how trends in IFT vary by sector and industry. Domestic IFT for services and for feasibly in-house services has increased over time, both as a portion of total economic output and as a portion of total output within services. IFT for goods, in contrast, has declined as an overall portion of the economy, and stayed relatively constant as a portion of all output for goods. Additionally, trends in IFT vary considerably by industries with the broad sector categories – most of the increase in IFT for services seems to be driven by increases in intermediate output from the FIRE and PBS industries, for instance.

It is important to keep in mind the limitations of the I-O data for a thorough exploration of domestic outsourcing. Specifically, the data include limited detail beyond the total dollar value of IFT between industries and final users. For instance, they do not include any information about the quality of IFT, such as the relationships between firms involved in a transaction, the terms of the transaction, how the specific transaction may have changed over

time, and how the transaction fits within a firm's production network. This kind of information will be essential for developing a more complete understanding of how production across firms is organized in different industries, how and why it has changed over time, and what consequences these changes have had. Another limitation of the data is that the industry and sector categories are far from perfect representations of the activities of each firm. Any analysis of IFT using these data must bear in mind some of the key issues with these categories, including the imprecision in defining what activities should count as goods versus services, and which industry categories suffer from insufficient detail.

Nevertheless, the I-O data allow us to generate a baseline understanding of prevalence and trends in domestic IFT across the U.S. economy. Given the lack of conceptual clarity and consistency in the research on domestic outsourcing in the U.S. to date, this is an essential first step. This study has helped us begin to critically examine the scope of what we consider domestic outsourcing, and it has helped us identify which kinds of IFT we may or may not be interested in exploring to advance our understanding of domestic outsourcing and other changes in production across firms. This also allows us to locate past or future case studies in the broader landscape of changes in IFT, so that we can be specific about how broadly we think certain types of relationships and trends may extend. In doing so, we can start to build bridges between diverse bodies of scholarship that have approached this topic in distinct ways.

References

Abraham, Katharine G., and Susan K. Taylor. 1996. "Firms' Use of Outside Contractors: Theory and Evidence." *Journal of Labor Economics* 14(3):394–424.

Appelbaum, Eileen. 2017. "Domestic Outsourcing, Rent Seeking, and Increasing Inequality." *Review of Radical Political Economics* 49(4):513–28. doi: 10.1177/0486613417697121.

Arrighi, Giovanni. 1994. *The Long Twentieth Century: Money, Power, and the Origins of Our Times*. London: Verso.

Autor, David H. 2003. "Outsourcing at Will: The Contribution of Unjust Dismissal Doctrine to the Growth of Employment Outsourcing." 42.

Barenberg, Mark. 2015. *Widening the Scope of Worker Organizing: Legal Reforms to Facilitate Multi-Employer Organizing, Bargaining and Striking*. Roosevelt Institute.

Benner, Chris. 2008. *Work in the New Economy: Flexible Labor Markets in Silicon Valley*. John Wiley & Sons.

Berlingieri, Giuseppe. 2014. *Outsourcing and the Rise of Services*. 1199.

Berlinski, Samuel. 2008. "Wages and Contracting Out: Does the Law of One Price Hold?" *British Journal of Industrial Relations* 46(1):59–75. doi: 10.1111/j.1467-8543.2007.00665.x.

Bernhardt, Annette. 2018. "Making Sense of the New Government Data on Contingent Work." *Center for Labor Research and Education*. Retrieved July 15, 2020 (http://laborcenter.berkeley.edu/making-sense-new-government-data-contingent-work/).

Bernhardt, Annette, Rosemary Batt, Susan Houseman, and Eileen Appelbaum. 2016. *Domestic Outsourcing in the U.S.: A Research Agenda to Assess Trends and Effects on Job Quality*. UC Berkeley IRLE.

Brown, Clair, Timothy Sturgeon, and Julia Lane. 2014. *Using a Business Function Framework to Examine Outsourcing and Offshoring by US Organizations*. 121–14. UC Berkeley.

Bureau of Labor Statistics. n.d. "Industries at a Glance: NAICS Code Index." Retrieved May 20, 2019 (https://www.bls.gov/iag/tgs/iag_index_naics.htm#service-providing_industries).

Dey, Matthew, Susan N. Houseman, and Anne E. Polivka. 2009. *What Do We Know about Contracting Out in the United States? Evidence from Household and Establishment Surveys*. W.E. Upjohn Institute.

Dorn, David, Johannes Schmeider, and James Spletzer. 2018. *Domestic Outsourcing in the United States*. U.S. Department of Labor.

Dube, Arindrajit, and Ethan Kaplan. 2010. “Does Outsourcing Reduce Wages in the Low-Wage Service Occupations? Evidence from Janitors and Guards.” *Industrial & Labor Relations Review* 63(2):287–306.

Flecker, Jörg, and Pamela Meil. 2010. “Organisational Restructuring and Emerging Service Value Chains: Implications for Work and Employment.” *Work, Employment and Society* 24(4):680–98. doi: 10.1177/0950017010380635.

Fligstein, Neil. 1993. *The Transformation of Corporate Control*. Cambridge, MA: Harvard University Press.

Fligstein, Neil, and Taekjin Shin. 2007. “Shareholder Value and the Transformation of the US Economy, 1984–20001.” Pp. 399–424 in *Sociological forum*. Vol. 22. Wiley Online Library.

Gereffi, Gary, and Karina Fernandez-Stark. 2016. “Global Value Chain Analysis: A Primer.”

Gereffi, Gary, John Humphrey, and Timothy Sturgeon. 2005. “The Governance of Global Value Chains.” *Review of International Political Economy* 12(1):78–104.

Horowitz, Karen, and Mark Planting. 2006. *Concepts and Methods of the U.S. Input-Output Accounts*. Washington, D.C.: U.S. Bureau of Economic Analysis of the U.S. Department of Commerce.

Houseman, Susan, Christopher Kurz, Paul Lengermann, and Benjamin Mandel. 2011. “Offshoring Bias in U.S. Manufacturing.” *Journal of Economic Perspectives* 25(2):111–32. doi: 10.1257/jep.25.2.111.

Katz, L. F., and A. B. Krueger. 2016. “The Rise and Nature of Alternative Work Arrangements in the United States, 1995-2015 (Working Paper No. 22667.” *National Bureau of Economic Research. Retrieved*.

Krippner, G. 2005. “The Financialization of the American Economy.” *Socio-Economic Review* 3:173–208.

McKinsey Global Institute. 2020. *What 800 Executives Envision for the Postpandemic Workforce*.

Robbins, Carol A., Mary L. Streitwieser, William A. Jolliff, and Carol Robbins. 2013. *R & D and Other Intangible Assets in an Input-Output Framework: Experimental Estimates with Us Data*. Citeseer.

Saxenian, AnnaLee. 1996. *Regional Advantage" Culutre and Competition in Silicon Valley and Route 128*. Cambridge, MA: Harvard University Press.

Segal, Lewis M., and Daniel G. Sullivan. 1997. “The Growth of Temporary Services Work.” *Journal of Economic Perspectives* 11(2):117–36. doi: 10.1257/jep.11.2.117.

Slaper, Timothy F. 2018. “Automation and Offshoring in Durable Goods Manufacturing: An Indiana Case Study:” *Economic Development Quarterly*. doi: 10.1177/0891242418807557.

Sturgeon, Timothy J., and Gary Gereffi. 2009. “Measuring Success in the Global Economy: International Trade, Industrial Upgrading and Business Function Outsourcing in Global Value Chains.” *Transnational Corporations* 18(2):1.

Weil, David. 2014. *The Fissured Workplace: Why Work Became so Bad for so Many and What Can Be Done to Improve It*. Cambridge, MA: Harvard University Press.

Williamson, Oliver. 1981. “Transaction Cost Economics.” Pp. 41–65 in *Handbook of New Institutional Economics (2005)*, edited by Menard and Shirley.

World Economic Forum. 2020. *Future of Jobs*.

Yuskavage, Robert, Erich Strassner, and Gabriel Medeiros. 2008. “Outsourcing and Imported Services in BEA’s Industry Accounts.” Pp. 247–88 in *International Flows of Invisibles: Trade in Services and Intangibles in the Era of Globalization*, edited by M. Reinsdorf and M. Slaughter. Chicago, IL: University of Chicago Press.

Supplemental Technical Appendices

Trends in inter-firm transactions across industries in the U.S.

Exploring new concepts and implications for research on domestic outsourcing

Jessie HF Hammerling, PhD[16]

December 2021

Contents

Appendix 1. Data sources

BEA Input-Output Accounts Data: The BEA's I-O accounts are a primary component of the U.S. economic accounts. They function as the building blocks for other economic accounts, including the BEA's national income and product accounts (NIPAs), which feature the estimates of gross domestic product (GDP). The I-O accounts also provide a detailed view of the interrelationships between U.S. producers and users and the contribution to production across industries. These accounts are used by policymakers and businesses to understand industry interactions, productivity trends, and the changing structure of the U.S. economy. Most of the

[16] Research Specialist, UC Berkeley Labor Center. Contact: jesshf@berkeley.edu

data in the I-O accounts comes from the Economic Census (Horowitz & Planting, 2006).

https://www.bea.gov/industry/io_annual.htm

Economic Census: The Economic Census is the U.S. Government's official measure of American business and the economy. U.S. Census Bureau conducts the Economic Census every five years, for years ending in '2' and '7'. Information from the Census covers more than 1,000 industries, 15,000 products, every state, over 3,000 counties, 15,000 cities and towns, and Puerto Rico and other U.S. Island Areas. All but the smallest businesses are sent surveys.

https://www.census.gov/programs-surveys/economic-census/about/faq.html

Appendix 2. Note on investment

It is important to note that I consider "investment" use to be an intermediate use and include it in my measure of IFT as such. The I-O accounts treat investment as a final use category, but for my purposes it makes more sense to think of it as intermediate.

Investment is considered a final use in the I-O data. Specifically, GDP equals C + I + G + NX (consumption, investment, government consumption and investment, and net exports). Intermediate inputs, by definition, eventually end up in one of these final use categories, which is why GDP does not include intermediate output (because that would be considered double-counting). A purchased commodity is determined to be either an investment or an intermediate input based on whether it is entirely used up in the production process, or whether it is used repeatedly over time. The classic example would be flour that is consumed in a food production process (intermediate input), versus a machine used repeatedly for manufacturing (investment). This example seems clear enough, but when you consider investment in services (non-

tradeables) the distinction between what counts as an intermediate input and what counts as final use investment becomes murky.

The question of what is a permanent (or even semi-permanent) input into production becomes harder to answer when we look at services. For example, many industries purchase services from the information sector, and often these purchases are recorded as investments, such as purchases from software publishing, motion picture, and cable network firms. Viewed one way, this makes sense – these are effectively intellectual property investments and as such can be viewed as permanent. But viewed from the standpoint of my project, one could argue that programmers employed by a software company selling to other companies should in fact be counted as part of the contract workforce – especially since a given version of software typically has a short half-life, often less than a year. As it stands, in my current data, several business services industries are recorded as having very little intermediate production, with much of their output being recorded under investment. In order to cast a broad net for my approach to measuring IFT and avoid overlooking transactions that may be part of a related dynamic, I include investment as an intermediate output in my analysis. This follows the basic logic of this project, which starts by exploring the breadth of what transactions I consider to be potentially relevant for understanding trends in domestic outsourcing. Further analysis to refine this approach to investment would be a worthwhile follow-up investigation.

Appendix 3. Constructing the IFT ratio

To measure domestic inter-firm transactions, I transform the make and use tables so that I can construct an industry by industry table, showing each industry's domestic output purchased by domestic users for intermediate or final consumption. With this industry by industry table, I then

calculate the portion of each industry's total domestic output that is used for intermediate domestic consumption.

There are 4 basic steps in constructing the estimates:

1. Remove inapplicable categories from the make/use tables
2. Construct a market share matrix based on the modified make table
3. Multiply the market share matrix by the modified use table
4. Calculate the proportion of industry output for intermediate consumption

I walk through each of these steps, beginning with the selection of the source tables, pointing out key concepts and definitions along the way.

Source data:

- Make table: 2007, before redefinitions
- Use table: 2007, before redefinitions, producers' values

Notes:

- **Before redefinitions:** I use the make/use tables before redefinitions, which leaves an industry's secondary output in the same industry category as its primary output, rather than redistributing secondary output into its own primary industry. An example is an in-house restaurant owned by a hotel, which would be classified as hotel industry output before redefinition, and food service industry output of food services after. For my purposes, I need the before-redefinitions version of the data, because I want to make sure

that intermediate production by the food service industry (in this case) is a clean measure of transactions between different firms.

- **Auxiliary establishments**: I investigated the potential problem posed by the NAICS reclassification of auxiliaries; see Appendix 4.
- **Producers' prices vs. purchasers' prices:** I use producers' prices, because purchasers' prices also include the cost of trade margins (transportation, taxes etc.), which I want to separate out into their own industries unless they are provided in-house. I'm assuming that the cost of any in-house transportation – e.g. if Walmart owns its own fleet of trucks – is still captured in producers' prices.
- **Self-employed:** Unincorporated self-employed are treated the same as incorporated self-employed in the data. That is, both types show up as producers and purchasers in the make and use tables.[17]

Step 1. Remove inapplicable categories from the make/use tables

I am estimating domestic production for domestic consumption, so I must remove imports, exports, and related categories from the data. Additionally, I must remove commodities or use categories that do not represent production[18] (e.g. second-hand goods) or consumption. I must also eliminate the value-added categories of the use table, which are not relevant to the measure construction.

[17] An important caveat to note is that the economic activity of independent contractors is recorded in the I-O Accounts data in the same way as it is for firms. Therefore, the output of independent contractors contributes to both intermediate and final use output.
[18] I do not remove scrap production or consumption from the data.

Most of these categories can simply be eliminated by removing rows or columns from one or both of the tables, including:

- Exports (use)
- Used and secondhand goods (make and use)
- Noncomparable imports (make and use)[19]
- Rest of the world adjustment (make and use)[20]
- Change in private inventories (use)[21]
- Value-added rows (use)
- Intermediate, final, and totals (make and use)

In order to remove imports, however, I must estimate the distribution of imports of each commodity across the use table rather than simply eliminating the imports column, because some imports are for intermediate consumption and some are for final consumption. This is explained in greater detail below.

I *do not need* to construct a similar estimate in order to remove exports or change in private inventories from the make table because I only use a percentaged version of the make table (see below), making a proportionally-estimated adjustment to the absolute values unnecessary.

[19] Horowitz & Planting, 2006: 7-10
[20] Horowitz & Planting, 2006: 7-11
[21] This does not represent output that is also consumed (because the output is ending up in private inventories), so I remove it from the table.

Step 1a. Construct a domestic use table by removing imports

In order to measure only domestic consumption, I remove imports from the use table data. BEA publishes an import matrix that shows the use of commodities for intermediate and final consumption; however, this is based on the "after-redefinitions" use table, and I need "before-redefinitions" data to construct my measure. Therefore, I construct an import matrix based on the BEA's methodology,[22] but using the before-redefinitions data.

The steps for constructing the import matrix are:

- Calculate the import to domestic supply. Domestic supply is the total amount of a commodity available for consumption within the U.S; it equals domestic output (the total of each commodity row in the use table), plus the absolute values in the import column, minus exports and change in private inventories for each commodity (which I have already removed in step 1).
- Next, multiply the domestic supply by the commodity output for each row in the use table, after the modifications in step 1. The outcome is a table in the same dimensions as the modified use table that shows the imports of each commodity by intermediate or final consumers.
- Finally, I add the import matrix (the values in which are negative) to the modified use table in order to create the domestic use table.

Note:

[22] Horowitz & Planting, 2006: 12-5

- **Foreign vs. domestic port value:** In addition to using after-redefinitions data, the BEA's import matrices reflect the domestic port value of imports. However, the import column in the use table (which I use to construct a before-redefinitions import matrix) reflects foreign port value. I believe it is more accurate for my methodology to use the foreign port value, which subtracts the values of domestically-produced import support services (e.g. transportation) from the domestic port value of the imported commodity and then redistributes them in their domestic commodity categories.

Assumption:

- The construction of the import matrix makes the assumption that the imported proportion of a given commodity is the same for each consumer (that is, the import to domestic supply). In reality, the proportion of each commodity imported may vary by user.

Step 2. Construct a market share matrix based on the modified make table

A market share matrix shows the proportion of each commodity output that is produced by each industry. I construct this matrix with the make table (after the modifications in step 1) by dividing each cell of a commodity column by total commodity output. The result is a matrix with the same dimensions as the modified make table, showing the portion of each commodity's total output that is produced by each industry.

Step 3. Multiply the market share matrix by the domestic use table

Next, I multiply the market share matrix by the modified domestic use table. The result of this matrix multiplication is a domestic make/use table, which shows each industry's production for intermediate or final use.

Assumption:

- This step assumes that the commodity output profile of each industry on the make table is the same across the purchasing industries in the use table. In reality, industries may differ in the distribution of industries from which they buy a given commodity.

Step 4. Calculate the proportion of industry output for intermediate consumption

The final step is to calculate the proportion of each industry's domestic output that is consumed as intermediate or final use by domestic users. For each industry row, I sum output across the intermediate use columns, plus the investment columns, and divide by the sum of output across all columns (intermediate and final use). I use the same designations as BEA for intermediate or final users, excluding the columns omitted in step 1 and the investment columns that I count as intermediate (see Appendix 2).

Appendix 4. Auxiliary/Enterprise Support Establishment reclassification

Problem: I-O make/use data is recorded at the establishment level. Auxiliary establishments (referred to by the Census as "enterprise support establishments" or ESEs) are establishments that do not produce products or provide services for sale either to other businesses or to final users; rather, these units provide administrative or support services (e.g. legal, accounting,

trucking, warehousing) to the primary establishments of the business in which they are located.[23] When the BEA moved to NAICS from SIC industry codes in 1997, it began to assign industry codes to ESEs based on their own products, rather than the products of the parent firm.[24]

This reclassification is potentially problematic for my measure of domestic IFT, because it records transactions between ESEs and parent firms as sales across industries, rather than recording them as internal transactions within the industry of the parent firm (as I would prefer). As a result, the reclassification of ESEs may overstate the amount of intermediate output of industries with a high number of ESEs. However, I was not able to find an empirical study that would allow me to assess the magnitude of the problem.

Solution: I analyzed Census data on ESEs to estimate the impact of ESE reclassification.[25] Specifically, the Census published two tables on ESEs for 2002 and 2007: one with information on the NAICs codes into which the ESEs were reclassified,[26] and one that shows information for ESEs based on the industry that they served.[27] The goal was to examine the size of ESEs (in terms of number of establishments and in terms of employment), and to examine the impact of reclassification on the target industries (since my concern is that this reclassification might incorrectly inflate my IFT measure).

[23] Horowitz & Planting, 2006: p. 4.
[24] In addition, a new NAICS industry code for management entities (55 - Management of companies and enterprises) was created, which includes establishments that provide multiple kinds of services. NAICS 55 is discussed in more detail below.
[25] The I-O data does not have any way of identifying ESEs, but the Economic Census captures this information, designating firms as ESEs during the data collection process.
[26] "Geographic Area Series: Enterprise Support Statistics"
[27] "Subject Series – Misc. Subjects: Summary Statistics of Enterprise Support Establishments by Industry Served"

Findings: Overall, I found that the impact of ESE reclassification on the industries into which they were reclassified and the industries that they served was minimal. Only two industries are significantly affected by ESE reclassification, which I discuss in more detail in B.

A. **Overall Impact:** ESEs represented only 0.6% of all establishments in the economy in 2007, and only a slightly larger 2.6% of employment (see table A.4.1). Moreover, the majority of the reclassifications is nonconsequential for my analysis because the bulk of ESEs were reclassified into a single NAICS code, Management of Companies and Enterprises (55), which is entirely composed of ESEs or holding companies.[28] Specifically, NAICS 55 represented 76.5% of all auxiliary establishments and 69.4% of employment in ESEs (see table A.4.2). For my purposes, this reclassification is not problematic, because NAICS 55 is by definition a category composed entirely of auxiliary units, either holding companies or ESEs.

Table A.4.1. Overall Impact of ESE Reclassification, 2007

All industries' ESEs	Percent of all establishments	Percent of all employment
Total	0.6	2.6

Source: Author's analysis of the *U.S. Economic Census* Subject Series - Misc Subjects: Summary Statistics of Enterprise Support Establishments by Industry Served for the United States: 2007; compared with EC0700A1: All sectors: Geographic Area Series: Economy-Wide Key Statistics: 2007

Table A.4.2. Portion of ESEs Reclassified into NAICS 55, 2007

Industries into which ESEs are reclassified:	Percent of ESE establishments	Percent of ESE employment
NAICS 55	76.5	69.4
All other industries	23.5	30.6

Source: Author's analysis of the *U.S. Economic Census* Subject Series - Misc Subjects: Summary Statistics of Enterprise Support Establishments by Industry Served for the United States: 2007; compared with EC0700A1: All sectors: Geographic Area Series: Economy-Wide Key Statistics: 2007

[28] The only NAICS code within 55 that is considered to include ESEs is 551114 Corporate, subsidiary, and regional managing offices. The others are considered "holding companies" which also serve an auxiliary function.

B. Impact on industries into which ESEs were reclassified: ESEs were less than 0.5% of the total number of establishments and less than 5% of employment in most of the industries into which they were reclassified (see table A.4.3), excluding NAICS 55. The only industries that were significantly affected by ESE reclassification are Transportation and Warehousing (48-49), primarily driven by Warehousing and Storage (493); and Scientific Research and Development Services (5417). Specifically, in Transportation and Warehousing, ESEs were 3.6% of establishments and 14.2% of industry employment. For Warehousing and Storage, ESEs were 43.5% of establishments and 76.1% of employment.[29] In Scientific Research and Development Services, ESEs were 5.8% of all establishments and 31.3% of all employment.

For these industries I will need to account for the significant presence of ESEs in order to avoid overestimating domestic IFT; I will do so by reweighting the measure of domestic IFT to account for the reclassification of ESEs.

Table A.4.3. Impact of ESEs on the industries into which they were reclassified, 2007*

NAICS code	Industry into which ESEs were reclassified	ESEs as a percent of all industry establishments	ESE employment as a percent of all industry employment
48-49	Transportation and warehousing	3.6	14.2
493	*Warehousing and Storage*	43.5	76.1
51	Information	0.2	1.0
54	Professional, scientific, and technical services	0.3	4.3
5417	*Scientific research and development services*	5.8	31.3
56	Administrative and support and waste management and remediation services	0.2	0.9

[29] Source: *U.S. Economic Census* EC0748A3: Transportation and Warehousing: Geographic Area Series: Enterprise Support Statistics for the United States: 2007

81	Other services (except public administration)	0.2	0.9

*Excluding NAICS 55
Source: Author's analysis of the *U.S. Economic Census* Subject Series – Misc. Subjects: Summary Statistics of Enterprise Support Establishments by Industry Served for the United States: 2007; compared with EC0700A1: All sectors: Geographic Area Series: Economy-Wide Key Statistics: 2007

C. Impact on industries that ESEs served: As shown in table A.4.4, Transportation and Warehousing ESE reclassification had minimal impact on the industries served (i.e. that the ESEs were reclassified out of). The percent of establishments lost in each industry as a result of reclassification was less than 1% of all establishments, and the percent of employees lost in each industry was less than 5%. Data are only available at the 2-digit NAICS code level, so I am not able to replicate this analysis at the detailed industry level (i.e. for Warehousing and Storage).

Table A.4.4. Impact of Transportation and Warehousing ESE reclassification on the industries that they served, 2007

ESE NAICS code	ESE Description	Industry served code	Industry served description	% Industry-served establishments lost in ESE reclassification	% Industry-served employment lost in ESE reclassification
48-49	Transportation and warehousing	31-33	Manufacturing	0.5	0.6
48-49	Transportation and warehousing	42	Wholesale trade	0.4	1.3
48-49	Transportation and warehousing	44-45	Retail trade	0.3	2.7

Source: Author's analysis of the *U.S. Economic Census* Subject Series – Misc. Subjects: Summary Statistics of Enterprise Support Establishments by Industry Served for the United States: 2007; compared with EC0700A1: All sectors: Geographic Area Series: Economy-Wide Key Statistics: 2007

Appendix 5. Detailed industries by sector

The below tables A.5.1-3 list each industry included in the BEA's 2007 detailed I-O data, along with the BEA's industry label and industry code, and the corresponding NAICS code(s). The codes are similar but not identical. For instance, that the BEA's codes for goods capture a much greater degree of detail compared to their codes for services.

These tables are based on the BEA-NAICS code bridge published with the I-O data. Here, I have grouped industries based on their classification as goods (Table A.5.1) or services (Table A.5.2), according to the BLS's classification of NAICS codes (Bureau of Labor Statistics, n.d.). Government categories are not included because they do not have corresponding NAICS codes.

Table A.5.1. BEA to NAICS Code Bridge – Goods (2007)

BEA Code and Title				Related 2007 NAICS Codes
11	Agriculture, forestry, fishing, and hunting			
	111CA	Farms		
		1111A0	Oilseed farming	11111-2
		1111B0	Grain farming	11113-6, 11119
		111200	Vegetable and melon farming	1112
		111300	Fruit and tree nut farming	1113
		111400	Greenhouse, nursery, and floriculture production	1114
		111900	Other crop farming	1119
		1121A0	Beef cattle ranching and farming, including feedlots and dual-purpose ranching and farming	11211, 11213
		112120	Dairy cattle and milk production	11212
		112A00	Animal production, except cattle and poultry and eggs	1122, 1124-5, 1129
		112300	Poultry and egg production	1123
	113FF	Forestry, fishing, and related activities		
		113000	Forestry and logging	113
		114000	Fishing, hunting and trapping	114
		115000	Support activities for agriculture and forestry	115
21	Mining			
	211	Oil and gas extraction		

		211000	Oil and gas extraction	211
	212	Mining, except oil and gas		
		212100	Coal mining	2121
		2122A0	Iron, gold, silver, and other metal ore mining	21221, 21222, 21229
		212230	Copper, nickel, lead, and zinc mining	21223
		212310	Stone mining and quarrying	21231
		2123A0	Other nonmetallic mineral mining and quarrying	21232, 21239
	213	Support activities for mining		
		213111	Drilling oil and gas wells	213111
		21311A	Other support activities for mining	213112-5
22	Utilities			
	22	Utilities		
		221100	Electric power generation, transmission, and distribution	2211
		221200	Natural gas distribution	2212
		221300	Water, sewage and other systems	2213
23	Construction			
	23	Construction*		
		230301	Nonresidential maintenance and repair	23
		230302	Residential maintenance and repair	23
		233210	Health care structures	23
		233230	Manufacturing structures	23
		233240	Power and communication structures	23
		233262	Educational and vocational structures	23
		233293	Highways and streets	23
		2332A0	Commercial structures, including farm structures	23
		2332B0	Other nonresidential structures	23
		233411	Single-family residential structures	23
		233412	Multifamily residential structures	23
		2334A0	Other residential structures	23
31 G	Manufacturing			
	321	Wood products		
		321100	Sawmills and wood preservation	3211

	321200	Veneer, plywood, and engineered wood product manufacturing	3212
	321910	Millwork	32191
	3219A0	All other wood product manufacturing	32192, 32199
327	Nonmetallic mineral products		
	327100	Clay product and refractory manufacturing	3271
	327200	Glass and glass product manufacturing	3272
	327310	Cement manufacturing	32731
	327320	Ready-mix concrete manufacturing	32732
	327330	Concrete pipe, brick, and block manufacturing	32733
	327390	Other concrete product manufacturing	32739
	327400	Lime and gypsum product manufacturing	3274
	327910	Abrasive product manufacturing	32791
	327991	Cut stone and stone product manufacturing	327991
	327992	Ground or treated mineral and earth manufacturing	327992
	327993	Mineral wool manufacturing	327993
	327999	Miscellaneous nonmetallic mineral products	327999
331	Primary metals		
	331110	Iron and steel mills and ferroalloy manufacturing	3311
	331200	Steel product manufacturing from purchased steel	3312
	33131A	Alumina refining and primary aluminum production	331311-2
	331314	Secondary smelting and alloying of aluminum	331314
	33131B	Aluminum product manufacturing from purchased aluminum	331315, 331316, 331319
	331411	Primary smelting and refining of copper	331411
	331419	Primary smelting and refining of nonferrous metal (except copper and aluminum)	331419
	331420	Copper rolling, drawing, extruding and alloying	33142
	331490	Nonferrous metal (except copper and aluminum) rolling, drawing, extruding and alloying	33149
	331510	Ferrous metal foundries	33151
	331520	Nonferrous metal foundries	33152
332	Fabricated metal products		
	33211A	All other forging, stamping, and sintering	332111-2, 332117
	332114	Custom roll forming	332114
	33211B	Crown and closure manufacturing and metal stamping	332115-6
	332200	Cutlery and handtool manufacturing	3322
	332310	Plate work and fabricated structural product manufacturing	33231
	332320	Ornamental and architectural metal products manufacturing	33232
	332410	Power boiler and heat exchanger manufacturing	33241
	332420	Metal tank (heavy gauge) manufacturing	33242

	332430	Metal can, box, and other metal container (light gauge) manufacturing	33243
	332500	Hardware manufacturing	3325
	332600	Spring and wire product manufacturing	3326
	332710	Machine shops	33271
	332720	Turned product and screw, nut, and bolt manufacturing	33272
	332800	Coating, engraving, heat treating and allied activities	3328
	33291A	Valve and fittings other than plumbing	332911-2, 332919
	332913	Plumbing fixture fitting and trim manufacturing	332913
	332991	Ball and roller bearing manufacturing	332991
	33299A	Ammunition, arms, ordnance, and accessories manufacturing	332992-5
	332996	Fabricated pipe and pipe fitting manufacturing	332996
	33299B	Other fabricated metal manufacturing	332997-9
333	Machinery		
	333111	Farm machinery and equipment manufacturing	333111
	333112	Lawn and garden equipment manufacturing	333112
	333120	Construction machinery manufacturing	33312
	333130	Mining and oil and gas field machinery manufacturing	33313
	33329A	Other industrial machinery manufacturing	33321, 333291-4, 333298
	333220	Plastics and rubber industry machinery manufacturing	33322
	333295	Semiconductor machinery manufacturing	333295
	33331A	Vending, commercial laundry, and other commercial and service industry machinery manufacturing	333311, 333312, 333319
	333313	Office machinery manufacturing	333313
	333314	Optical instrument and lens manufacturing	333314
	333315	Photographic and photocopying equipment manufacturing	333315
	33341A	Air purification and ventilation equipment manufacturing	333411-2
	333414	Heating equipment (except warm air furnaces) manufacturing	333414
	333415	Air conditioning, refrigeration, and warm air heating equipment manufacturing	333415
	333511	Industrial mold manufacturing	333511
	33351A	Metal cutting and forming machine tool manufacturing	333512-3
	333514	Special tool, die, jig, and fixture manufacturing	333514
	33351B	Cutting and machine tool accessory, rolling mill, and other metalworking machinery manufacturing	333515, 333516, 333518
	333611	Turbine and turbine generator set units manufacturing	333611
	333612	Speed changer, industrial high-speed drive, and gear manufacturing	333612
	333613	Mechanical power transmission equipment manufacturing	333613

	333618	Other engine equipment manufacturing	333618
	33391A	Pump and pumping equipment manufacturing	333911, 333913
	333912	Air and gas compressor manufacturing	333912
	333920	Material handling equipment manufacturing	33392
	333991	Power-driven handtool manufacturing	333991
	33399A	Other general purpose machinery manufacturing	333992, 333997, 333999
	333993	Packaging machinery manufacturing	333993
	333994	Industrial process furnace and oven manufacturing	333994
	33399B	Fluid power process machinery	333995-6
334	Computer and electronic products		
	334111	Electronic computer manufacturing	334111
	334112	Computer storage device manufacturing	334112
	33411A	Computer terminals and other computer peripheral equipment manufacturing	334113, 334119
	334210	Telephone apparatus manufacturing	33421
	334220	Broadcast and wireless communications equipment	33422
	334290	Other communications equipment manufacturing	33429
	334300	Audio and video equipment manufacturing	3343
	33441A	Other electronic component manufacturing	334411, 334412, 334414-7, 334419
	334413	Semiconductor and related device manufacturing	334413
	334418	Printed circuit assembly (electronic assembly) manufacturing	334418
	334510	Electromedical and electrotherapeutic apparatus manufacturing	334510
	334511	Search, detection, and navigation instruments manufacturing	334511
	334512	Automatic environmental control manufacturing	334512
	334513	Industrial process variable instruments manufacturing	334513
	334514	Totalizing fluid meter and counting device manufacturing	334514
	334515	Electricity and signal testing instruments manufacturing	334515
	334516	Analytical laboratory instrument manufacturing	334516
	334517	Irradiation apparatus manufacturing	334517
	33451A	Watch, clock, and other measuring and controlling device manufacturing	334518-9
	334610	Manufacturing and reproducing magnetic and optical media	33461
335	Electrical equipment, appliances, and components		
	335110	Electric lamp bulb and part manufacturing	33511
	335120	Lighting fixture manufacturing	33512
	335210	Small electrical appliance manufacturing	33521
	335221	Household cooking appliance manufacturing	335221

	335222	Household refrigerator and home freezer manufacturing	335222
	335224	Household laundry equipment manufacturing	335224
	335228	Other major household appliance manufacturing	335228
	335311	Power, distribution, and specialty transformer manufacturing	335311
	335312	Motor and generator manufacturing	335312
	335313	Switchgear and switchboard apparatus manufacturing	335313
	335314	Relay and industrial control manufacturing	335314
	335911	Storage battery manufacturing	335911
	335912	Primary battery manufacturing	335912
	335920	Communication and energy wire and cable manufacturing	33592
	335930	Wiring device manufacturing	33593
	335991	Carbon and graphite product manufacturing	335991
	335999	All other miscellaneous electrical equipment and component manufacturing	335999
3361MV	Motor vehicles, bodies and trailers, and parts		
	336111	Automobile manufacturing	336111
	336112	Light truck and utility vehicle manufacturing	336112
	336120	Heavy duty truck manufacturing	33612
	336211	Motor vehicle body manufacturing	336211
	336212	Truck trailer manufacturing	336212
	336213	Motor home manufacturing	336213
	336214	Travel trailer and camper manufacturing	336214
	336310	Motor vehicle gasoline engine and engine parts manufacturing	33631
	336320	Motor vehicle electrical and electronic equipment manufacturing	33632
	3363A0	Motor vehicle steering, suspension component (except spring), and brake systems manufacturing	33633-4
	336350	Motor vehicle transmission and power train parts manufacturing	33635
	336360	Motor vehicle seating and interior trim manufacturing	33636
	336370	Motor vehicle metal stamping	33637
	336390	Other motor vehicle parts manufacturing	33639
3364OT	Other transportation equipment		
	336411	Aircraft manufacturing	336411
	336412	Aircraft engine and engine parts manufacturing	336412
	336413	Other aircraft parts and auxiliary equipment manufacturing	336413
	336414	Guided missile and space vehicle manufacturing	336414
	33641A	Propulsion units and parts for space vehicles and guided missiles	336415, 336419
	336500	Railroad rolling stock manufacturing	3365

	336611	Ship building and repairing	336611
	336612	Boat building	336612
	336991	Motorcycle, bicycle, and parts manufacturing	336991
	336992	Military armored vehicle, tank, and tank component manufacturing	336992
	336999	All other transportation equipment manufacturing	336999
337	Furniture and related products		
	337110	Wood kitchen cabinet and countertop manufacturing	33711
	337121	Upholstered household furniture manufacturing	337121
	337122	Nonupholstered wood household furniture manufacturing	337122
	33712A	Other household nonupholstered furniture	337124, 337125, 337129
	337127	Institutional furniture manufacturing	337127
	33721A	Office furniture and custom architectural woodwork and millwork manufacturing	337211, 337212, 337214
	337215	Showcase, partition, shelving, and locker manufacturing	337215
	337900	Other furniture related product manufacturing	3379
339	Miscellaneous manufacturing		
	339112	Surgical and medical instrument manufacturing	339112
	339113	Surgical appliance and supplies manufacturing	339113
	339114	Dental equipment and supplies manufacturing	339114
	339115	Ophthalmic goods manufacturing	339115
	339116	Dental laboratories	339116
	339910	Jewelry and silverware manufacturing	33991
	339920	Sporting and athletic goods manufacturing	33992
	339930	Doll, toy, and game manufacturing	33993
	339940	Office supplies (except paper) manufacturing	33994
	339950	Sign manufacturing	33995
	339990	All other miscellaneous manufacturing	33999
311FT	Food and beverage and tobacco products		
	311111	Dog and cat food manufacturing	311111
	311119	Other animal food manufacturing	311119
	311210	Flour milling and malt manufacturing	31121
	311221	Wet corn milling	311221
	31122A	Soybean and other oilseed processing	311222-3
	311225	Fats and oils refining and blending	311225
	311230	Breakfast cereal manufacturing	31123
	311300	Sugar and confectionery product manufacturing	3113
	311410	Frozen food manufacturing	31141
	311420	Fruit and vegetable canning, pickling, and drying	31142
	31151A	Fluid milk and butter manufacturing	311511-2
	311513	Cheese manufacturing	311513

	311514	Dry, condensed, and evaporated dairy product manufacturing	311514
	311520	Ice cream and frozen dessert manufacturing	31152
	31161A	Animal (except poultry) slaughtering, rendering, and processing	311611-3
	311615	Poultry processing	311615
	311700	Seafood product preparation and packaging	3117
	311810	Bread and bakery product manufacturing	31181
	3118A0	Cookie, cracker, pasta, and tortilla manufacturing	31182-3
	311910	Snack food manufacturing	31191
	311920	Coffee and tea manufacturing	31192
	311930	Flavoring syrup and concentrate manufacturing	31193
	311940	Seasoning and dressing manufacturing	31194
	311990	All other food manufacturing	31199
	312110	Soft drink and ice manufacturing	31211
	312120	Breweries	31212
	312130	Wineries	31213
	312140	Distilleries	31214
	312200	Tobacco product manufacturing	3122
313TT	Textile mills and textile product mills		
	313100	Fiber, yarn, and thread mills	3131
	313200	Fabric mills	3132
	313300	Textile and fabric finishing and fabric coating mills	3133
	314110	Carpet and rug mills	31411
	314120	Curtain and linen mills	31412
	314900	Other textile product mills	3149
315AL	Apparel and leather and allied products		
	315000	Apparel manufacturing	315
	316000	Leather and allied product manufacturing	316
322	Paper products		
	322110	Pulp mills	32211
	322120	Paper mills	32212
	322130	Paperboard mills	32213
	322210	Paperboard container manufacturing	32221
	322220	Paper bag and coated and treated paper manufacturing	32222
	322230	Stationery product manufacturing	32223
	322291	Sanitary paper product manufacturing	322291
	322299	All other converted paper product manufacturing	322299
323	Printing and related support activities		
	323110	Printing	32311
	323120	Support activities for printing	32312

324	Petroleum and coal products		
	324110	Petroleum refineries	32411
	324121	Asphalt paving mixture and block manufacturing	324121
	324122	Asphalt shingle and coating materials manufacturing	324122
	324190	Other petroleum and coal products manufacturing	32419
325	Chemical products		
	325110	Petrochemical manufacturing	32511
	325120	Industrial gas manufacturing	32512
	325130	Synthetic dye and pigment manufacturing	32513
	325180	Other basic inorganic chemical manufacturing	32518
	325190	Other basic organic chemical manufacturing	32519
	325211	Plastics material and resin manufacturing	325211
	3252A0	Synthetic rubber and artificial and synthetic fibers and filaments manufacturing	325212, 32522
	325310	Fertilizer manufacturing	32531
	325320	Pesticide and other agricultural chemical manufacturing	32532
	325411	Medicinal and botanical manufacturing	325411
	325412	Pharmaceutical preparation manufacturing	325412
	325413	In-vitro diagnostic substance manufacturing	325413
	325414	Biological product (except diagnostic) manufacturing	325414
	325510	Paint and coating manufacturing	32551
	325520	Adhesive manufacturing	32552
	325610	Soap and cleaning compound manufacturing	32561
	325620	Toilet preparation manufacturing	32562
	325910	Printing ink manufacturing	32591
	3259A0	All other chemical product and preparation manufacturing	32592, 32599
326	Plastics and rubber products		
	326110	Plastics packaging materials and unlaminated film and sheet manufacturing	32611
	326120	Plastics pipe, pipe fitting, and unlaminated profile shape manufacturing	32612
	326130	Laminated plastics plate, sheet (except packaging), and shape manufacturing	32613
	326140	Polystyrene foam product manufacturing	32614
	326150	Urethane and other foam product (except polystyrene) manufacturing	32615
	326160	Plastics bottle manufacturing	32616
	326190	Other plastics product manufacturing	32619
	326210	Tire manufacturing	32621
	326220	Rubber and plastics hoses and belting manufacturing	32622
	326290	Other rubber product manufacturing	32629

*Construction data published by BEA at the detail level do not align with 2007 NAICS industries. In NAICS, industries are classified based on their production processes, whereas BEA construction is classified by type of structure. For example, activity by the 2007 NAICS Roofing contractors industry would be split among many BEA construction categories because roofs are built on many types of structures.

Table A.5.2. BEA-NAICS Code Bridge – Services (2007)

BEA Code and Title				Related 2007 NAICS Codes
42	Wholesale trade			
	42	Wholesale trade *		
		420000	Wholesale trade	42
44RT	Retail trade			
	441	Motor vehicle and parts dealers		
		441000	Motor vehicle and parts dealers	441
	445	Food and beverage stores		
		445000	Food and beverage stores	445
	452	General merchandise stores		
		452000	General merchandise stores	452
	4A0	Other retail *		
		4A0000	Other retail	442-4, 446-8, 451, 453-4
48TW	Transportation and warehousing			
	481	Air transportation		
		481000	Air transportation	481
	482	Rail transportation		
		482000	Rail transportation	482
	483	Water transportation		
		483000	Water transportation	483

	484	Truck transportation		
		484000	Truck transportation	484
	485	Transit and ground passenger transportation		
		485000	Transit and ground passenger transportation	485
	486	Pipeline transportation		
		486000	Pipeline transportation	486
	487OS	Other transportation and support activities		
		48A000	Scenic and sightseeing transportation and support activities for transportation	487, 488
		492000	Couriers and messengers	492
	493	Warehousing and storage		
		493000	Warehousing and storage	493
51	Information			
	511	Publishing industries, except internet (includes software)		
		511110	Newspaper publishers	51111
		511120	Periodical Publishers	51112
		511130	Book publishers	51113
		5111A0	Directory, mailing list, and other publishers	51114, 51119
		511200	Software publishers	51121
	512	Motion picture and sound recording industries		
		512100	Motion picture and video industries	5121
		512200	Sound recording industries	5122
	513	Broadcasting and telecommunications		
		515100	Radio and television broadcasting	5151
		515200	Cable and other subscription programming	5152
		517110	Wired telecommunications carriers	5171
		517210	Wireless telecommunications carriers (except satellite)	5172
		517A00	Satellite, telecommunications resellers, and all other telecommunications	5174, 5719
	514	Data processing, internet publishing, and other information services		

		518200	Data processing, hosting, and related services	5182
		5191A0	News syndicates, libraries, archives and all other information services	51911-2, 51919
		519130	Internet publishing and broadcasting and Web search portals	51913
FIRE	Finance, insurance, real estate, rental, and leasing			
	521CI	Federal Reserve banks, credit intermediation, and related activities		
		52A000	Monetary authorities and depository credit intermediation	521, 5221
		522A00	Nondepository credit intermediation and related activities	5222-3
	523	Securities, commodity contracts, and investments		
		523A00	Securities and commodity contracts intermediation and brokerage	5231-2
		523900	Other financial investment activities	5239
	524	Insurance carriers and related activities		
		524100	Insurance carriers	5241
		524200	Insurance agencies, brokerages, and related activities	5242
	525	Funds, trusts, and other financial vehicles		
		525000	Funds, trusts, and other financial vehicles	525
	531	Real estate		
		5310HS	Housing	531
		531ORE	Other real estate	531
	532RL	Rental and leasing services and lessors of intangible assets		
		532100	Automotive equipment rental and leasing	5321
		532A00	Consumer goods and general rental centers	5322-3
		532400	Commercial and industrial machinery and equipment rental and leasing	5324
		533000	Lessors of nonfinancial intangible assets	533
PROF	Professional and business services			
	5411	Legal services		

		541100	Legal services	5411
	5415	Computer systems design and related services		
		541511	Custom computer programming services	541511
		541512	Computer systems design services	541512
		54151A	Other computer related services, including facilities management	541513, 541519
	5412OP	Miscellaneous professional, scientific, and technical services		
		541200	Accounting, tax preparation, bookkeeping, and payroll services	5412
		541300	Architectural, engineering, and related services	5413
		541400	Specialized design services	5414
		541610	Management consulting services	54161
		5416A0	Environmental and other technical consulting services	54162, 54169
		541700	Scientific research and development services	5417
		541800	Advertising, public relations, and related services	5418
		5419A0	Marketing research and all other miscellaneous professional, scientific, and technical services	54191, 54193, 54199
		541920	Photographic services	54192
		541940	Veterinary services	54194
	55	Management of companies and enterprises		
		550000	Management of companies and enterprises	55
	561	Administrative and support services		
		561100	Office administrative services	5611
		561200	Facilities support services	5612
		561300	Employment services	5613
		561400	Business support services	5614
		561500	Travel arrangement and reservation services	5615
		561600	Investigation and security services	5616
		561700	Services to buildings and dwellings	5617
		561900	Other support services	5619
	562	Waste management and remediation services		
		562000	Waste management and remediation services	562
6	Educational services, health care, and social assistance			
	61	Educational services		

		611100	Elementary and secondary schools	6111
		611A00	Junior colleges, colleges, universities, and professional schools	6112-3
		611B00	Other educational services	6114-7
	621		Ambulatory health care services	
		621100	Offices of physicians	6211
		621200	Offices of dentists	6212
		621300	Offices of other health practitioners	6213
		621400	Outpatient care centers	6214
		621500	Medical and diagnostic laboratories	6215
		621600	Home health care services	6216
		621900	Other ambulatory health care services	6219
	622		Hospitals	
		622000	Hospitals	622
	623		Nursing and residential care facilities	
		623A00	Nursing and community care facilities	6231, 6233
		623B00	Residential mental retardation, mental health, substance abuse and other facilities	6232, 6239
	624		Social assistance	
		624100	Individual and family services	6241
		624A00	Community food, housing, and other relief services, including rehabilitation services	6242-3
		624400	Child day care services	6244
7			Arts, entertainment, recreation, accommodation, and food services	
	711AS		Performing arts, spectator sports, museums, and related activities	
		711100	Performing arts companies	7111
		711200	Spectator sports	7112
		711A00	Promoters of performing arts and sports and agents for public figures	7113-4
		711500	Independent artists, writers, and performers	7115
		712000	Museums, historical sites, zoos, and parks	712
	713		Amusements, gambling, and recreation industries	
		713100	Amusement parks and arcades	7131
		713200	Gambling industries (except casino hotels)	7132
		713900	Other amusement and recreation industries	7139

	721	Accommodation		
		721000	Accommodation	721
	722	Food services and drinking places		
		722110	Full-service restaurants	7221
		722211	Limited-service restaurants	7222
		722A00	All other food and drinking places	7223-4
81	Other services, except government			
	81	Other services, except government		
		811100	Automotive repair and maintenance	8111
		811200	Electronic and precision equipment repair and maintenance	8112
		811300	Commercial and industrial machinery and equipment repair and maintenance	8113
		811400	Personal and household goods repair and maintenance	8114
		812100	Personal care services	8121
		812200	Death care services	8122
		812300	Dry-cleaning and laundry services	8123
		812900	Other personal services	8129
		813100	Religious organizations	8131
		813A00	Grantmaking, giving, and social advocacy organizations	8132, 8133
		813B00	Civic, social, professional, and similar organizations	8134, 8139
		814000	Private households	814

* Additional detail for the electric power generation, transmission, and distribution; wholesale trade; and other retail industries is available on an annual basis as part of the detailed gross output statistics.

Appendix 6. Feasibly in-house industries

The third grouping of domestic IFT that I assess includes only services that could feasibly have been produced in-house by the client. I identified these industries by hand, and they are listed below in table A.6.1. Table A.6.2 the list of services industries that I did not identify as feasibly in-house. That is, they are part of group 2 but not group 3.

An important pre-qualifying condition for the list of feasibly in-house industries is that over half of the industry's output must be an intermediate input into other firms or the government. That is, industries producing services primarily for final use consumption are not considered feasibly in-house. From this list of services, to identify which services I would consider to be "feasibly in-house" I considered historical patterns of ownership and supply chain structure as precedent. Specifically, for each industry classified as a service producing more intermediate than final use output, I assessed whether it is a common or frequent practice for an industry purchasing those services to instead produce those services in-house. In some cases I there are well-known examples of this (e.g. Walmart owns and operates some of its own warehousing and transportation services), and in other cases I looked to the BEA's use table to determine which industries are the main purchasing industries for particular services, and I then searched online for examples of in-house production to get a sense of the typical supply chain structure.

It is essential to recognize that this was an imperfect process. The decisions in many cases were difficult to make, and there may be examples in some cases that contradict my selections. This highlights the challenges of group 3 compared to group 2, and the limitations of using a conceptually narrow scope of IFT for an empirical analysis of trends.

Industry group 3 is an attempt to more closely match the approach taken in other literature on "domestic outsourcing," (e.g. Berlignieri 2014, Dorn et al. 2018) most of which hand-picks specific industries known to be common suppliers of outsourced services – that is, services that were, are, or could feasibly be provided in-house instead. My approach expands beyond the common examples like food services, cleaning, and logistics, to services industries that aren't necessarily typical examples of outsourcing but also may be involved in the same kind of process. For instance, we might not typically think of public relations services, repair and

maintenance services, or computer systems design as "outsourcing industries" but they all represent services that are in some cases provided in house and in other cases supplied by a separate firm.

While my approach, like other work on outsourcing, also involves an imprecise hand-selection of industries, my starting point for doing the hand-selection is the empirical test of which industries produce more output for intermediate versus final use, casting a broader net for which industries we might want to consider as contractor industries. In this way, I am able to estimate trends in domestic IFT using a more comprehensive approach than prior studies, even in my narrowest grouping of industries.

Table A.6.1. Feasibly In-House Services (2007)

BEA Title	Related NAICS Codes
Accounting, tax preparation, bookkeeping, and payroll services	5412
Advertising, public relations, and related services	5418
All other food and drinking places	722514, 722515, 7224, 7223
Architectural, engineering, and related services	5413
Automotive repair and maintenance	8111
Business support services	5614
Commercial and industrial machinery and equipment repair and maintenance	8113
Computer systems design services	541512
Couriers and messengers	492
Custom computer programming services	541511
Data processing, hosting, and related services	518
Dry-cleaning and laundry services	8123
Electronic and precision equipment repair and maintenance	8112
Employment services	5613
Environmental and other technical consulting services	54162, 54169
Facilities support services	5612
Full-service restaurants	722511
Independent artists, writers, and performers	7115
Investigation and security services	5616
Legal services	5411

Limited-service restaurants	722513
Management consulting services	54161
Marketing research and all other miscellaneous professional, scientific, and technical services	54191, 54193, 54199
Medical and diagnostic laboratories	6215
Office administrative services	5611
Other ambulatory health care services	6219
Other computer related services, including facilities management	541513, 541519
Other educational services	6114, 6115, 6116, 6117
Other support services	5619
Personal and household goods repair and maintenance	8114
Photographic services	54192
Promoters of performing arts and sports and agents for public figures	7113, 7114
Scenic and sightseeing transportation and support activities for transportation	487
Scientific research and development services	5417
Services to buildings and dwellings	5617
Software publishers	5112
Specialized design services	5414
Transit and ground passenger transportation	485
Travel arrangement and reservation services	5615
Truck transportation	484
Warehousing and storage	493

Table A.6.2. Other Services (2007)

BEA Title	Related NAICS Codes
Accommodation	721
Air transportation	481
Amusement parks and arcades	7131
Automotive equipment rental and leasing	5321
Book publishers	51113
Cable and other subscription programming	5152
Child day care services	6244
Civic, social, professional, and similar organizations	8134, 8139
Commercial and industrial machinery and equipment rental and leasing	5324
Community food, housing, and other relief services, including rehabilitation services	6242, 6243
Consumer goods and general rental centers	5323, 5322
Death care services	8122
Directory, mailing list, and other publishers	51114, 5112
Electric power generation, transmission, and distribution	2211

Elementary and secondary schools	6111
Food and beverage stores	445
Funds, trusts, and other financial vehicles	525
Gambling industries (except casino hotels)	7132
General merchandise stores	452
Grantmaking, giving, and social advocacy organizations	8132, 8133
Home health care services	6216
Hospitals	622
Individual and family services	6241
Insurance agencies, brokerages, and related activities	5242
Insurance carriers	5241
Internet publishing and broadcasting and Web search portals	51913, 51919
Junior colleges, colleges, universities, and professional schools	6112, 6113
Lessors of nonfinancial intangible assets	533
Management of companies and enterprises	55
Monetary authorities and depository credit intermediation	521, 522
Motion picture and video industries	5121
Motor vehicle and parts dealers	441
Museums, historical sites, zoos, and parks	712
Natural gas distribution	2212
News syndicates, libraries, archives and all other information services	51911, 51912
Newspaper publishers	51111
Nursing and community care facilities	6231
Offices of dentists	6212
Offices of other health practitioners	6213
Offices of physicians	6211
Other amusement and recreation industries	7139
Other personal services	8129
Other retail	442, 443, 444, 446, 447, 448, 451, 453, 454
Outpatient care centers	6214
Performing arts companies	7111
Periodical Publishers	51112
Personal care services	8121
Pipeline transportation	486
Postal service	491
Private households	8141
Radio and television broadcasting	5151
Rail transportation	482
Real estate	531
Religious organizations	8131

Residential mental retardation, mental health, substance abuse and other facilities	6232, 6233, 6239
Satellite, telecommunications resellers, and all other telecommunications	5174, 51791
Securities and commodity contracts intermediation and brokerage	523
Sound recording industries	5122
Spectator sports	7112
Veterinary services	54194
Waste management and remediation services	562
Water transportation	483
Water, sewage and other systems	2213
Wholesale trade	42
Wired telecommunications carriers	5171
Wireless telecommunications carriers (except satellite)	5172

Appendix 7. Input analysis

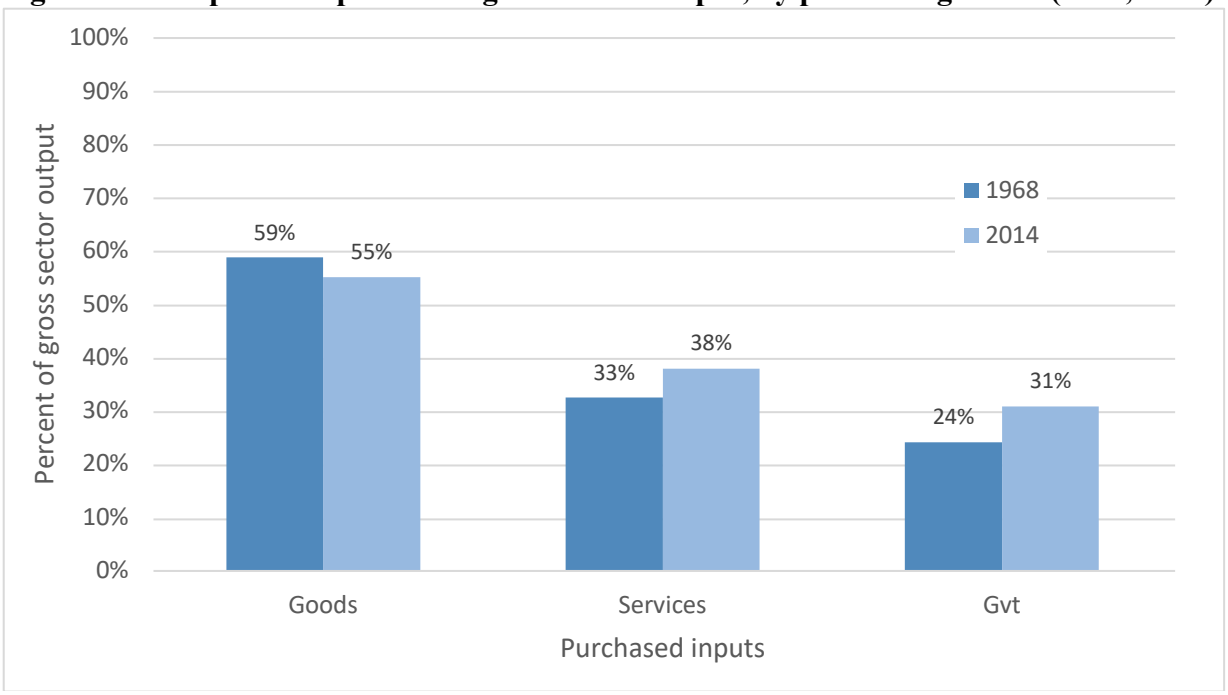
This analysis has concentrated on *outputs* – that is, what each firm *produces*, and how it is used by other firms or end-users. One of the strengths of the I-O data, however, is that it also allows us to consider *inputs* – that is, what each firm *purchases* as part of its production process.[30] In this section, I turn my attention to the purchasing industries rather than the producing industries. That is, the buyers rather than the makers.

Figure A.7.1 shows changes in the share of all purchased inputs as a portion of the total sector output of the purchasing industry. Services and government have increased the portion of inputs they purchase, relative to their gross output, while the good sector has decreased the portion of inputs it purchases. Here, it is essential to keep in mind that these data show domestic production and consumption only. Goods-producing firms might have increased their share of inputs

[30] However, it is not possible to include investment as an intermediate input here because the data do not identify the purchasing industry for investment output.

purchased internationally, for instance, while they decreased the share of inputs purchased domestically.

Figure A.7.1 Inputs as a percent of gross sector output, by purchasing sector (1968, 2014)

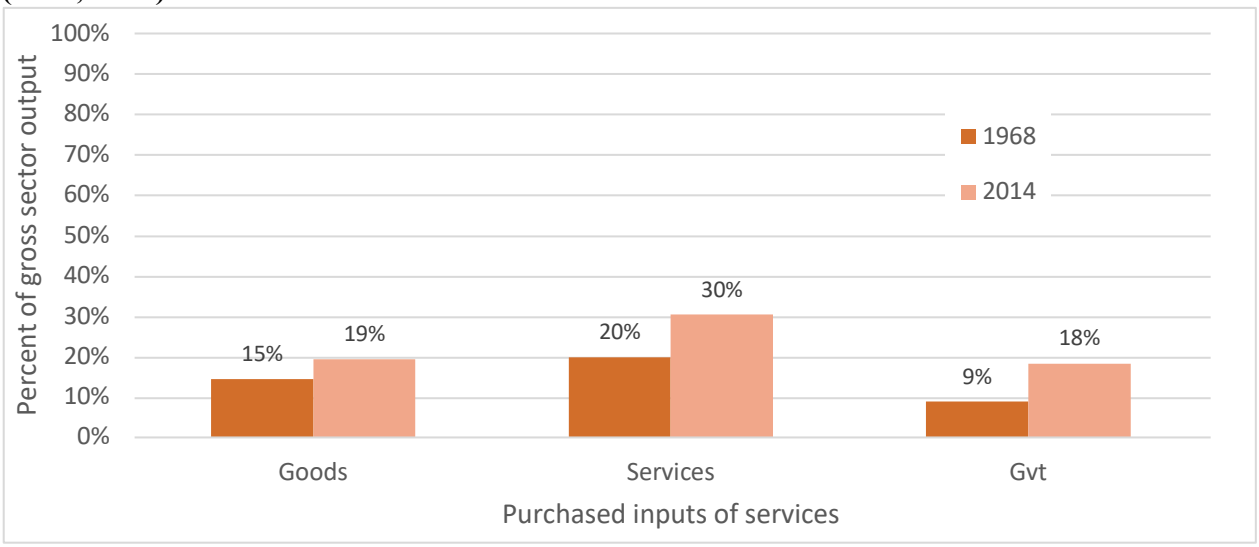


Source data: Author's analysis of the Bureau of Economic Analysis make and use tables, 1963-2014 (using 1963-1996 industry codes)

Figure A.7.2 shows the purchases of inputs that are classified as services, as a portion of gross sector output of the purchasing industry. Every sector has increased its use of purchased services over time: the goods-producing sector purchased services inputs equal to 15% of total sector output in 1968, and 19% in 2014; the services-producing sector purchased services inputs equal to 20% of total sector output in 1968, and 30% in 2014; and government purchased services inputs equal to 9% of total sector output in 1968, and 18% in 2014. This shows that, across all sectors, firms in the U.S. are purchasing more services from other U.S. firms than they have in prior decades.

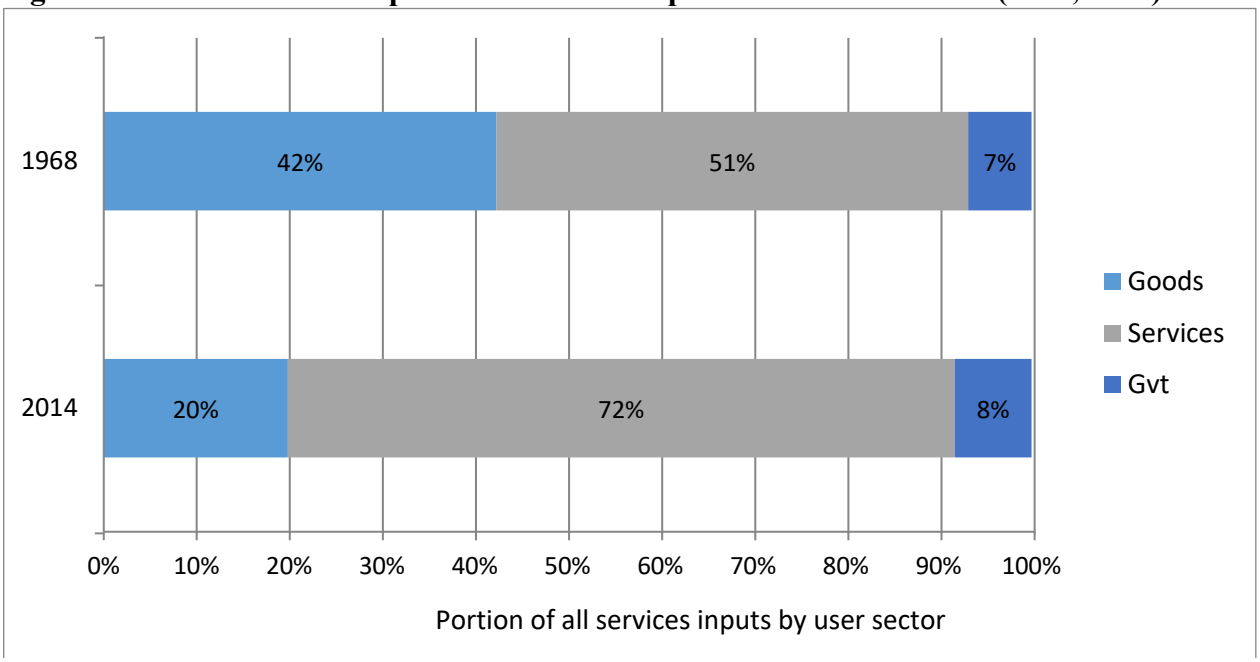
Figure A.7.3 shows how the volume of purchased service inputs are distributed across user sectors. Although each sector increased its purchases of service sector inputs (figure A.7.2), by 2014, the large majority of service inputs were being purchased by other service industries. This shows that the services sector is not only an important producer of intermediate output, it is also an important purchaser of intermediate output of services. Together, these charts suggest that both supply and demand for domestic IFT is concentrated in services.

Figure A.7.2 Inputs of services as a percent of gross sector output, by purchasing sector (1968, 2014)



Source data: Author's analysis of the Bureau of Economic Analysis make and use tables, 1963-2014 (using 1963-1996 industry codes)

Figure A.7 3 Distribution of purchased service inputs across user sectors (1968, 2014)



Source data: Author's analysis of the Bureau of Economic Analysis make and use tables, 1963-2014 (using 1963-1996 industry codes)