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OFF-SHORING: HOW BIG IS IT?

Panel

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FOREWORD

Off-Shoring: How Big Is It? is the second of three Academy Panel reports providing a comprehensive review of services off-shoring. This report presents the results of the Panel's research using publicly available industry-level data and confidential, firm-level (micro) data to address two critical questions:

1. What do currently available data indicate about the extent of U.S. services off-shoring?
2. What additional data are needed to provide a more complete assessment of U.S. services off-shoring?

Contrary to many popular perceptions, the Panel found that services off-shoring remains quite small among the multi-national corporations and industries studied from 1998 to 2004. The Panel also found that U.S. businesses were much more likely to outsource services to other domestic firms during the same period, heightening the need to distinguish carefully between these two distinct and different economic concepts.

Data gaps and deficiencies impede a complete assessment of the extent and impact of services off-shoring. The Panel commends the Bureau of Economic Analysis and the Bureau of Labor Statistics for their efforts to improve the quality, timeliness and completeness of the data with the resources available to them. Yet additional data improvements are needed and agencies should be provided the resources needed to achieve them. The Panel believes that it is prudent to improve existing data systems *now*—while the phenomenon remains relatively small—to better understand services off-shoring activities and their economic impacts in the future.

I would like to thank the Panel and staff for their detailed assessment of a complex yet critically important issue. Let me also extend my appreciation to both Bureaus for their support, cooperation and responsiveness. Finally, I want to thank the Congress, especially Chairman Frank Wolf, for providing the initial direction and support for this review.

Howard M. Messner
President
National Academy of Public Administration

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ACRONYMS

Academy	National Academy of Public Administration
AFL-CIO	American Federation of Labor-Congress of Industrial Organizations
ASTAR	Automated Survey Transmission and Retrieval
BEA	Bureau of Economic Analysis
BED	Business Employment Dynamics
BLS	Bureau of Labor Statistics
BPT	Business, Professional, and Technical Services
CIPSEA	Confidential Information Protection & Statistical Efficiency Act
COS	Company Organization Survey
CPS	Current Population Survey
EIN	Employer Identification Number
FDD	Final Domestic Demand
FDI	Foreign Direct Investment
GAO	Government Accountability Office
GDP	Gross Domestic Product
I-O	Input-Output
IPP	International Price Program
IRS	Internal Revenue Service
IT	Information Technology
ITAA	Information Technology Association of America
LEHD	Longitudinal Employer Household Dynamics Data
MGI	McKinsey Global Institute
MLS	Mass Layoff Statistics
MIT	Massachusetts Institute of Technology
MNC	Multinational Corporation
MOFA	Majority Owned Foreign Affiliates
MOU	Memorandum of Understanding
NAICS	North American Industry Classification System
NAPCS	North American Produce Code System
NAS	National Academy of Sciences
NASSCOM	National Association of Software and Services Companies (India)
OECD	Organization for Economic Co-operation and Development
OES	Occupational Employment Statistics
QCEW	Quarterly Census of Employment and Wages
SIC	Standard Industrial Classification
SOC	Standard Occupation Code
TA	Technology Administration (Department of Commerce)
UI	Unemployment Insurance
WTO	World Trade Organization

SECTION I

STUDY RESULTS

HIGHLIGHTS OF ACADEMY REPORT

SERVICES OFF-SHORING: HOW BIG IS IT?

This is the second of three Academy Panel reports providing a comprehensive review of services off-shoring. It is in response to direction from the House Appropriations Subcommittee on Science, State, Commerce and Justice with funding provided by the U.S. Department of Commerce's Bureau of Economic Analysis (BEA). This report focuses primarily on two questions:

1. *What do currently available data indicate about the extent of U.S. services off-shoring?*

2. *What additional data are needed to provide a more complete assessment of U.S. services off-shoring?*

Concerns about the impact of international trade on the U.S. economy are not new. What distinguishes off-shoring concerns today is the focus on the services sector, particularly white collar, high-technology jobs previously considered less vulnerable to international trade and potential migration overseas. As the Panel found in its first report—*Off-Shoring: An Elusive Phenomenon*—the extent of services off-shoring and its economic effects are complex and poorly understood. The diversity of views among previous studies reflects not only differences in data used, time periods covered, and industries analyzed, but also the lack of a commonly accepted definition and the interchangeable use of multiple terms.

To simplify the discussion and facilitate understanding, the Panel has recommended and is using the following terms and definitions:

outsourcing—firms contracting out service and manufacturing activities to unaffiliated firms located either domestically or in foreign countries

off-shoring—U.S. firms shifting service and manufacturing activities abroad to unaffiliated firms or their own affiliates

off-shore outsourcing—a subset of both outsourcing and off-shoring in that it refers only to those service and manufacturing activities of U.S. companies performed in unaffiliated firms located abroad

The Panel has identified two distinct types of services off-shoring with fundamentally different economic effects and different data needed to identify them.

1. **Services off-shoring due to business restructuring.** Results from a decision to restructure all or part of a business' internal production processes and to obtain those restructured intermediate services from a foreign supplier. This involves some direct

U.S. job losses. The proportion of imported services used by a firm or industry in its business operations is a key indicator of this type of off-shoring.

2. **Services off-shoring due to global expansion.** Arises from a decision to expand business operations or production activities globally. This may have no immediate employment effect, although some future employment may be foregone if overseas expansion substitutes for future exports. An indicator of this type of off-shoring is faster growth in sales or total activity among foreign affiliates relative to the sales growth or total activity for the multinational corporation (MNC) parent.

PRINCIPAL FINDINGS

The Panel has made the following four principal findings based on its review of available industry-level data (1998 to 2004) and micro-level (firm) data (1999 to 2003) for the pharmaceutical and medicine manufacturing; architecture, engineering and related services; computer systems design and related services; and business support services industries:

1. **Services off-shoring due to business restructuring is not as extensive for the MNC parents in the industries examined as some popular perceptions and concerns would suggest.** One reason is that fewer than 20 percent of all MNC parents imported services from 1999 to 2003. The results for comparable industry groups from 1998 to 2004 confirmed this finding.

2. **Outsourcing of services to domestic firms is substantially greater than off-shoring of services due to business restructuring.** For the four industries examined, services outsourcing ranged from three to more than 38 times larger than services off-shoring over the 1998 to 2004 period.

3. **There was little consistent growth in services off-shoring from business restructuring among specific industries and MNCs examined from 1998 to 2004.** Growth rates varied substantially by industry. For those groups reviewed, annual growth ranged from 35.4 percent (for mining, except oil and gas) to -9.5 percent (for utilities), with a median rate of 4.6 percent. Manufacturing industries tended to have the higher services off-shoring growth rates, while some key services industries (broadcasting and telecommunications, administrative and support services, and information and data processing) experienced a decline in services off-shoring.

4. **Services off-shoring due to global expansion was more widespread than that due to business restructuring among the MNC parents concentrated in the four industries examined.** The majority of these MNC parents had faster total sales growth for their foreign affiliates than for the parent. For those concentrated in three services industries (architectural, engineering and related services; computer systems design and related services; and business support services), more than 80 percent had faster affiliate sales growth.

The Panel acknowledges that existing data gaps and quality issues may understate the extent of services off-shoring. Yet the potential underestimate does not appear sufficient to explain the limited amount of services off-shoring due to business restructuring found at the industry and firm levels.

KEY DATA RECOMMENDATIONS

Two types of data issues were encountered when developing estimates of the extent of services off-shoring: basic data gaps and data quality concerns. The former reflected the absence of key data elements, while the later involved discrepancies in reported data and their timeliness. These data issues impede a complete assessment of the extent and impact of services off-shoring.

To address these data issues, the Panel's key recommendations focus on three critical areas:

1. Improving the consistency, completeness and coverage of BEA's data on services imports.

2. Providing longitudinal occupational data through a revised or restructured Bureau of Labor Statistics (BLS) survey.

3. Developing consistent business identifiers to link information from several statistical agencies with different business organizational levels.

These three recommendations are similar to several recommendations made in the September 2006 final report of the Services Off-shoring Working Group at the Massachusetts Institute of Technology's Industrial Performance Center.

Improve BEA's data on services imports

More detailed and consistent data on the types of services imported are needed to better understand the extent and impact of services off-shoring. The Panel supports the BEA initiative to collect more consistent and detailed data on services imports from MNC foreign affiliates, comparable to that now collected for unaffiliated services imports (those from independent third parties). The Panel also recommends that BEA periodically review the data to ensure they are comprehensive and compatible with details on services contained in other economic data.

The Panel also believes that BEA's agreement with Census to add a question to the annual Company Organization Survey (COS) to identify firms that are importing services should improve its survey coverage of services importers, especially among large multi-establishment firms. The Panel also recommends that BEA consider other efforts to improve its mailing list, including working with other federal agencies surveying particular service activities.

Develop a national longitudinal component to BLS's Occupational Employment Statistic (OES) surveys.

Changes in the occupational structures of firms that are off-shoring services can provide essential information about the number and types of workers likely to be displaced. BLS' OES program provides detailed occupational and wage data for individual establishments by industry and geographical areas within the United States. Yet BLS noted that the current sample was not designed to support comparisons of changes in occupations and wages across time periods. Developing additional OES samples to support such comparisons will require additional resources. The Panel believes this investment is needed if the distributional employment effects from services off-shoring (and from domestic outsourcing of services) are to be better understood.

Develop consistent business identifiers among federal statistical agencies.

Analyses of micro-level data available at different federal statistical agencies are needed to assess the employment and other economic effects of U.S. business decisions to off-shore services activities. Efforts to link micro-level data across the agencies have been impeded by the different systems that the three major agencies—BEA, BLS and Census—use for identifying business firms or establishments within their respective jurisdictions. The lack of accessible, comprehensive, and consistent business register has contributed to numerous data gaps and quality issues that affect the ability to estimate the extent and impacts of services off-shoring.

The Panel recognizes that each agency needs data from business entities at different organizational levels to meet specific requirements at varying time intervals. However, a consistent set of identifiers for components within complex U.S. business entities would help each agency understand how each component fits within a consolidated national or international business entity. The Panel recommends that BEA, BLS and Census work together to develop and maintain a consistent set of identifiers for each level of organization within every consolidated business entity in the United States. This would include shared location data for various entities and consistent methodology for assigning industrial classifications.

This change would retain the most advantageous features of each agency's current business identification system. Most important, consistency would facilitate data sharing that could enhance the usefulness of separately collected data in understanding major cross-cutting issues, especially services off-shoring. Specifically, it would improve the ability to match BEA MNC data with BLS establishment data and business establishments in the economic census, thus improving the understanding of services off-shoring and other cross-cutting issues.

CONCLUDING REMARKS

Levels of services off-shoring for the periods examined may be small, but there can be significant adverse effects on the sectors, geographic regions and individuals directly impacted. In addition, there exists the potential for future growth in this phenomenon, given the extent of

services outsourcing and continuing technological changes. The Panel commends BEA and BLS for their initiatives to improve the quality, timeliness, and completeness of their data with the resources available to them. However, additional data improvements and resources to achieve them are needed to understand more fully the extent and economic impacts of services off-shoring. The Panel believes it is prudent to improve existing data systems *now* to increase the ability to detect and monitor future services off-shoring activities and their economic impacts.

PANEL MESSAGE

The services sector—particularly its white collar, high-technology jobs—has traditionally been considered less susceptible to international competition and overseas migration of services activities. More recently, these service sector jobs have been perceived as increasingly vulnerable to businesses shifting some services activities to foreign (off-shore) locations. This led the House Appropriations Subcommittee on Science, State, Commerce and Justice to provide authority and funding for the U.S. Department of Commerce's Bureau of Economic Analysis (BEA) to have the National Academy of Public Administration (Academy) undertake a comprehensive study of the off-shoring phenomenon.

The Subcommittee, Academy and BEA agreed that this study needed to address five key questions:

1. How should "off-shoring" be defined?

2. What do currently available data indicate about the extent of U.S. off-shoring?

3. What additional data are needed to provide a more complete assessment of U.S. off-shoring?

4. What factors account for current U.S. off-shoring?

5. What are the major impacts of off-shoring on U.S. workers and the economy and implications for the educational system?

This report—*Off-shoring: How Big Is It?*—is the second of three Academy Panel reports and focuses on the second and third questions. The first report—*Off-Shoring: An Elusive Phenomenon*—was released in January 2006 and addressed questions one and four. In it, the Panel recommended a broad definition of off-shoring to avoid ambiguities created by narrower definitions used in most previous studies and to prevent the definition from becoming outmoded as conditions change over time. The report also discussed factors that account for off-shoring service activities, including cost differences and quality improvements like more timely services (e.g. 24/7 response). The third report will address policy issues raised by question five, such as the role of temporary foreign workers under the H-1B and L-1 visa programs, and the impact on the U.S. education system's ability to meet the economy's needs for scientists, engineers and other high-skilled professional workers

In *Services Offshoring: How Big Is It?*, the Panel's principal findings regarding questions two and three are summarized below.

What do currently available data indicate about the extent of U.S. off-shoring?

Currently available data show that services off-shoring from 1999 to 2003 was small for the industries and firms examined. This finding is contrary to some popular perceptions. Growth

in services off-shoring for these industries and firms during this period was also limited and varied substantially by industry. Existing data gaps and quality issues may understate the extent of services off-shoring. Yet the potential underestimate does not appear sufficient to explain the limited amount of services off-shoring found at the industry and firm levels. Services off-shoring may appear small in the aggregate at the moment, but there can be significant adverse effects on the sectors, geographic regions and individuals directly impacted. A more complete understanding of these economic impacts and the future size and scope of services off-shoring will require more detailed and better data.

What additional data are needed to provide a more complete assessment of U.S. off-shoring?

The analysis of industry- and micro-level data to estimate the extent of services off-shoring encountered a number of data gaps and data quality issues. The key data issues involved:

- Improving the consistency, completeness and coverage of BEA's data on services imports.

- Providing longitudinal occupational data through a revised or restructured BLS survey.

- Developing consistent business identifiers to link information from several statistical agencies with different business organizational levels.

These key data issues and others—summarized in Chapter 7—impede a complete assessment of the extent and impact of services off-shoring. The Panel supports current BEA initiatives to collect more consistent, detailed data on services imports and to improve its coverage of services importers. The Panel recommends additional improvements to address other data gaps and quality issues. These improvements and the resources to achieve them are needed *now* to better understand the extent of services off-shoring and its economic impacts before the phenomenon becomes more widespread.

Many of these findings and recommended data improvements have been reinforced by a recent report issued by the services off-shoring working group of the Industrial Performance Center at the Massachusetts Institute of Technology. That working group recommended that the federal statistical agencies collect more detail on international trade in services, publish time series data on employment by occupation and provide access to more micro-level data resources.[1]

This Panel Message presents the major findings and recommendations contained in this report. It also describes the methodologies used to estimate the extent of services off-shoring and outsourcing. Individual chapters contain the underlying analysis supporting these findings and recommendations.

[1] Industrial Performance Center at MIT, *Services Off-shoring Working Group Final Report*, September 2006.

METHODOLOGY

In its first report, the Panel found little consensus among prior studies regarding the extent and economic effects of services off-shoring. Disparity stemmed from many factors, including the lack of a commonly accepted definition; different time periods and industries covered; the variety of data and methodologies used, some with uncertain reliability; the wide range of potential economic impacts and entities affected; and the inherent difficulty in measuring off-shoring and estimating its impacts.

Most of these studies used publicly available industry-level data to examine services off-shoring and its economic impacts, principally employment effects; few used micro-level or firm data. Furthermore, none attempted to link data at the micro-level from the major statistical agencies that collect trade and employment data. This may have reflected difficulties in obtaining access to confidential data, as well as the lack of explicit agency agreements or memoranda of understanding to share such data consistent with provisions of the 2002 Confidential Information Protection and Statistical Efficiency Act (CIPSEA).

The Panel concluded that additional analysis of micro-level data was needed since off-shoring decisions reflect strategic business choices made by individual U.S. firms. This analysis also would avoid aggregation problems likely to occur with industry-level data since not all firms within an industry are likely to engage in services off-shoring. Given resource and time constraints, this research focused on a limited number of industries that were significant in size, potentially susceptible to services off-shoring, diverse, well integrated into the overall economy, and likely to continue expanding. The Panel selected the following industries[2]:

- pharmaceutical and medicine manufacturing [3254],
- architectural, engineering and related services [5413],
- computer systems design and related services [5415], and
- business support services [5614].

Three of the four are services industries, reflecting their increasing role in the U.S. economy and responding to growing concerns about services off-shoring.

The micro-level research, together with additional industry-level research, had several objectives. The key ones were to:

[2] The U.S., Canadian and Mexican statistical agencies use a common North American Industrial Classification System (NAICS) to identify industries at varying levels of detail. The most aggregate or highest level—the 2-digit level—distinguishes among 19 goods and services producing sectors, such as durable manufacturing and business and professional services. The most detailed level—the 6-digit level—contains more than 1,170 distinct industry categories. The industries the Panel selected are at the intermediate, 4-digit level to assure that the activities are sufficiently similar within reasonably sized sectors. The 4-digit NAICS codes are provided in parentheses.

- Develop estimates of the extent and impact of services off-shoring.

- Assess the adequacy of currently available micro- and industry-level data to produce such estimates.

Reflecting the decision to use both industry- and micro-level data, the Panel used different methodologies to achieve these key objectives. This approach acknowledged the complexity of off-shoring, its varied economic effects and the inherent difficulty in measuring them.

Distinguishing outsourcing from off-shoring

In its first report, the Panel found that the varied terms and definitions used in previous studies had unnecessarily complicated understanding of off-shoring. To simplify the discussion and enhance understanding, the Panel recommended using three basic terms and definitions:

> *outsourcing*—firms contracting out service and manufacturing activities to unaffiliated firms located either domestically or in foreign countries
>
> *off-shoring*—U.S. firms shifting service and manufacturing activities abroad to unaffiliated firms or their own affiliates
>
> *off-shore outsourcing*—a subset of both outsourcing and off-shoring in that it refers only to those service and manufacturing activities of U.S. companies performed in unaffiliated firms located abroad[3]

Outsourcing reflects a strategic business decision to restructure current operations and rely on an independent third-party supplier to provide some services or goods components that had previously been produced within the firm. When outsourcing occurs between domestic firms, the production of that intermediate product or service and associated jobs shift from the restructuring firm to the new supplier. Although total U.S. employment may not change, employees of the restructuring firm holding those shifted jobs will lose their current ones. At the same time, the new supplier of the outsourced activity will seek new workers as it expands its business operations. Businesses make outsourcing decisions for numerous reasons; the key ones are to increase efficiency, reduce costs or both. Off-shoring decisions, often made for the same reasons as outsourcing, are conceptually distinct and can have different economic impacts.[4]

Two types of off-shoring

The Panel's definition of off-shoring is sufficiently broad to encompass two distinct types of off-shoring:

[3] National Academy of Public Administration, *Off-Shoring: An Elusive Phenomenon.* January 2006, p 38.
[4] See *Off-Shoring: An Elusive Phenomenon*, Chapter 2, ps. 8-10 for a more complete discussion of the differences between outsourcing and off-shoring and the reasons for each.

1. **Off-shoring due to business restructuring.** Results from a business' decision to restructure all or part of its internal production processes and to obtain those restructured intermediate inputs from a foreign supplier.

2. **Off-shoring due to global expansion.** Arises from a business' decision to expand its operations or production activities globally.

The review of previous studies found an almost exclusive focus on the first type. Yet both types are conceptually distinct, have substantially different economic effects and require different indicators and data to identify their scope and impact. Services off-shoring due to business restructuring involves a change in the mix of services used in the firm's operations between internally provided and foreign supplied services. A critical issue for this type of services off-shoring is the direct employment effects from substituting imported services for internally provided services.

Services off-shoring due to global expansion involves a reallocation of a firm's total services output between its domestic and foreign operations. This type of off-shoring occurs only among firms that are multinational corporations (MNCs) and the direct employment effects are less certain than those from business restructuring off-shoring. Global expansion off-shoring may involve no decline in the current operations of the U.S. MNC parent when the firm chooses to meet growing overseas demands through overseas expansion, rather than increased U.S. exports. If foreign affiliate production substitutes for exports, this type may only forego future growth in exports and associated domestic employment. Alternatively, an expansion in foreign affiliate sales may provide access to new markets that would not otherwise be served by exports. This could complement MNC parent operations supporting an increase in parent (and U.S.) employment.

Indicators of Outsourcing and Off-shoring

Outsourcing and off-shoring due to business restructuring involve changes in the mix of inputs used by the firm in its business operations. Thus, indicators for these activities should include outsourced or off-shored inputs relative to a firm's total inputs. Most previous studies used the ratio of purchased services inputs relative to total services inputs or total inputs as indicators. This report used that same indicator for services outsourcing—purchased services inputs relative to total inputs—except where data limitations required a less precise indicator.[5] For services off-shoring, the preferred indicator would have been the percent of purchased services inputs imported. However, data limitations required the use of less precise indicators. For industry-level analyses, the services off-shoring indicator was the ratio of total services imports relative to total intermediate inputs; for the micro-level analyses, the indicator was essentially the same—total services imports relative to total purchased inputs.

Global expansion off-shoring involves a redistribution of a MNC's output between the domestic parent and its foreign affiliates. Because an indicator must compare affiliate production relative to parent output, the indicator used here was the comparison of growth rates of the MNC parent's

[5] See discussion in Chapter 6 explaining the use of a less precise indicator for services outsourcing—total outsourcing = total purchased inputs relative to total sales.

total sales and sales of services relative to their foreign affiliates. A faster rate of growth in affiliate activities implies an increase in the affiliates' share of total MNC activities. This would reflect a redistribution of MNC output consistent with global expansion off-shoring.

Data Sources

The industry-level analyses in Chapters 3-5 examine off-shoring due to business restructuring. They use publicly available data from BEA input-output (I-O) use tables and the Bureau of Labor Statistics' (BLS) Occupational Employment Statistics (OES) surveys to estimate services outsourcing and off-shoring by industry sectors and changes in employment, including changes in occupational mixes, within those sectors. Although this methodology is consistent with that used in several previous studies, current research examines different time periods (e.g. post-1997 to use NAICS rather than Standard Industrial Classification categories); employs different techniques (e.g. use of OES data to assess services outsourcing or off-shoring); or combines different data sets (e.g. link BLS occupational employment data from the OES program with BEA I-O and trade data) to identify distributional employment effects.

The micro-level analysis presented in Chapter 6 uses BEA survey data on the financial operations of MNC parents and their foreign affiliates, as well as other international transactions between unaffiliated parties, to identify the extent of services off-shoring for MNCs due to business restructuring and global expansion. Data limitations required the use of less precise indicators of services off-shoring than the Panel would have preferred. As discussed below and in Chapter 7, the net effect of these data limitations was a likely understated extent of services off-shoring from business restructuring for both the industry- and micro-level analyses.

FINDINGS

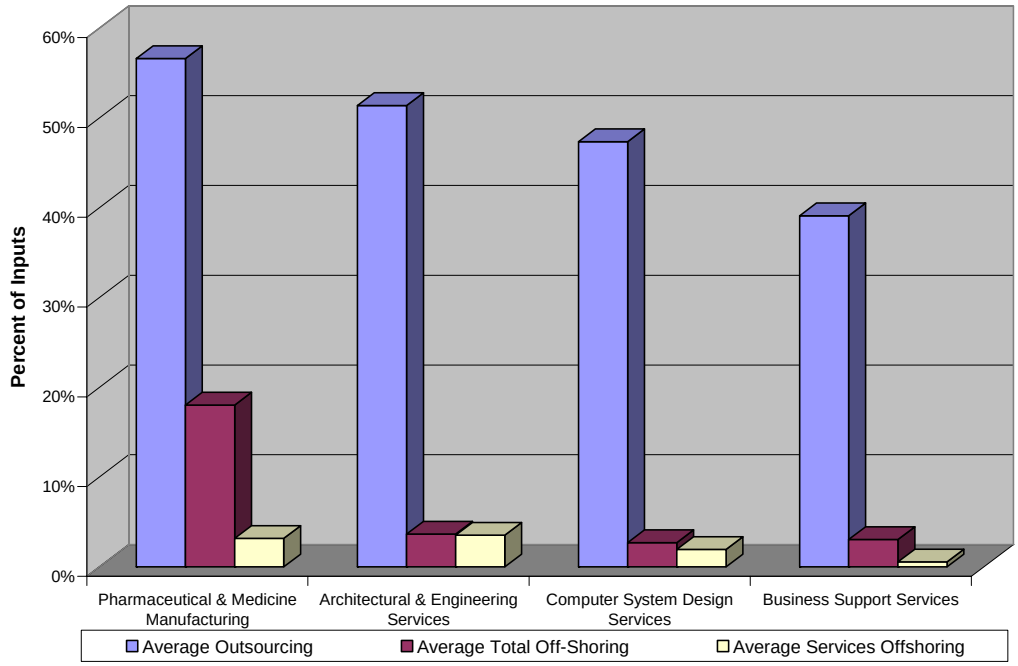
Extent of Services Off-Shoring and Outsourcing

Chart 1 shows the average outsourcing, total off-shoring and services off-shoring due to business restructuring from 1999 to 2003 for MNC parents in each of the four industries examined in Chapter 6. Each indicator is expressed as a percent of inputs used.[6] This chart compares the period average of services off-shoring to both total off-shoring and total outsourcing since data limitations precluded estimates of services outsourcing.

Charts 2 and 3 show estimated services off-shoring and services outsourcing as a percent of total inputs for the industry sectors from Chapter 3 that are comparable to the four MNC industries examined. For each MNC industry group or comparable aggregate industry sector, services off-shoring represented only a small fraction of services outsourcing.

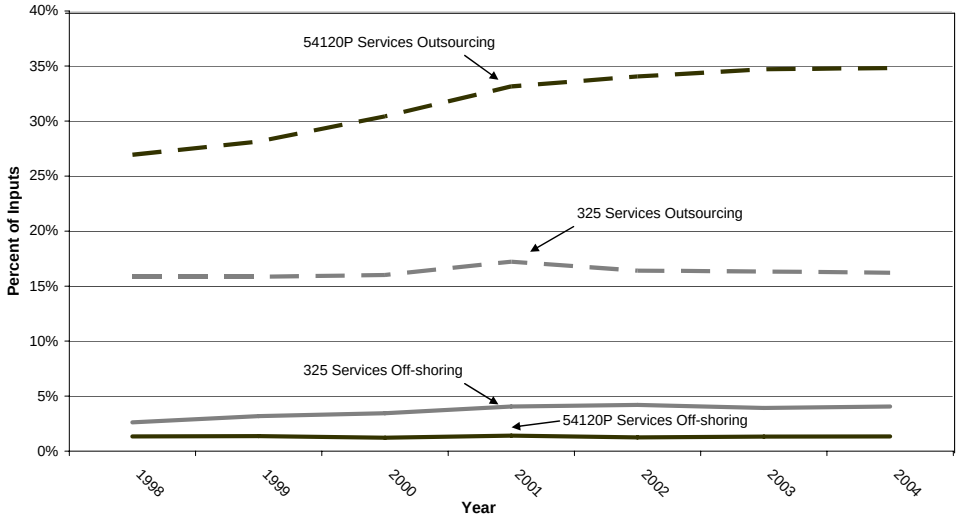
[6] More precisely, the services off-shoring indicator is services imports relative to total purchased inputs; the total off=shoring indicator is goods and services imports relative to total purchased inputs, and the outsourcing indicator is total purchased inputs relative to total sales which is a proxy for total inputs. See Chapter 6, development of key indicators pp. 6-7.

Chart 1: Average Outsourcing and Services Off-Shoring for MNCs in Selected Industries



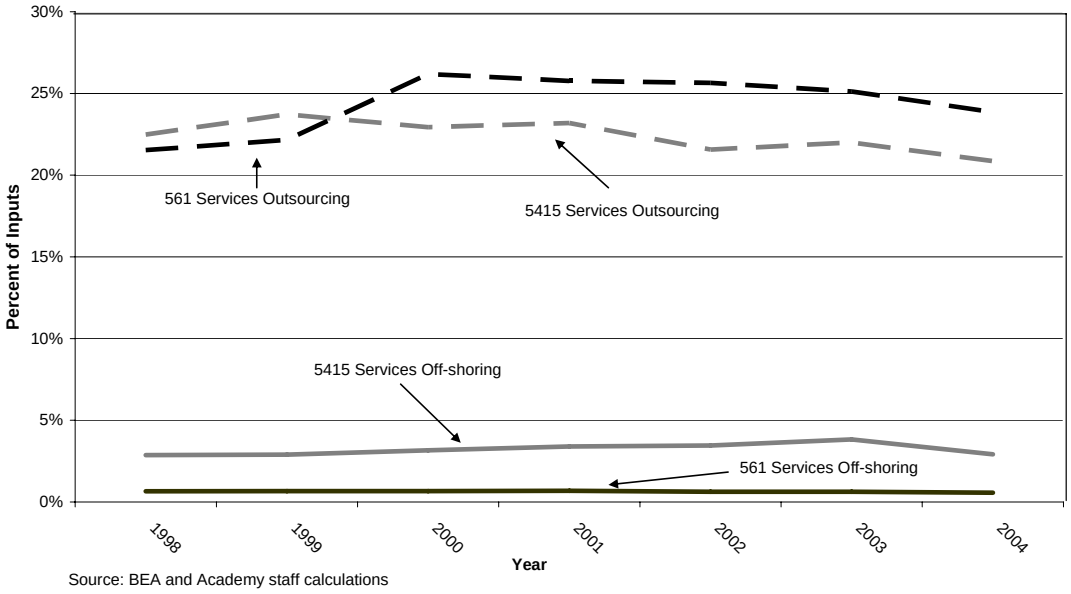
Source: Bureau of Economic Analysis

Chart 2: Services Outsourcing and Off-Shoring for Chemical Industry (325) and Miscellaneous Professional Services Industry (5412OP): 1998 – 2004



Source: Bureau of Economic Analysis

Chart 3: Services Outsourcing and Off-Shoring for Computer Systems Design [5415] and Administration and Support Services (561): 1998 – 2004



Source: BEA and Academy staff calculations

The industry-level analysis in Chapter 3 also showed a substantial range in the industry services off-shoring and outsourcing indicators from 1998 to 2004 for the 65 industry sectors examined.[7] Services outsourcing was substantially greater than services off-shoring for all industry sectors, ranging from 1.5 to more than 10 times larger. In addition, services off-shoring tended to be greater for manufacturing industries while services outsourcing appeared greater for services industries. Services industries accounted for nine of the 10 industries with the greatest services outsourcing, but only three were among the ten with the greatest services off-shoring.

The Panel recognizes that data limitations encountered during this analysis could affect some results, especially if the impact was primarily in one direction. Unfortunately, several limitations—the likelihood that U.S. import data understated services imports and the inability to use purchased services inputs in the services off-shoring indicator for MNC parents—suggest that services off-shoring indicators for the micro- and industry-level analyses are underestimated. The extent could not be ascertained, but the Panel believes it was not likely to account for an appreciable extent of the differences between services off-shoring and outsourcing shown in the charts using industry- and micro-level data.

[7] This more comprehensive industry-level analysis confirmed that the results obtained for the four industries selected for detailed examination were consistent with those occurring across the full spectrum of 65 industry groups in the I-O tables.

For services off-shoring due to business restructuring, the Panel finds that the level of services off-shoring among MNC parents in the industries reviewed has been small during the 1999 to 2003 period. At the aggregate-level, services off-shoring levels have also remained small for comparable industry groups and most other industry sectors during the 1998 to 2004 period.

The Panel finds that services outsourcing to domestic firms has been substantially larger than services off-shoring for the industry groups examined during the 1998 to 2004 period.

The Panel finds that outsourcing and total off-shoring have been substantially larger than services off-shoring for the MNC parents examined during the 1999 to 2003 period.

One reason for the limited extent of services off-shoring among the MNC parents reviewed is that only a small number of them imported services during the 1999 to 2003 period. Among the entire universe of roughly 3,600 MNCs, about 16 percent did so. For the four industries examined, the percentage of MNC parents importing services in any year varied from 14 to 30 percent except for two groups. For those with sales concentrated in the pharmaceutical and medicine manufacturing industry, the percentage of services importers varied from 34 to 45 percent. For MNCs with limited (non-concentrated) sales in business support services, the percentage ranged from 29 to 50 percent. These findings are consistent with some previous studies, but they are contrary to some popular perceptions.

Outsourcing and Services Off-Shoring Varies Among Industries

Although the overall extent of services off-shoring may be less than some expect, its growth and impact on individual groups and sectors must be examined to ascertain any appreciable distributional effects. Both the micro- and industry-level data reveal substantial variation in the levels of services off-shoring and outsourcing across specific industries.

The analysis in Chapter 6 and the data in Chart 1 indicate the differences in the level of services off-shoring, total outsourcing and total off-shoring for MNC parents in the four industries examined. For those in business support services, the rate of services off-shoring was one-half to one-quarter as large as that for those in the other three industries from 1999 to 2003. Chart 1 shows that total off-shoring of goods and services was about 6 times larger for parents concentrated in pharmaceutical and medicine manufacturing than in the three services industries. The industry-level analysis in Chapter 3 showed similar variations among the four comparable industry sectors (see Charts 2 and 3). For example, services off-shoring for the chemical industry from 1998 to 2004 was two to three times greater than the miscellaneous professional scientific and technical services sector and more than four to six times greater than the administrative and support services sector.

The Panel finds that the extent of outsourcing and services off-shoring varies substantially among the MNC parents and industries examined over the 1999 to 2003 and 1998 to 2004 periods.

This substantial variance may help to explain some of the differences found in previous studies that examined different industries.

Growth In Services Off-Shoring And Outsourcing

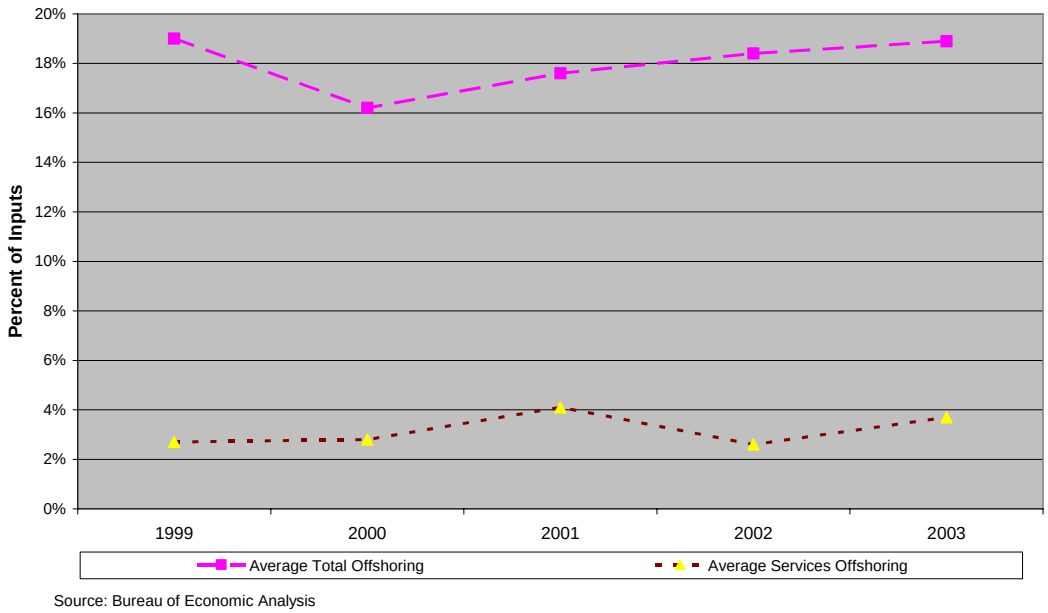
Both the industry- and micro-level analyses examined growth in services off-shoring and outsourcing over their respective time periods, an area of particular concern even if current services off-shoring levels were relatively small.[8] At the industry level, growth rates for services off-shoring were calculated over the 1998 to 2004 period and industries ranked based on those growth rates. Manufacturing industries had most of the higher growth rates in services off-shoring, while the services industries generally had very low levels and growth. Ten of the 65 industries had annual growth rates of 10 percent or more; seven of them were manufacturing. Eight of the 65 industries had declining growth rates, with annual changes ranging from 0.7 percent to 9.5 percent. Several key services industries experienced a decline in services off-shoring over this period, including computer systems design and related services and miscellaneous professional, scientific and technical services. The median services off-shoring annual growth was 4.6 percent for the 65 industry sectors over this period.

There was little correlation between the growth in services off-shoring and services outsourcing at the industry level during the period. Industries with the fastest growth in services off-shoring generally were not the ones with the fastest growth in services outsourcing. Only two of the 10 industries with the fastest growth in services off-shoring were in the top ten for services outsourcing growth.[9]

[8] Data limitations prevented estimating services outsourcing for MNCs. Only total outsourcing estimates could be developed as explained in Chapter 6.

[9] The industry-level analyses in Chapter 3 ranked industries by their growth in services off-shoring and services outsourcing. The correlation between these two rankings was only 0.09, a very small and insignificant positive correlation.

Chart 4: Average Total and Services Off-shoring Rates for MNC Parents in Pharmaceutical and Medicine Manufacturing (1999 to 2003)



Source: Bureau of Economic Analysis

Chart 5: Average Total and Services Off-Shoring Rates for MNC Parents in Architectural and Engineering Services

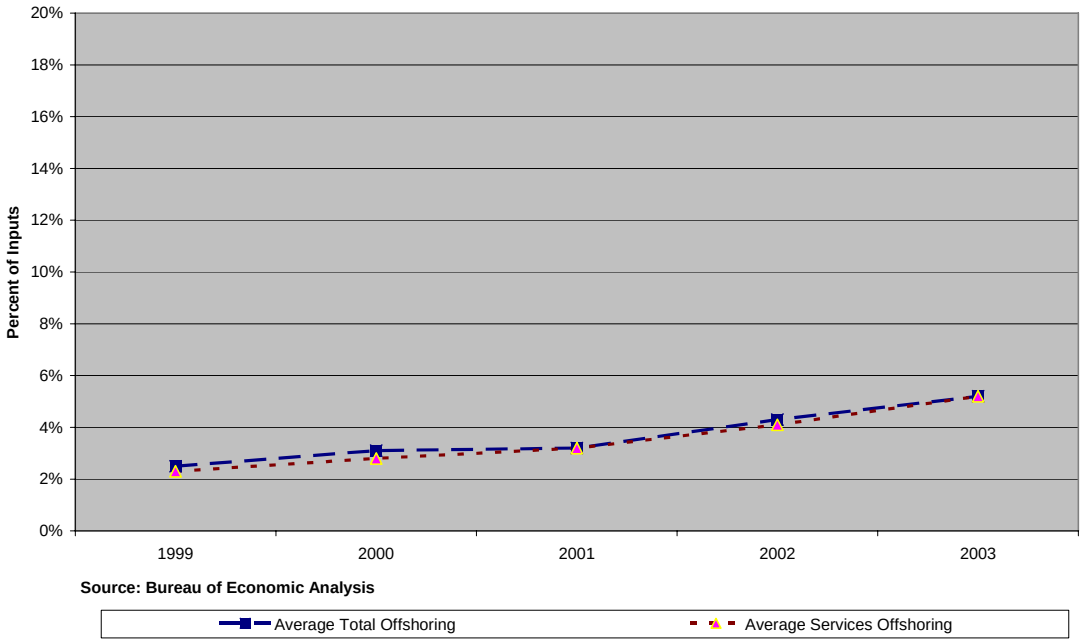
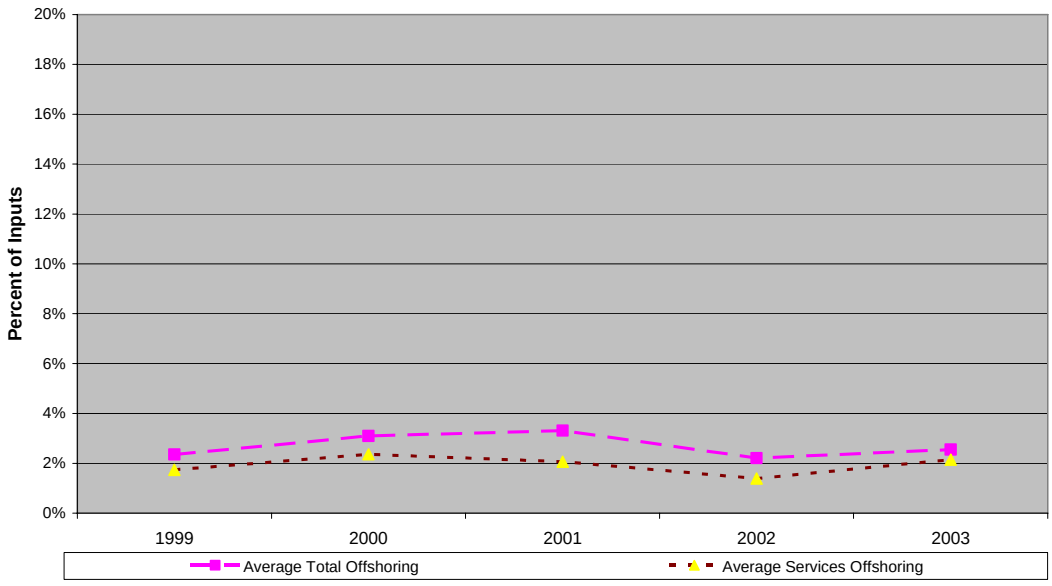
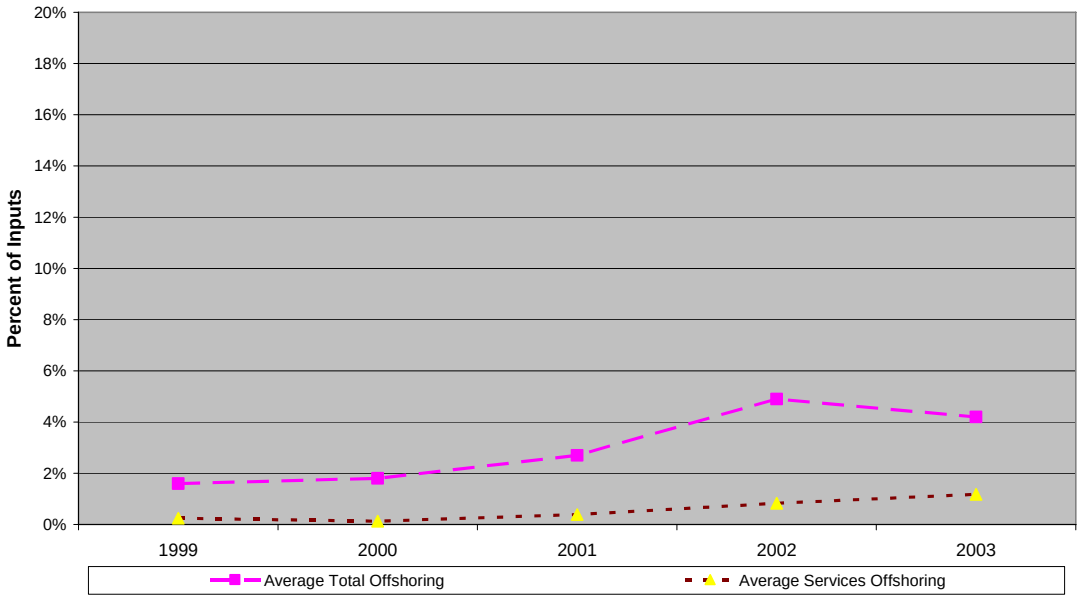


Chart 6: Average Total and Services Off-Shoring Rates for MNC Parents in Computer Systems Design (1999 to 2003)



Source: Bureau of Economic Analysis

Chart 7: Average Total and Services Off-shoring Rates for MNC Parents in Business Support Services (1999 to 2003)



Source: Bureau of Economic Analysis

For MNC parents in the four industries examined, Charts 4-7 show total off-shoring and services off-shoring as a percent of purchased inputs from 1999 to 2003. These charts suggest slight growth in average services off-shoring in one or two of the industries (e.g. engineering and business support services), but no consistent, substantial growth in services off-shoring among all four industries. For this micro-level analysis, the shorter time period and limited sample sizes for some of the MNC sub-groups raised concerns about the susceptibility of group averages to distortion from small sample effects. Chapter 6 describes the alternative statistical technique[10] used to ascertain and estimate significant trends in MNC parents' outsourcing or services off-shoring. The micro-level results indicated that in only one of the eight MNC industry groups examined[11]—pharmaceutical and medicine manufacturing—did the parents experience significant growth in services off-shoring.

> **The Panel finds little evidence of consistent growth in services off-shoring from business restructuring among MNC parents in the industries examined from 1999 to 2003. The same is true at the aggregate level for comparable industry groups from 1998 to 2004.**

This finding is consistent with the mixed results found when comparing growth rates for services off-shoring among the 65 industry sectors from 1998 to 2004 using industry-level data. As the data in charts 2 and 3 indicate, there does not appear to be any obvious growth trend in services off-shoring for those industry sectors comparable to the four MNC industries examined. This lack of consistent growth in services off-shoring from business restructuring during these limited periods does not preclude future growth emerging over a longer time period. In fact, the substantially higher levels of services outsourcing indicate the potential for future growth in this area.

Differences Between Firms Off-Shoring Services and Those Not Off-Shoring Services

Chapter 6 compared MNC parents' off-shoring services from 1999 to 2003 with others in the same industry using descriptive characteristics and financial measures to ascertain substantial differences. The comparisons included the number and size of MNCs (by employment levels) and a range of financial variables, including total sales, value-added, employment, employee compensation, average employment compensation, total sales per employee, total imports, net income and capital expenditure (property, plant and equipment spending). As a result:

[10] As noted in the chapter, semi-log regressions were estimated for pooled cross-section and time series data for each MNC parent sub-group to determine whether any statistically significant trends existed for the services off-shoring or outsourcing indicators. The results showed both positive (growth) and negative (decline) values for the services off-shoring coefficient for the eight MNC groups tested. The coefficients ranged from -0.14 to 0.22, with a median of 0.034, but only one of them was statistically significant.

[11] Although only four industries were examined, we were able to develop two sub-groups of MNC parents within each industry based on the industry distribution of their sales. MNC parents with the preponderance of their sales in one of these industries were considered concentrated in the industry; MNC parents with some sales in one of these industries, but the preponderance in another industry, were considered non concentrated in these industries.

The Panel finds that MNC parents off-shoring services appear to be larger, account for disproportionate amounts of total sales and net income and have higher sales per employee than MNC parents not off-shoring services in the same industries and sub-groups.

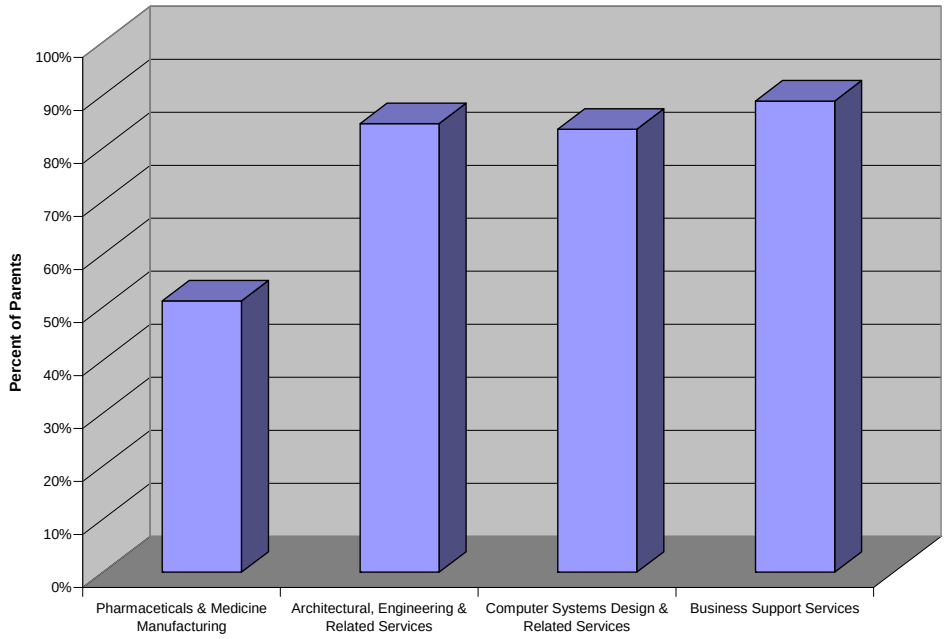
Global Expansion Off-Shoring

The analyses in Chapter 6 examined differences in growth rates for total sales and services sales between MNC parents and their foreign affiliates in the four industries reviewed. This was done to determine whether services off-shoring due to global expansion could be detected. The evidence is mixed based on industry averages over this period. Foreign affiliate sales increased faster than parent sales in three of the industries, but sales for parents concentrated in architectural, engineering and related services grew faster than foreign affiliate sales over the 1999 to 2003 period. Analysis of the distribution of affiliate sales by industry, customer and market destination indicated that:

- U.S. foreign affiliates often were concentrated in a variety of different industries than their parents. Computer system design and related services was the only group with the majority of affiliates classified in the same industry as the parents. A greater diversification of activities appears to be one result of overseas expansion.

- For all four MNC parent industries, the majority of U.S. foreign affiliate sales were to unaffiliated customers in their local foreign market. Very few affiliate sales were imports to the United States, either to the parent or third parties.

Chart 8: MNC Parents with Faster Foreign Affiliate Sales Growth 1999 to 2003



Source: Bureau of Economic Analysis.

Chart 8 shows the percentage of MNC parents concentrated in these four industries whose foreign affiliate sales grew faster than their own from 1999 to 2003. In all four industries the majority of MNC parents had faster affiliate than parent sales. For the three services industries, over 80 percent of the parents had faster affiliate sales growth. The analysis in Chapter 6 also indicated that the vast majority of these parents (from 76 to over 88 percent) had increased parent sales during this period. This contrasts with the limited percent of MNC parents importing services over this same period and thus off-shoring services due to business restructuring. Services off-shoring due to global expansion appears much more common among the MNC parents in the four industries examined during the period.

The Panel finds that services off-shoring due to global expansion was more prevalent among MNC parents in the four industries studied than services off-shoring due to business restructuring during the 1999 to 2003 period.

DATA ISSUES AND RECOMMENDATIONS

Two types of data issues were encountered when developing estimates of the extent of services off-shoring: basic data gaps and data quality concerns. The former reflected the absence of key data elements, while the later involved discrepancies in reported data and their timeliness.

Chapter 7 examines these data issues and their effect on the ability to estimate the extent and impact of services off-shoring. Data gaps and quality concerns reflect the inherent complexity of the off-shoring phenomenon and challenges that federal statistical agencies face in developing and collecting services data. The Panel commends BEA and BLS for their initiatives to improve the quality, timeliness and completeness of their data with the resources available to them. The Panel also greatly appreciates the full cooperation, support and responsiveness both agencies provided during this review.

Contemplating approaches to address these data issues, the Panel weighed several considerations:

- Not all data issues were equally important to improving the understanding of the extent and impact of services off-shoring.
- Addressing some data issues could also help to resolve other data problems.
- Any proposed change would require resources to implement and could impose additional costs and reporting burdens on survey respondents.
- Some recommendations appeared easier or less costly to implement than others.
- It is likely that some recommendations could be implemented more quickly than others.
- Addressing some data gaps and quality issues would have significant implications for a broader set of economic, financial or statistical policy issues.

- Several possible recommendations are being considered or actively pursued by the agencies themselves.

The Panel's recommended improvements and changes to the current data collection system attempt to balance these considerations. The Panel's key recommendations focus on three critical areas:

1. Improving the consistency, completeness and coverage of BEA data on services imports,

2. Providing longitudinal occupational data through a revised or restructured BLS survey.

3. Developing consistent business identifiers to link information from several statistical agencies with different business organizational levels.

These key recommendations are similar to several recommendations contained in the September 2006 report of the services off-shoring working group of the Massachusetts Institute of Technology's Industrial Performance Center. Additional Panel recommendations concerning data needs are organized by the principal responsible statistical agency.

Key Data Improvements for BEA

- **Collect consistent levels of detail for affiliated as unaffiliated services imports.**

BEA uses various surveys to collect services import data. Currently, the BEA annual survey for unaffiliated services imports (BE-22 or the benchmark survey BE-20) collects more detailed data on the types of services imported than are collected for affiliated services imports in its quarterly surveys of MNCs and their transactions with foreign affiliates (BE-577). Because of these differences, the micro-level analysis of services off-shoring could use only total services imports to develop estimates of services off-shoring among MNCs. This did not prevent developing some initial total services off-shoring estimates, but it did preclude detailed analysis of the types of services being off-shored by the MNC parent. Moreover, inconsistent categories of services imports—particularly the greater detail available for unaffiliated imports—may help to explain the different treatment of affiliated and unaffiliated imports in BEA I-O tables.

More detailed and consistent data on types of affiliated and unaffiliated services imports could provide greater insight on the economic impacts of services off-shoring. Specifically, they would improve estimates of specific occupational impacts by providing a more direct linkage with specific, detailed services industries and occupations used to produce them. BEA has a proposal under consideration to establish comprehensive and uniform coverage between its collection of affiliated and unaffiliated services. This will entail simplification and consolidation of minor categories of unaffiliated services imports, and then consistent collection of remaining detailed services categories for both types of imports.

The Panel recommends that BEA should implement its proposal to collect consistent levels of detail for affiliated and unaffiliated services imports and periodically review the collection to ensure that it is comprehensive and compatible with details on services contained in other economic data.

This change will improve understanding of the types of services being off-shored and the implications for particular occupations. Using the same survey forms to collect detailed affiliated and unaffiliated services imports also should eliminate BEA's use of different company identifiers for MNCs' importing both types and facilitate merging these data electronically. The Panel recognizes that BEA will have to extend the level of detail on services imports as more detailed data on services are developed for the U.S. economy. An example is the current effort led by the U.S. Census Bureau to develop a hierarchical product code system for domestic services through the North American Product Code System (NAPCS).

- **Improve sampling coverage of U.S services importers.**

The Panel agrees with BEA that improving current mailing lists will require more than access to a consistent set of business identifiers with common current addresses, as recommended below. BEA's agreement with Census to add a question to the annual Company Organization Survey (COS) to identify firms that are importing services is a useful step. This should result in improved BEA survey coverage of services importers among large multi-establishment firms, though BEA could consider other efforts to improve its mailing list.

The Panel recommends that BEA should assess the effectiveness and impact of the additional COS question and continue to seek ways to improve its survey of services importers.

This would include working with other federal agencies surveying particular service activities to determine whether information on imports of those specific services would useful to that agency. An alternative source of specific service imports would help BEA assess the adequacy of its survey coverage in this area.

Key Data Improvements for the U.S. Statistical System

- **Develop consistent business identifiers.**

CIPSEA was designed to establish consistent protection for confidential information collected by federal statistical agencies and provide increased opportunities to share data for statistical purposes among those agencies through written agreements. Efforts to link micro-level data across agencies may be impeded by the different systems used by the three major statistical agencies—BEA, BLS and Census—for identifying business firms or establishments within their respective jurisdictions. The lack of an accessible, comprehensive and consistent business register has contributed to numerous data gap and quality issues affecting the ability to estimate the extent and impacts of services off-shoring.

The Panel recognizes that each agency needs data from business entities at different organizational levels to meet specific information requirements at varying time intervals. However, a consistent set of identifiers for components within complex U.S. business entities would help each agency understand how the business components fit within a consolidated national or international business entity. In addition, it would retain the most advantageous features of each agency's current business identification system. Most important, consistency would facilitate data sharing that could enhance the usefulness of separately collected data in understanding major cross-cutting issues, especially services off-shoring.

> **The Panel recommends that BEA, BLS and Census should work together to develop and maintain a consistent set of identifiers for each level of organization within every consolidated business entity in the United States. This would include shared location data for various entities and consistent methodology for assigning industrial classifications to them.**

Developing a consistent set of business identifiers with common current addresses is the first step in helping BEA improve its mailing lists for services imports surveys. This change would eliminate the use of different firm identifiers for MNCs importing both affiliated and unaffiliated services, which also would be accomplished through BEA's proposal to adopt a common survey. The key advantage, however, is the impact on future data sharing and linking micro-level data across agencies. This change would improve the ability to match BEA MNC data with BLS establishment data and business establishments in the economic census, thus improving understanding of the extent and impact of services off-shoring and other cross-cutting issues.

Key Data Improvements for BLS

- **Redesign OES sample for multi-establishment firms and longitudinal analysis.**

The analyses of changes in occupational employment shares and their relation to services outsourcing and off-shoring, discussed in Chapters 4 and 5, demonstrate the importance of understanding these distributional effects for firms or industries that off-shored services. The analyses affirmed the value of examining individual firm behavior using micro-level data to estimate services off-shoring's extent and impact. They also indicated that changes in occupational structures reflect the effect of numerous economic factors, services off-shoring being one of them.

The current sampling design for the OES program produces reliable estimates of occupational employment by industry and geographic area within the United States to meet not only BLS requirements but also specific state needs as funding comes from state trust funds under the Wagner-Peyser Act. Yet the design limits analysis of occupational shifts and wage changes over time for specific firms, particularly MNCs with multiple establishments. Specifically, it is difficult to know whether any establishments matched for MNCs in the OES data are representative of all the MNC's establishments. Moreover, BLS has warned researchers and other users on its website that it "does not use or encourage the use of OES data for time series analysis."[12]

[12] BLS website, see http//www.bls.gov/oes/oes_ques.htm#Ques27.

The Panel recommends that BLS should develop additional sampling panels for its OES program to provide representation for multi-establishment firms at a national level and to support longitudinal analysis for single and multi-establishment firms.

This change would require additional resources, even if some of the additional sampling panels could be accommodated within the overall sample without sacrificing the quality and reliability of geographic and industry-level estimates. Developing the capability of longitudinal analysis at a national level can demonstrate the value of monitoring occupational shifts for particular firms over time for potential future application to specific geographical areas.

Additional Data Recommendations for BEA

- **Develop Estimates of MNC value added for services.**

The value of BEA MNC data for estimating the extent and impact of services off-shoring is diminished by the inability to distinguish purchased services inputs from all purchased inputs. The former is needed to develop indicators for the extent of MNC services outsourcing and off-shoring.

The Panel recognizes that the feasibility of modifying BEA surveys to collect these data depends primarily upon the ability of business accounting systems to supply that level of detail. Previous efforts to collect similar data have shown that business accounting systems are not able to supply such detail, making it necessary to consider other estimation efforts. One alternative is the use of detailed economic census data to develop benchmark estimates of the distribution of a MNC's value added between goods and services activities. Another is the application of more detailed benchmark I-O industry analyses to MNCs in the same industry. Although these data are not current, BEA could use historical data to project estimates if reliable, stable trends were found.

The Panel recommends that BEA should explore other available data, such as the economic census or benchmark I-O industry estimates, and estimation techniques to help allocate MNC value added between services and other activities.

- **Develop consistent accounting for affiliated and unaffiliated services imports in BEA I-O tables.**

Currently, affiliated services imports are shown separately from unaffiliated services imports and are accounted for differently in BEA I-O tables as "non-comparable" imports. The differences in the detailed services collected for unaffiliated imports precluded providing more consistent treatment. With similar details for both types of services imports, BEA staff would be able to separate affiliated services imports from the "non-comparable" import category in the BEA I-O tables and develop accounting linkages between them and unaffiliated services imports of the same type.

The Panel recommends that BEA staff should work to remove affiliated imports from the "non-comparable" imports component within its I-O tables and link them more closely with the same type of unaffiliated services.

This will require coordination between BEA industry and international staffs to ensure that accounting for affiliated and unaffiliated services imports in these I-O tables can be linked without losing information and insight currently available from each type of import.

- **Accelerate availability of MNC operating data**

BEA has taken steps to improve the timeliness of its MNC financial and operating data and unaffiliated services import data, such as exploring ways to encourage its respondents to submit data electronically using BEA's Internet filing system. However, many larger MNCs are unwilling or unable to use the system. As discussed in Chapter 6, this is particularly unfortunate because only a limited percentage of MNCs import services, and these tended to be disproportionately large, at least for the sectors reviewed in detail for this report.

Since BEA can identify MNCs that import services from its current data, BEA could focus attention on those MNCs. If this group continues to represent a relatively small percentage of all MNCs, BEA could consider reallocating resources or assigning higher priority to processing their data.

The Panel recommends that BEA should reallocate priorities and resources, if necessary, to accelerate the processing of MNC data for those MNCs importing services.

BEA could test this approach on a sample of large MNC services importers to determine the additional resources needed to accelerate the availability of services import data.

- **Collect data on imports for intermediate use.**

Closing this data gap has the potential to improve directly the indicators used to assess the extent of services off-shoring. It also appears to be the one producing the fewest effects on other broad economic issues. The cost and effectiveness of obtaining these estimates are somewhat uncertain. Moreover, BEA staff have indicated that most of the services currently imported appear to be for intermediate use. As more detailed types of services activities are developed and imported, however, the distinction between intermediate use and final demand may become increasingly important. The Panel acknowledges the conceptual difficulties posed by this type of collection effort, given the multiple and complex transactions that occur within a large and dynamic U.S. economy. This is particularly acute for the services sector relative to the manufacturing sector. As BEA has acknowledged, its MNC surveys ask respondents to distinguish intermediate use from final demand use for goods imports. Yet BEA officials stated that they have not been successful in overcoming the conceptual and measurement hurdles presented by service type imports.

The Panel recommends that BEA should consider limited sampling of MNC service importers to test their ability to distinguish particular types of services imports for their own use rather than for sale to others.

BEA industry account staff have developed an algorithm for allocating affiliated services imports to intermediate use by commodity type within the I-O tables. Once common service type categories for affiliated and unaffiliated services have been adopted and BEA staff have been able to link their accounting treatment in the I-O tables, BEA can assess the accuracy of that algorithm and determine its applicability to allocating unaffiliated services imports between intermediate and other uses among the 65 industry sectors in the I-O tables.

Additional Data Recommendations for BLS

- **Apply additional sampling criteria for the MLS program**

BLS' Mass Lay-off Statistics (MLS) program identifies major lay-off events at individual establishments and surveys those establishments to obtain more detailed information on the nature of the event. It does so by using administrative data available on unemployment insurance claimants from the comprehensive set of establishments within the Quarterly Census of Employment and Wages. MLS staff then interview employers experiencing these major events about the nature of the lay-offs. MLS is the only direct survey that asks U.S. employers whether a major lay-off at an establishment involved movement of work activity overseas. It focuses on major lay-off events that are highly disruptive to surrounding communities and involve often substantial adjustment issues for displaced employees. As a result, its targeting criteria are not aimed at detecting services off-shoring activities that are either less immediate or more dispersed throughout the firm.

Starting in 2007, BLS will obtain monthly data from states on all lay-offs, regardless of size. This more detailed universe of events provides an opportunity to use additional selection criteria for surveying firms with specific lay-offs. The Panel believes this could provide an opportunity to address future services off-shoring issues by using different criteria for some of the follow-up surveys. These criteria could include BEA MNCs that have increased services off-shoring or OES establishments that have experienced major occupational changes consistent with services outsourcing or off-shoring. To better address future services off-shoring issues:

The Panel recommends that BLS should develop additional survey criteria to target firms or establishments likely to be off-shoring or outsourcing services in a supplement to its MLS program in 2007 and future years.

This recommendation would require additional resources, but it will utilize an already planned expansion of a program that effectively combines administrative data with targeted sampling information.

- **Publish 3-digit level data on standard occupation codes.**

BLS has provided the aggregated 2- and detailed 6-digit standard occupation code (SOC) data for the OES program on its website, but it has not yet done so for the intermediate 3-digit level. Unfortunately, attempts to aggregate the 6-digit data resulted in an undercount of the actual 3-digit data, as described in Chapter 4. BLS can avoid this issue by making estimates of 3-digit SOC data sets available to the public.

> **The Panel recommends that BLS should provide OES data at a 3-digit level on its website, in addition to the 2- and 6-digit SOC levels already provided.**

While BLS staff have noted that publication of OES data at the 3-digit level may require some additional suppression of currently available 6-digit level details to avoid confidentiality issues, it is not clear how extensive this would be. This should be examined and some alternatives assessed in implementing this recommendation.

CONCLUSION

Current levels of services off-shoring may be small. But, the potential for future growth in this phenomenon can be substantial, given the extent of services outsourcing and continuing technological changes. The Panel believes it is prudent to improve existing data systems now to increase the ability to detect and monitor future services off-shoring activities and their economic impacts. More detailed and better data are needed to assess both the future size and scope of services off-shoring and any adverse effects on the sectors, geographic regions, and individuals directly impacted.

LISTING OF PANEL FINDINGS AND RECOMMENDATIONS

FINDINGS

Services Off-shoring from Business Restructuring

- The level of services off-shoring due to business restructuring among MNC parents in the industries reviewed has been small during the 1999 to 2003 period. At the aggregate level, services off-shoring levels have also remained small for comparable industry groups and most other industry sectors during the during the 1998 to 2004 period.

- Services outsourcing to domestic firms has been substantially larger than services off-shoring for the industry groups examined during the 1998 to 2004 period.

- Outsourcing and total off-shoring have been substantially larger than services off-shoring for the MNC parents examined during the 1999 to 2003 period.

- The extent of outsourcing and services off-shoring varies substantially among the MNC parents and industries examined over the respective 1999 to 2003 and 1998 to 2004 periods.

- There is little evidence of consistent growth in services off-shoring from business restructuring among MNC parents in the industries examined from 1999 to 2003. The same is true at the aggregate level for comparable industry groups from 1998 to 2004.

- MNC parents off-shoring services appear to be larger, account for disproportionate amounts of total sales and net income, and have higher sales per employee than MNC parents not off-shoring services in the same industries and sub-groups.

Services Off-shoring from Global Expansion

- Services off-shoring due to global expansion was more prevalent among MNC parents in the four industries studied than services off-shoring due to business restructuring during the 1999 to 2003 period.

DATA RECOMMENDATIONS

Key Data Recommendations for BEA

- BEA should implement its proposal to collect consistent levels of detail for affiliated and unaffiliated services imports and periodically review the collection to ensure that it is comprehensive and compatible with details on services contained in other economic data.

- BEA should assess the effectiveness and impact of the additional COS question and continue to seek ways to improve its survey of services importers.

Key Data Recommendation for Statistical System

- BEA, BLS and Census should work together to develop and maintain a consistent set of identifiers for each level of organization within every consolidated business entity in the United States. This would include shared location data for various entities and consistent methodology for assigning industrial classifications to them.

Key Data Recommendations for BLS

- BLS should develop additional sampling panels for its OES program to provide representation for multi-establishment firms at a national level and to support longitudinal analysis for single and multi-establishment firms.

Additional Data Recommendations for BEA

- BEA should explore other available data, such as the economic census or benchmark I-O industry estimates, and estimation techniques to help allocate MNC sales and value added between services and other activities.

- BEA staff should work to remove affiliated imports from the “non-comparable” imports component within its I-O tables and link them more closely with the same type of unaffiliated services.

- The Panel recommends that BEA should reallocate priorities and, if necessary resources, to accelerate the processing of MNC data for those MNCs importing services.

- BEA should consider limited sampling of MNC service importers to test their ability to distinguish particular types of services imports for their own use rather than for sale to others.

Additional Data Recommendations for BLS

- To better address future services off-shoring issues, BLS should develop additional survey criteria to target firms or establishments likely to be off-shoring or outsourcing services in a supplement to its MLS program in 2007 and future years.

- BLS should provide OES data at a 3-digit level on its website, in addition to the 2- and 6-digit SOC levels already provided.

SECTION II

RESEARCH AND ANALYSIS

CHAPTER 1

INTRODUCTION

This is the second of a three part series of Academy Panel reports under a grant from the Bureau of Economic Analysis (BEA) in the Department of Commerce to conduct a comprehensive study of off-shoring. Public Law 108-447 gave BEA the authority and funding for the grant. BEA issued the grant to the Academy in February 2005 and the Panel held its first Panel meeting in March 2005 to review background materials, obtain agency perspectives on off-shoring issues from the three key federal statistical agencies—BEA, the Bureau of Labor Statistics (BLS) and the Census Bureau—and establish an overall work plan.

OBJECTIVES OF THE ACADEMY OFF-SHORING STUDY

The issue of businesses shifting some of their activities to foreign (off-shore) locations and the effects of these shifts on the U.S. economy and individual workers is not new. However, "current concerns over off-shoring emphasize the loss of service-sector, white-collar, and high-technology jobs, rather than heavy manufacturing jobs previously the focal point of public debate about international trade's benefits and costs."[13] Several studies of this recent off-shoring phenomenon cite the role of technology, improved international telecommunications, the growth and expanded use of the internet, improved and standardized software applicable to a range of business activities and the increased digitization of business services as key factors expanding the scope of off-shoring activities into a broader group of industries and occupations. Traditional concerns about the impact of trade on manufacturing industries and blue-collar jobs have evolved to new concerns about the impact of off-shoring on high-tech services industries that have previously been considered less susceptible to off-shoring. The slow employment recovery from the 2001 recession and the adverse distributional employment effects on certain high-tech occupations (e.g., computer programmers) reinforces these new concerns.

With that background in mind, the Academy and BEA agreed that this off-shoring study needed to address the following key issues:

1. How should off-shoring be defined?

2. What do currently available data indicate about the extent of U.S. off-shoring?

3. What additional data are needed to provide a more complete assessment of U.S. off-shoring?

4. What factors account for current U.S. off-shoring? And

[13] National Academy of Public Administration, *Off-shoring: An Elusive Phenomenon.* January 2006, p. 7.

5. What are the major impacts of off-shoring on U.S. workers and the economy and implications for the educational system?

The Panel addressed the first and fourth issues in the first report—*Off-shoring: An elusive Phenomenon*—released in January 2006. This second report focuses primarily on the second and third issues, while the final report will address the broader policy concerns raised in the last issue.

KEY ELEMENTS OF THE FIRST REPORT

In its first report, the Academy Panel developed a conceptual framework to help understand the inherently complex issues involved in measuring and assessing the impacts of off-shoring, especially off-shoring of services. Any attempt to measure the extent and impact of services off-shoring had to combine different U.S. labor market and international trade perspectives. The significance of services off-shoring activities and their economic effects had to be assessed relative to other economic changes affecting the U.S. labor market and international trade. As the first report noted, "off-shoring is one of the structural sources of job shifts in a dynamic labor market that creates and destroys between 7 and 8 million jobs a quarter."[14]

In summarizing the results of numerous previous studies addressing different aspects of services off-shoring, the Panel found little consensus among them about the extent and impact of services off-shoring. The disparity and intensity of viewpoints stem from many factors, including:

- the lack of a commonly accepted definition;
- differences in how the phenomenon has been reviewed;
- varied reliability of data and their use;
- the wide range of potential economic impacts and entities affected; and
- the inherent difficulty in measuring off-shoring and estimating its impacts.

The Panel also found that the multiple terms used to describe off-shoring unnecessarily complicated any understanding of the phenomenon. To simplify the discussion and enhance understanding, the Panel recommended using three basic terms: "outsourcing," "off-shoring" and "off-shore outsourcing" and defined them as follows:

> "**Outsourcing—firms contracting out service and manufacturing activities to unaffiliated firms located either domestically or in foreign countries;**
>
> **Off-shoring—U.S. firms shifting service and manufacturing activities abroad to unaffiliated firms or their own affiliates;**

[14] Ibid., p. 29.

Off-shore outsourcing—a subset of both outsourcing and off-shoring in that it refers only to those service and manufacturing activities of U.S. companies performed in unaffiliated firms located abroad."[15]

The Panel recognized that its definition of off-shoring was broader than many others that limited off-shoring to particular activities (e.g. IT enabled services), or to shifts in activities only to certain foreign areas (e.g. low wage developing countries). However, the broad definition was consistent with the Panel's four selection criteria and was also very similar to the definition of movement of work used by BLS in its Mass Lay-off Survey (MLS) program. The Panel expected this broad definition would avoid ambiguities from artificial distinctions or changes over time created by the narrower definitions used by others.

Most of these previous off-shoring studies used a variety of publicly-available industry-level data to examine the extent of services off-shoring and evaluate its economic impacts, principally the employment effects; few used confidential micro-level (firm) data. Further, none attempted to link data at the micro-level from the major statistical agencies that collect trade and employment data. This may have reflected difficulties in obtaining access to these confidential data or the lack of agreements or memoranda of understanding (MOU) to share such data as provided in the Confidential Information Protection and Statistical Efficiency Act of 2002 (CIPSEA).

The Panel concluded that linking micro-level employment and trade data was critical to assessing the adequacy of available data for estimating the extent and effects of off-shoring, since individual firms make these strategic services off-shoring decisions. Given resource and time constraints, the micro- level research had to focus on a limited number of industries that were significant in size, potentially vulnerable to off-shoring, sufficiently diverse, well integrated into the overall economy, and likely to continue expanding. The Panel selected the following four-digit NAICS industries:

- pharmaceutical and medicine manufacturing [3254]
- architectural, engineering, and related services [5413]
- computer systems design and related services [5415], and
- business support services [5614].

Three of the four industries selected were services industries. This was consistent with the increased role of services industries in the U.S. economy and responsive to current off-shoring concerns that focused almost exclusively on services off-shoring. The micro-level research, together with additional industry-level research, had several objectives but the key ones were to develop estimates of the extent and economic impact of services off-shoring and assess the adequacy of currently available micro- and industry-level data to produce such estimates. The results of this additional research are presented in this second report.

[15] Ibid., p. 38.

OFF-SHORING, MNCs, AND NATIONAL STATISTICAL AND ACCOUNTING SYSTEMS

In the first report, the Panel developed a conceptual framework to assess off-shoring as an economic phenomenon whose complex issues and impacts had to be considered relative to the impacts of other economic forces affecting U.S. labor markets and international trade. Chapter 7 of this report describes a number of data limitations and issues encountered while undertaking this additional research and presents some recommendations for improvements. These data limitations and proposed improvements must also be considered within the context of the U.S. decentralized federal statistical system that is unique among most other developed nations, and the role of national economic, financial and accounting data in an increasingly global world.

The decentralized federal statistical system imposes some unique challenges in attempting to work with confidential micro-level data from more than one agency. Special access is required, consistent with CIPSEA to assure that consistent, uniform procedures for protecting confidential data are followed.[16] While CIPSEA authorizes data sharing among federal agencies, this can occur only under written agreement. In this instance, BEA and BLS had to develop and execute an MOU, and BEA had to issue public notices required under CIPSEA, to permit linking BEA micro-level multinational corporation (MNC) data with BLS micro-level establishment data from the Quarterly Census of Employment and Wages (QCEW) and Occupational Employment Statistics (OES) programs. Even with the full support of both agencies, the process for completing this BEA and BLS MOU on data sharing was a lengthy one. In addition to the separate departmental legal and policy reviews, the first of the two required Federal Register notices had a 60 day comment period that had to expire before the second notice could be published. The data to be linked also had to be reviewed for confidentiality issues before any data transfer could occur. While the Panel expects that future research involving linking BEA and BLS data will be facilitated by the MOU, efforts to link micro-level data among other agencies will require specific agency MOUs to proceed.

The continued expansion of MNCs and the increasing importance of international trade and other international transactions among independent nations raises some unique challenges for accountants and statisticians trying to maintain national economic and financial data. Efforts to establish and maintain international standards for specific data elements in national accounts and international transactions have become both more important and more difficult to achieve. The increased presence of MNCs and their expanding role account for some of this. Reconciling international accounts has also become more important and more difficult, as BEA's experience with India and Canada (described in Chapter 7) has demonstrated. The Panel is particularly sensitive to these challenges and tried to take them into account in making its own recommendations for improving data to address services off-shoring. Unfortunately, the data

[16] The Foreign Direct Investment and International Financial Data Improvements Act of 1990 also authorized BEA and BLS to link BLS establishment data on occupational employment with BEA MNC data, particularly data on U.S affiliates of foreign corporations, to examine the occupational structures of those companies relative to other domestic firms in the same industry.

issues posed by increased globalization and expansion of MNC operations are even more complex and challenging than those encountered for services off-shoring.

ROAD MAP TO THE SECOND REPORT

Chapter 2 describes two distinct types of services off-shoring—off-shoring due to business restructuring, and that due to global expansion. There are differences in potential economic effects from each. Each presents unique measurement challenges. The chapter describes the off-shoring and outsourcing indicators developed to measure the extent of services off-shoring and outsourcing at both a micro- and industry-level. The chapter also examines the effect of data limitations on the services off-shoring and outsourcing indicators ultimately used and the potential impact on the resulting estimates of the extent of and changes in services off-shoring.

Chapters 3, 4, and 5 present the results of industry- level analyses. Chapter 3 describes the use of BEA input-output (I-O) tables to identify services outsourcing among 65 aggregate industry sectors. The use of BEA trade data in conjunction with the I-O tables enables estimates of services off-shoring among these same industries. However, data limitations require the use of critical assumptions to allocate services imports between intermediate and other uses. Industries are ranked according to the growth in their services outsourcing and off-shoring intensity over the 1998–2004 period.

Chapter 4 uses occupational data from BLS' OES program to determine whether changes in certain core service producing occupations provide an indication of services outsourcing and off-shoring. Core services producing occupations account for a substantial amount of employment in the four industries examined and exclude general occupations common to most industries (e.g., management). Core occupations were developed at both aggregate and detailed Standard Occupation Codes (SOCs). The rates of growth in the employment share of these core occupations in the specialized industry supplying the services were compared to rates among all the other industries to determine whether any significant differences occurred.

Chapter 5 links BEA I-O data with BLS OES data to determine whether better estimates of off-shoring can be produced and to identify any changes in the occupational mixes between industries that have the highest and lowest growth in services off-shoring (from BEA data) over this period. Data limitations restrict estimates of any occupational changes for the 65 NAICS I-O industry sectors to the 2002 to 2005 time period. The analysis distinguishes between occupation employment changes due to occupational structural changes and those due to sectoral growth. Occupations are ranked by their rate of employment change over the period, from the lowest (actual employment losses) to the highest growth. These rankings for the quartile of industries with the highest growth in services off-shoring are then compared to the quartile with the lowest services off-shoring growth

Chapter 6 describes the analysis of BEA micro-data on MNCs for the four selected industry groups. BEA data allowed an identification of MNCs with sales concentrated in the target industries and those with only some sales in those industries (their sales activities were concentrated in a range of other industries). Although the percent of MNCs importing services

varied among each industry, service importing MNCs were in the minority in every instance. Data limitations restricted the period of analysis to 1999 to 2003. This chapter also examined the growth in sales for MNC parents and their foreign affiliates to determine whether affiliate growth exceeded parent growth. Those instances were consistent with potential services off-shoring due to global expansion.

Chapter 7 reviews the data gaps and quality problems encountered while undertaking the micro- and industry-level research. Data gaps are distinguished from data quality issues. The chapter concludes with a number of Panel recommendations to improve the ability of current data to estimate the extent and impacts of services off-shoring.

CHAPTER 2

METHODOLOGIES FOR IDENTIFYING SERVICES OFF-SHORING AND OUTSOURCING

In their first off-shoring report—*Off-Shoring: An Elusive Phenomenon*—the Academy Panel recommended adopting a broad definition of off-shoring—"firms shifting service and manufacturing activities abroad to unaffiliated firms or their own affiliates." The Panel observed that current concerns about the economic impacts of off-shoring focused more on white-collar, high-technology activities within the services sector than on manufacturing industries that have traditionally been considered more vulnerable to the economic effects of international trade. The Panel also found little consensus among previous studies about the extent and impacts of services off-shoring. Consequently, the Panel determined that additional research was needed for a comprehensive review of services off-shoring.

This chapter describes the multiple analytical approaches used to estimate the extent and impacts of services off-shoring among U.S. business since 1998 and to assess the adequacy of currently available data to develop such estimates. This includes analysis of both micro- (firm) and industry-level data using indicators of services off-shoring and outsourcing as consistent as data would allow. The chapter also presents the rationale for the analytical approaches used and how the available data affected them. Although many of the analytical approaches are similar to those found in previous studies, they have been applied to different data (e.g., micro-level rather than industry-level data), time periods (e.g., post 1997 to use NAICS rather than SIC categories) or data sets (e.g., linking BLS occupational employment data from the OES program with BEA industry accounts input-output (I-O) and trade data).

BASIC RESEARCH PLAN AND OBJECTIVES

Most previous studies of U.S. off-shoring used only publicly-available, industry-level data from BEA and BLS.[17] Because off-shoring decisions reflect strategic business choices made by individual U.S. firms, the Panel believed that its additional research needed to use micro-level data collected by both agencies to estimate the extent of services off-shoring and its economic effects. Because these data are confidential, it was necessary for the project staff carrying out the research to obtain sworn status with each agency to access and analyze these micro-level data. Additional data sharing arrangements described below also had to be put in place by the two agencies to allow linking these confidential micro-level data from different data sets between agencies.

Given the uncertainties about matching various micro-level data sets, the limited time available to complete this portion of the study, and other resource restraints, the Panel decided to

[17] National Academy of Public Administration, Off-Shoring: an Elusive Phenomenon, January 2006, See Chapter 4. The few studies of U.S. services off-shoring using micro-level data relied on proprietary data collected by the private research group doing the study.

concentrate this additional micro-level research on the following 4-digit NAICS industries, primarily in the services sector:

- pharmaceuticals and medicine manufacturing[18] [3254],
- architectural, engineering and related services [5413],
- computer systems design and related services [5415], and
- business support services [5614].

This concentration primarily on service industries responds to concerns about the effects of services off-shoring, particularly high-technology services, rather than more traditional manufacturing activities. These target industries are also expanding, potentially susceptible to off-shoring, diverse, and have significant interactions with other economic sectors.

The Panel's research plan involved work with BEA and BLS micro-level and industry-level data to achieve two basic objectives:

- Develop estimates of off-shoring, particularly services off-shoring, activity and derived economic effects, including employment effects, for each of the four selected industries, and
- Determine the adequacy of currently available data in developing estimates of off-shoring and associated economic effects.

Although the Panel recognized the need for micro-level analysis to evaluate the effects of specific firm decisions, there were a number of reasons for including industry-level analyses in the second report:

- A comprehensive assessment of the adequacy of currently available data for identifying services off-shoring must include industry-level data;
- Industry-level analyses can provide a broader, economy-wide scope to an assessment of the extent and effects of off-shoring that an intensive analysis of micro-level data for several key industries cannot;
- Some alternative indicators for measuring the extent and effects of off-shoring (e.g., core supply producing occupations) can be identified and tested at an industry level before applying them to micro-level analyses;

[18] A large amount of drug manufacturing occurs in Puerto Rico. BEA considers Puerto Rico to be a part of the United States for collecting and publishing its trade and MNC financial and operating data.

- Industry-level analyses can identify other industries using the services and commodities produced by these four selected industries and examine whether those users are outsourcing or off-shoring these services; and

- Results from industry-level analyses can be compared with micro-level results and similar estimates from previous studies to reinforce particular findings.

The basic research plan involved analyzing BEA micro-level financial and operating data of MNCs and trade in unaffiliated services data, as well as the industry accounts I-O data, primarily in the services sector, to determine whether estimates of services off-shoring activity could be developed for MNCs within the selected industries, or for the comparable industry sectors contained in the I-O use tables. Analysis of BLS micro-level establishment data would also identify any differences in employment, occupational structure, and wage changes between firms[19] believed to be off-shoring services and other firms within the same industries. To identify off-shoring firms, the Panel planned to use several alternative sources—BLS MLS data, results from analyses of BEA MNC data, or other independent sources. Trends in employment flows, occupational structures and wage changes for the firms believed to be off-shoring were compared with trends for similar sized firms in the same industries to determine any significant differences.

The analysis relied primarily on BEA micro- and industry-level data to identify the extent of services off-shoring for specific firms (MNCs) and industry sectors. BLS employment data from the QCEW and OES programs were linked at the industry- and micro- level to examine the employment effects for those firms or industries off-shoring services. The BLS data allowed analysis not only of aggregate employment effects, but key distributional effects—particularly whether services off-shoring had any different impacts on employment levels for specific occupations. As work progressed, occupational data appeared capable of identifying internal restructuring within firms that might indicate services outsourcing and possibly off-shoring. The analysis presented in chapters 4 and 5 explores these possibilities. Data limitations involving sampling design for the MLS and confidentiality issues with attempting to link external micro-level information from private sources[20] to government micro-level data required relying primarily on BEA MNC data to identify firms off-shoring services.

DEVELOPMENT OF OFF-SHORING INDICATORS

Previous studies have noted the varied reasons for off-shoring, the primacy of cost-savings considerations and the range of financial and economic effects on the off-shoring firm, its

[19] Since business restructuring decisions leading to off-shoring or outsourcing are believed to be made at the firm, not the establishment level, the BLS establishment data need to be aggregated to the firm level within the business organization. For example, Wal-Mart makes strategic business decisions at the firm or corporate level that affect each local store or establishment. The individual establishments, stores, need to be aggregated to develop a measure of the total firm, Wal-Mart.

[20] Academy staff had obtained data from a private group that contained names of individual firms that had been cited in press reports or other public documents as relocating certain of their services operations to foreign locales. The existence of company names and the need to use them to link these data to government micro-level data raised confidentiality issues that appeared insurmountable.

workers, suppliers and customers, as well as the broader effects on the U.S. economy and workforce. The Panel believed that its definition of off-shoring was sufficiently broad to encompass all these varied reasons for firms' off-shoring services.

Two Different Types of Off-Shoring

Firms decide to off-shore certain services for two distinctly different reasons. One results from a strategic decision to restructure or re-engineer current business or productions processes; the other arises from strategic decisions to expand overseas operations through foreign affiliates to meet growing global demands. If the firm is off-shoring because it has restructured internal production processes to obtain services from off-shore suppliers, that business restructuring decision should produce a change in the mix of inputs used to produce its output. There should be an increase in services imports by the firm that has restructured its activities and off-shored services to either an unaffiliated supplier or a foreign affiliate that had previously been supplied either internally or from an unaffiliated domestic supplier (outsourced services supplier). When the foreign supplier is an unaffiliated entity, off-shoring is a subset of outsourcing—"off-shore outsourcing"—as defined above.[21]

Alternatively, a firm may off-shore some of its services because it decided to reallocate its total services output between its domestic and overseas operations. This is a separate decision from outsourcing or off-shoring due to business restructuring, and is undertaken for entirely different reasons. Because only MNCs have separate domestic (U.S. parent) and overseas (foreign affiliate) operations, only MNCs can off-shore in this way. This global expansion off-shoring involves redistributing a MNC's global output from its U.S. parent to its foreign affiliates, whereas off-shoring due to business restructuring involves redistributing the inputs used by the U.S. firm (or the MNC parent). Both MNCs and other domestic firms can experience off-shoring from business restructuring, and this activity should reflect increased use of imported services inputs.

Indicators of Business Restructuring Off-Shoring

In theory, identifying and estimating the extent of off-shoring for firms that restructure their internal production processes would be relatively straightforward if sufficient data were available. An indicator for business restructuring off-shoring would reflect the amount of imported goods and services used by the firm to produce its products during the year relative to the total inputs used (labor, capital, and purchased intermediate products). The higher that ratio, the greater the off-shoring activity. Increases in the ratio over time indicate growth in the firm's off-shoring activity.

[21] MNCs can engage in business restructuring services off-shoring by obtaining the restructured service activity from a foreign affiliate rather than an independent foreign supplier. In this case, the services off-shoring is not a subset of outsourcing, since the off-shored service is obtained from an "in house" affiliate. For the rest of this paper, the term services off-shoring will apply to off-shoring from both affiliated and unaffiliated foreign suppliers. Chapters 2 and 3 of the first Panel report, *Off-shoring: an Elusive Phenomenon*, describe more completely the differences between outsourcing and off-shoring.

Since current concerns about off-shoring focus on service activities, and even more narrowly on high-technology services, rather than on the broader array of all goods and services, this off-shoring indicator needs to be refined to focus more directly on services. Again, in theory, the same off-shoring indicator can be constructed for particular services. For any service, the numerator of the specific services off-shoring ratio would include only the imports of specific services used as intermediate inputs. The denominator would still include the labor, capital and purchased inputs for the firm's production processes using those specific services.

The size of this off-shoring ratio is important because it helps determine the economic effects of off-shoring on the firm, its workers and the rest of the economy. In particular, it helps determine the direct employment impact from off-shoring. However, current off-shoring concerns also focus on whether off-shoring is increasing over time. Thus, the change in this off-shoring ratio is equally important, since it will indicate whether services off-shoring is increasing and, if so, how fast.

Business restructuring off-shoring, like outsourcing, frequently affects activities not involving a business's core competencies. As the first Panel report noted, "off-shoring decisions are made for many of the same reasons as outsourcing decisions."[22] However, these decisions can produce different benefits and risks. For this report, estimates of the level and growth of services outsourcing were developed and compared to services off-shoring estimates. Since services off-shoring from business restructuring is often a subset of services outsourcing, the difference between the two may identify the potential for future services off-shoring growth if current expected benefits and risks become more favorable. Services outsourcing was estimated as the amount of purchased services inputs relative to total inputs used in a firm's production process.

Indicators of Global Expansion Off-Shoring

This form of off-shoring arising from global expansion of a firm's service production activities to areas outside the U.S. differs in several respects from off-shoring due to a restructuring of the firm's internal production processes. First, this form is unique to MNCs, because only they have foreign affiliates to engage in global expansion outside the U.S. Second, this usually involves a redistribution of one or more components of the firm's services outputs, while off-shoring due to business restructuring involves one or more services inputs used by the firm. Third, effects of global expansion off-shoring, especially the employment effects, are even more complex than those from off-shoring due to business restructuring.

While the direct employment effects from off-shoring due to business restructuring are likely to involve some loss of jobs as imported services substitute for domestically supplied services, the direct employment effects from global expansion off-shoring are more uncertain. In many instances, primarily those where off-shoring provides the MNC access to previously untapped foreign markets, the direct employment and other economic effects may be strictly positive.[23] In

[22]Op.cit., *Off-Shoring; an Elusive Phenomenon*. p. 9.

[23] Several recent studies of BEA MNC employment data—Matthew J. Slaughter (*Globalization and Employment by US Multinational Corporations: A Framework and Facts*, March 2004) and Ann E Harrison and Margaret S. McMillan *(Outsourcing Jobs? Multinationals and US Employment*, NBER working paper 12372, July 2006)—have also found some complementarities between MNC parent and affiliate employment in certain conditions.

other cases, where the global expansion off-shoring foregoes growth in (or perhaps replaces) U.S. exports to foreign markets, the direct employment and other economic effects may be more mixed. Because of this greater complexity, identifying and estimating global expansion off-shoring by MNCs was much more difficult and required different data than business restructuring off-shoring.[24]

Estimating global expansion off-shoring examined whether MNCs within the four selected industry groups have redistributed some services production from the U.S parent to their foreign affiliates. A principal indicator for services off-shoring due to global expansion is the comparison of total service production growth rates for MNC parents relative to their foreign affiliates. A critical condition for global expansion off-shoring is that total service production[25] is growing faster for a MNC's foreign affiliates than for the U.S. parent. This condition limits global expansion off-shoring to those MNCs with foreign affiliates that account for an increased share of total MNC services production.

There are a number of reasons, however, why services production for affiliates may be growing faster than for the MNC parent. Foreign demands for a MNC's services may be growing faster than domestic (U.S.) demands. In this case, faster growth in foreign affiliates' service production activities may simply be responding to changes in foreign market demand or other market conditions and not reflect an explicit MNC decision to reallocate services production to its overseas affiliates. Faster growth among affiliates may also reflect decisions to diversify, particularly if affiliate services activities differ from those of the parent. Global expansion off-shoring also implies that the MNC parent had been or would be able to meet the growth in foreign demand with its services exports. Identification of global expansion services off-shoring requires much more detailed data on the types of services produced and the markets served by foreign affiliate production and parent exports. More detailed data on the types of services produced and sold by foreign affiliates relative to parents could help distinguish between some of these reasons for expansion in foreign affiliate services activities, one of them being global expansion off-shoring.

ANALYTICAL APPROACHES FOR ESTIMATING SERVICES OFF-SHORING

Because services off-shoring involves a reallocation of some components of a firm's services inputs (business restructuring off-shoring) or outputs (global expansion off-shoring) from its U.S. facilities (or those of its domestic unaffiliated service supplier) to some foreign facilities, analysis of industry- or micro-level data focused initially on production and trade data. MNCs with a declining share of total services output for the parent relative to its foreign affiliates provide an initial identification of possible services off-shoring due to global expansion. Similarly, firms increasing their use of imported services for intermediate inputs in their production processes provide a direct measure of the extent of services off-shoring from business restructuring. However, an examination of changes in specific occupations firms use to produce

[24] This greater complexity and need for different types of data may explain why most previous studies of services off-shoring reviewed and summarized in Chapter 4 of the first Panel report addressed only restructuring off-shoring.
[25] As explained in chapter 6, this study used total sales as a proxy for total services production.

services may provide an alternative means to identify the extent of this type of services off-shoring (or at least services outsourcing).

Concerns about services off-shoring involve not only the current extent of off-shoring, but also any trends or changes in off-shoring over time. To address these concerns requires consistent, longitudinal data. Micro-level research on four specific, primarily services industries, at a 4-digit NAICS level, limited time series data to the availability of consistent NAICS data. Since the NAICS began in 1997, a 1997-2004 time period would allow an examination of changes U.S. firms' activities during the late 90's expansion building up to the 2001 recession and the subsequent recovery. Because not all BEA and BLS data are available for each of these years, the industry-level analyses covered the 1998 to 2004 period, but the micro-level data were available only from 1999 to 2003.

While the analyses initially focused on four industries, the industry-level analysis was extended to other manufacturing and services industries that may be using outputs from these industries (intermediate services) in their production processes to identify whether they have outsourced, and perhaps off-shored any of these services. Similarly, the micro-level research included an examination of firms concentrated in these industries, as well as firms that have some, but not a preponderance, of their activity in one of these industries. Both industry- and micro-level analyses developed similar indicators of services off-shoring and outsourcing to the extent data permitted.

Industry-Level Analyses

Industry-level analyses used BEA I-O and trade data to develop services off-shoring and outsourcing indicators. These were then applied to all 65 industry sectors in the annual BEA I-O tables to identify industry sectors with the highest levels and growth rates for services off-shoring and outsourcing over the 1998- 2004 period. Analysis of BLS OES data for aggregate (2- and 3-digit) and detailed (6-digit) SOC categories of occupations first focused on developing core occupations needed to produce the services and commodities for the four industries selected for review. Changes in the employment of these core occupations between each selected industry and all other industries were examined to determine whether they could identify services outsourcing and off-shoring. Finally, BEA I-O data were compared with BLS OES data at the industry level to determine whether those industries with the highest growth in services off-shoring and outsourcing had different changes in their mix of occupations relative to industries with the lowest growth in these measures over the period.

Input-Output (I-O) Off-Shoring and Outsourcing Indicators

BEA produces annual estimates of the inputs used by manufacturing and services industries to produce their output. While these annual estimates are not as detailed as the estimates developed for baseline years (based on economic census data collected at five-year intervals by the Census Bureau[26]), they are more current[27] and provide information about outsourcing and off-shoring

[26] For further information on economic census data collected by the Census Bureau go to www.census.gov.

[27] Although the latest economic census data were collected for 2002, these data are still not available. Thus, the latest detailed I/O data currently available are from the 1997 economic census.

activities, albeit at a more aggregate level. Since these I-O data contain information on use of purchased services as inputs by various industries, we compared the change in purchased services and the purchased services share of gross output by industry over the period. Industries increasing use of "external" purchased services are outsourcing those services and may be susceptible to off-shoring. Consequently, the services outsourcing indicator used at the industry level was the ratio of purchased services relative to total sales (a proxy for total production or output).

These I-O data also provided information on imports and exports of commodities by industry group. Sufficiently detailed export and import data in these I-O tables could provide insights about services outsourcing and off-shoring among individual industries. Unfortunately, there were major data limitations impeding the use of I-O data. The lack of data on services imports for intermediate use rather than final demand was the first data gap encountered. In addition, the current BEA I-O tables provided data only for 65 industry sectors. While 38 of these were service industries, the industries were not consistently disaggregated to the 4-digit NAICS level. Perhaps the most critical data limitation was the need to assume that the share of unaffiliated services imports in the total available domestic supply for each commodity is the same for all industries using that commodity to distribute these services imports among all of the I-O industries. This intermediate services import estimate was divided by total purchased inputs for each industry to develop a services off-shoring intensity indicator.

Despite these limitations, I-O data provided information on the extent of outsourcing of services among manufacturing and services industries. To the extent that services off-shoring due to business restructuring is a subset of services outsourcing,[28] estimates of services outsourcing can provide an upper boundary for potential services off-shoring. More detailed information on the share of services imports used as intermediate products would provide estimates of the amount of outsourced services that were also off-shored.

Occupational Distribution Indicators of Services Outsourcing and Off-Shoring

This industry-level analysis used BLS OES data on detailed occupations by industry to develop an alternative measure for identifying services outsourcing and off-shoring. The key to this alternative occupational-based approach was an assumption that industries (and firms within those industries) specializing in the production of particular services use labor inputs in processes unique to the industry or that differ significantly from labor inputs needed for other non- service production. If different services (or for that matter manufactured goods) require different labor inputs (occupational mixes) to produce those services, then it should be possible to identify a group of core occupations that "define" the industry and distinguish it from other industries. This analysis required an industry approach because, as I-O analysis indicated, industries used a range of services and components in production processes, and some services and components were used in other industries and were produced in yet other industries.

[28] Off-shore outsourcing is the only type of off-shoring due to restructuring for non-MNCs. However, MNC parents can off-shore services due to restructuring by importing those services from their foreign affiliates as well as unaffiliated foreign suppliers.

This analysis examined the principal occupations used in each selected industry. The degree of occupation concentration within each industry (usually whether a limited number of occupations account for a major part of total employment in the industry) defined this group as "core" services producing occupations. The analysis also identified other industries that employed these "core" occupations even though they were ancillary to those industries' principal production activities. For example, computer programmers and systems analysts are "core" occupations within the computer design services industry, but other industries also include these occupations since they require computer support services in their own production processes. Likewise, mechanical and electrical engineers are core occupations within the architectural and engineering services industry, but other industries also employ them in their internal production processes.

Differences in growth of core occupations relative to total employment were compared across industries. If non-specialist industries were reducing relative employment of selected service industry core occupations, while selected service industries were increasing their employment shares for these core occupations, or at least not decreasing it to the same degree as all other industries, this result was consistent with an increase in outsourcing of services produced by these primary occupations. Chapter 4 presents this analysis in detail.

Industry-level analysis of changes in the employment share of core service producing occupations between the selected industries and the rest of the economy demonstrates the need to supplement OES data to go beyond measuring outsourcing and try to identify off-shoring. A decline in core occupation employment outside specialist services industries that exceeds the growth in these occupations within those industries may be consistent with possible off-shoring, but may also reflect the greater efficiency and productivity of these core occupations in the specialist service industries.

Linking BEA I-O and BLS OES data

Because BEA I-O tables identify industries off-shoring services, combining results with OES occupational analyses provided a more complete measure of the extent of services off-shoring and its impact on the occupational structures of those industries off-shoring services. Data limitations again impeded this analysis. There were a number of aggregation issues that needed to be overcome, as described in Chapter 5. Perhaps the most critical limitation was that not all firms within an industry are homogeneous. They do not all face the same market conditions for their production and inputs, nor do they respond the same to changes in those conditions. If only a few firms within an industry are off-shoring services, the effect of off-shoring actions at the aggregate industry-level will depend upon the extent of their off-shoring and their size relative to all other firms in the industry.

The same is true for the effect of services off-shoring on occupational employment. In short, possible occupational changes for off-shoring firms within the industry will be masked by the occupational changes for non-off-shoring firms in that industry. The masking of these individual firm off-shoring distributional effects is more likely at higher levels of aggregation for each industry. However, these analyses provided an opportunity to develop alternative measures for identifying services outsourcing and off-shoring and test their feasibility. The concept of core service producing occupations can be applied at the micro-level to assess whether firms that are

off-shoring particular services are also experiencing a decline in the relative employment of those core services producing occupations.

MICRO-LEVEL ANALYSES

Although the Census Bureau collects substantial, detailed data on business firm operations through its economic census, these data are collected only every five years, the latest are the 2002 Census. In addition, Census publishes more limited information from annual surveys in its County Business Patterns, Statistics of U.S. Businesses, Annual Survey of Manufactures, Service Annual Survey, and surveys on Construction, Retail Trade, Governments, and other sectors of the economy.

An alternative source of timelier, but less detailed information is financial and operating data for MNCs from BEA annual and quarterly surveys. These surveys provide detail not found in the Census data on the relationships between MNCs and their foreign affiliates. Academy staff were authorized access to confidential, micro-level data from two datasets collected by the BEA: "financial and operating" data of MNCs, and "international transactions" data. Although U.S. parent MNCs account for less than 20 percent of total U.S. employment, MNCs are likely to be critical to assessing the extent of services off-shoring activity and its economic impacts, particularly its employment effects.

A number of prior studies suggested that MNCs have had a leading role in initiating and expanding the off-shoring of services. Indeed, only MNCs can engage in global expansion services off-shoring. MNCs are also likely to play a substantial role in services off-shoring due to business restructuring. As BEA has noted, MNCs accounted for an estimated 37 percent of U.S. goods imports for 2003.[29] MNCs also account for an even larger share of services imports that are considered most vulnerable to off-shoring—other private services, especially business, professional and technical (BPT) services. In 2004, of the estimated $40.7 billion of imported BPT services, almost 70 percent—$28.2 billion—were affiliated imports representing transactions between a MNC and its foreign affiliates.[30]

Identifying MNC Services Outsourcing

Because services off-shoring from business restructuring is often a subset of services outsourcing,[31] examining the extent of services outsourcing among MNCs in our select industries was a critical first step in analyzing the extent of services off-shoring. While not all outsourced services will or can be off-shored, outsourced services are potentially more susceptible to future off-shoring than services still produced internally. Thus, current outsourced service activities can provide an indicator of potential future growth in services off-shoring.

[29] R. Mataloni, "U.S. Multinational Companies: Operations in 2003", SCB July 2005 p. 13.
[30] E. Nephew, J. Koncz, M. Borga and M. Mann, "U.S. International Services: Cross-Border Trade in 2004 and Sales through Affiliates in 2003. SCB October 2005, Table 1 p. 46.
[31] MNCs can also off-shore services from restructuring by importing services inputs from their foreign affiliates.

Data limitations with BEA MNC surveys required use of an indirect proxy to assess the extent of and changes in MNC parent services outsourcing. Our services outsourcing indicator was the ratio of a MNC parent's total purchased inputs to its total output, where total output was measured as total sales in a given year.[32] Total sales were obtained directly from the MNC parent surveys, but the total purchased inputs variable was estimated as the difference between each MNC parents annually reported total sales and its value added—both variables were available or derived from the MNC survey data.

Unfortunately, BEA MNC parent surveys do not collect separate information for the value added of goods and services. Consequently, the estimated purchased inputs variable cannot distinguish goods from services[33] and only total outsourcing indicators could be developed. These were estimated for two groups of MNC parents:

- those with sales concentrated in the four industries examined (group I parents), and
- those with some sales in these industries, but with the preponderance of their sales in other industries (group II parents).

These two groups were developed both to expand the sample of MNC parents reviewed and to determine whether MNCs with services sales as only an ancillary activity were more likely to outsource (or off-shore) those ancillary services.

Business Restructuring Off-Shoring by MNCs

Business restructuring off-shoring requires some use of imported purchased inputs. The preferred indicator of services off-shoring was that portion of a MNC parent's purchased services inputs imported either from a. foreign affiliate (affiliated imports) or an independent third party (unaffiliated imports). Again, data limitations required use of indirect proxy indicators of services off-shoring: the first, "off-shoring intensity," was the ratio of total imports to total purchased inputs; the second, "services off-shoring intensity," was the ratio of total service imports to total purchased inputs.

These off-shoring intensity indicators were then used to identify those MNC parents with above average off-shoring intensity, and those with positive off-shoring intensity growth over the period 1999 to 2003. Because of the substantial number of MNC parents that did not import either goods or services during this period, these off-shoring intensity indicators were used to divide the MNC parents within each industry group into sub-groups—the target group of services off-shoring MNC parents and other MNC parents.

[32] As discussed in Chapter 6, total sales are an incomplete measure of total production which also includes changes in inventories. However, BEA staff have indicated that inventories for services are likely to be relatively minor. For certain types of services, e.g. trade and financial intermediation, output cannot be approximated by sales. However, for the types of services believed to be vulnerable to off-shoring—principally business, professional and technical private services—sales may be a reasonable proxy for total production.

[33] Chapter 6 describes these data limitations and the development of this services outsourcing intensity measure in greater detail.

The services off-shoring MNC parents were compared with other MNC parents in the same industries and across different industries to identify any:

1. substantial differences in the extent of services off-shoring among those MNC parents in the industry sub-groups;

2. significant trends in the growth of the services off-shoring intensity over the period; and

3. other differences in characteristics or economic performance between services off-shoring MNC parents and other MNC parents in the same industry sub-groups, using BEA MNC financial and operating data.

Global Expansion Off-Shoring by MNCs

This analysis examined transactions between and the relative economic performance of MNC parents and their foreign affiliates within the selected four industries over the period 1999 to 2003 to identify whether those MNCs reallocated services production activity from the U.S parent to their foreign affiliate(s). Total sales served as the proxy for services production activity. To determine whether total activity was reallocated from the parent to the foreign affiliates, we focused on those MNCs whose affiliates accounted for a larger share of total MNC sales over the 1999 to 2003 period. An increase in the affiliates' share of total MNC sales occurs if their sales increased faster than parent sales over the period.

To detect possible services off-shoring among MNCs due global expansion and to attempt to distinguish that from other explanations for faster affiliate growth, the micro-level analysis in chapter 6:

- Identified those MNCs that experienced faster growth in foreign affiliates' total sales relative to the domestic parent during the 1999 to 2003 period and tried to determine the types of services involved (if possible).

- Examined and compared sales of MNC parents and foreign affiliates by industry.

- Examined the markets served—by destination and customer type—by foreign affiliate total sales and services sales, and compared them to markets served by parent services exports.

The distribution of foreign affiliate sales among its local or host-country market, other foreign markets and the U.S. market can help determine whether the faster overseas growth reflects global off-shoring or other reasons. This analysis was combined with an examination of the distribution of parent services export to foreign markets. If most of the affiliate sales growth is occurring in the foreign home market and that market had not been served by parent services exports, that growth is less likely to impede growth in the parent's services exports. The impact of affiliate expansion in foreign markets not served by parent exports may be more positive than

negative for parent sales to domestic or other foreign customers. In addition, foreign affiliates may be a primary source of demand for parent exports.

ESTIMATING EMPLOYMENT AND ECONOMIC IMPACTS

Analyses of BEA financial and operating data of MNCs identified MNC parents that had off-shored services due to either internal restructuring or global expansion. BEA surveys provided information on total sales, value added, employment, employee compensation, capital expenditures, net income, total exports and imports for each MNC. Data for services off-shoring MNC parents and non-off-shoring MNC parents were compared to assess the relative economic performance of each group within the same industry.[34] Simple regression analysis was used to determine whether there were any statistically significant differences or trends for key financial measures between the services off-shoring parents and other MNCs over this period.

To assess employment effects, the industry-level analysis in Chapter 5 examined occupational structural changes in those industries with the fastest growth in services off-shoring relative to those with the slowest growth (or actual declines in services off-shoring). For the micro-level analyses still underway, the research plan is to link BEA MNC micro-data with BLS micro-data from the QCEW and OES data bases. This linkage should allow an examination of potential differences in job creation and destruction for services off-shoring MNC parents relative to non-services off-shoring parents and comparably sized firms[35] in the same industry. Changes in the occupational structures of services off-shoring MNC parents will also be compared to occupational changes for non-services off-shoring MNC parents and other similar sized firms in the same industry. These analyses of linked BEA and BLS micro-data should provide the most direct measures of net employment effects and distributional effects among particular occupations for servicing off-shoring firms. These results will be presented in the third Panel report.

[34] Even though the non-concentrated, Group II MNCs are from different NAICS industries, we still compared the performance of services off-shorers to others for those four groups as well.

[35] Since BEA data indicated that most MNCs tended to be large sized firms, with more than 1000 employees, only large sized domestic firms would be compared with MNCs using the BLS data.

CHAPTER 3

INDUSTRY-LEVEL ANALYSIS

INTRODUCTION

This chapter presents estimates of services outsourcing and off-shoring using publicly available data from BEA's industry and international accounts.[36] Chapter 4 and Chapter 5 present analyses of OES data to determine whether changes in the employment of services producing occupations can be observed in individual industries. Chapter 4 looks at the OES data alone to see whether they can be used to identify industries that may be outsourcing or off-shoring service activities. Chapter 5 takes a more direct approach for examining the employment and occupational impacts of services off-shoring by linking the measures of off-shoring developed in this chapter with OES national data. It uses these data to examine the components of the changes in employment for occupations in industry sectors experiencing high and low rates of services off-shoring growth.

Industry-level analysis in this chapter uses BEA annual industry accounts data to identify industry sectors[37] that have increased or reduced use of purchased services inputs relative to total output (services outsourcing). It also uses published import data to estimate services off-shoring, measured as purchased services imports as a percent of total purchased inputs.

This chapter addresses the extent to which industry-level data provide adequate information for estimating the extent of services off-shoring among industries and its impact on employment within specific occupations. It assesses the effect of existing data limitations on the reliability and consistency of services off-shoring estimates, including the critical assumptions needed to work within these limitations. For example, it examines the extent to which non-comparable imports affect measurements of off-shoring, and the assumptions needed to convert total comparable import data to imports of intermediate goods and services. The chapter includes Panel recommendations for improving the usefulness of industry level data in estimating services off-shoring.

[36] All of the principal statistical agencies have excellent web sites that make their detailed public data readily available. See

www.bea.gov (Bureau of Economic Analysis)
www.bls.gov (Bureau of Labor Statistics)
www.census.gov (Bureau of the Census)

[37] The term "sector" as used in this chapter and Chapter 5 refers to industries classified according to the 65 industry codes in BEA's annual industry I-O accounts. BEA classification groups industries in varying combinations of 2-digit to 4-digit NAICS codes. The list of sectors and their NAICS industries is provided in Appendix D.

DATA SOURCES AND DEVELOPMENT

BEA I-O data present aggregate industry activity for 65 BEA annual industry input-output account sectors, including 27 specific service sectors.[38] These data provide detailed information on the flows of inputs and outputs among sectors and subsequent changes in the purchases of intermediate goods and services (outsourcing) among sectors. BEA I-O data that include services imports can be utilized to develop estimates of purchased intermediate imports, which are then used to measure services off-shoring over the period 1998 to 2004.

Estimating Off-Shoring Intensity Indices

In 1996, Feenstra and Hanson proposed a common sense measure of off-shoring due to business restructuring as "the share of imported intermediate inputs in the total purchase of non-energy materials."[39] Their measure has been used in a number of recent studies of services off-shoring, including several by Amiti and Wei (2005, 2006). These studies have generally relied on the SIC system, which has a much longer time frame, but far less detail on services industries than the newer NAICS-based data.

BEA inter-industry data contain consistent annual estimates back to 1998 using NAICS. NAICS-based data were used because they (1) place a much heavier emphasis on service sector industries than the SIC, and (2) are the basis on which current and future data are classified by BEA, BLS, and Census. It is important that the classification system emphasize service sectors, because service activities account for the overwhelming majority of economic activities and are at the core of current off-shoring concerns.

Another advantage of BEA inter-industry data is the availability of a consistent measure of total comparable[40] imports associated with each good or service produced. While there are no direct measurements of imported intermediate goods and services used by an industry, a consistent allocation assumption can be applied to the total comparable import data to estimate industry intermediate comparable imports. Because all non-comparable imports are for services only, adding non-comparable imports for each industry to estimates of intermediate comparable imports of services yields industry totals for intermediate services imports.

BEA Industry I-O Use Tables

Measures of outsourcing and off-shoring can be calculated from BEA annual industry accounts I-O use tables using a methodology similar to that of Feenstra and Hanson. The I-O use tables also provide data on how commodities and services are used in the economy, both by sectors

[38] There does not appear to be an official BEA list of service sectors. Yuskavage, Strassner, and Medeiros (2006) identify 36 of BEA annual industry I-O accounts sectors as service sectors. The NAPA analysis omits Utilities, Wholesale Trade, Retail Trade, and Transportation and Warehousing from their service sector classification.

[39] Feenstra, Robert C. and Gordon H. Hanson (1996). "Globalization, Outsourcing and Wage Inequality." *American Economic Review*.

[40] Comparable imports generally are imports of goods and services for which domestic analogs exist. Non-comparable imports generally consist of services for which there is no domestic counterpart. Unfortunately, it also includes virtually all services imports of multinational companies regardless of the potential existence of domestic analogs.

producing goods and services and by households, businesses, and governments for international trade and final demand.

Columns in the I-O use table contain data for each sector. Elements of the columns include types and amounts of purchased goods and services used in production, value added, gross operating surplus and indirect business taxes less subsidies. Summing the columns produces the value of total output for each sector.

Rows of the table show how much of each good or service is provided to each of the sectors and how much to the principal components of final demand. The row sums are total commodity or service output.

Table 3-1 illustrates the structure of the I-O use tables with highly aggregated data for 1998 and 2004. All industries have been combined into three sectors—total manufacturing, total services, and other than manufacturing and services (e.g., agriculture, natural resources, wholesale and retail sales and government). Total intermediate uses are the sum of purchased inputs by each of the sectors (summing along the rows of the table). Final domestic demand (FDD) is the familiar C+I+G from the national income accounts. Summing FDD with exports and imports (shown separately) and the change in private inventories yields an estimate of GDP by commodity or service.

Table 3-1 provides information on the interaction of the sectors. For example, it shows that in 2004, the services sector purchased $794 billion of manufacturing output and $3.3 trillion of services output for use as inputs to produce some $12.2 trillion in service sector output. The manufacturing sector used $1.4 trillion of manufacturing intermediate product and $570 billion of service sector-provided services in producing some $4.3 trillion in manufacturing sector output.

The table also provides information on how much of each commodity or service is used for intermediate purposes relative to other uses, such as final demand or export. In 2004, almost 64 percent of manufacturing output was used for intermediate purposes. For services, only about 38 percent was allocated to intermediate uses.

Outsourcing and Off-Shoring Calculations

Data in Table 3-1 provide information needed to estimate industry sector outsourcing and off-shoring intensities. Table 3-2 shows aggregated estimates of total services outsourcing and off-shoring intensities for all sectors of the economy. These estimates reflect the extent to which all industries taken together have outsourced or off-shored their services inputs.

Table 3-1
The Use of Commodities by Industries, Annual I-O Accounts, 1998 and 2004
Billions of Dollars

Industries/Sectors										
Commodities/Services	Total Manufacturing	Total Services	Other than Manufacturing and Services	**Total Intermediate Uses**	Exports of goods and services	Imports of goods and services	Change in Inventories	C+I+G	**Total Final Uses (GDP)**	**Total Commodity Output**
1998										
Total Manufacturing*	1,370	586	398	**2,353**	530	-826	32	1,689	**1,425**	**3,778**
Total Services**	473	2,163	597	**3,233**	130	-22	1	5,111	**5,219**	**8,452**
Other than Manufacturing and Services***	648	422	423	**1,494**	227	-70	38	1,986	**2,181**	**3,675**
Noncomparable Imports****	19	37	22	**78**		-129		51	**-78**	**0**
Total intermediate inputs	**2,510**	**3,209**	**1,440**	**7,158**						
Compensation of employees	795	3,047	1,182	**5,024**						
Indirect Taxes and Surplus	497	2,258	941	**3,723**	0	0	0	0	**0**	**0**
Total Value Added	**1,292**	**5,305**	**2,123**						**8,747**	
'Total Industry Output	**3,802**	**8,514**	**3,563**		**887**	**-1,047**	**71**	**8,836**		**15,905**
2004										
Total Manufacturing*	1,411	794	537	**2,743**	566	-1,240	80	2,147	**1,553**	**4,296**
Total Services**	570	3,253	806	**4,629**	192	-49	2	7,293	**7,438**	**12,067**
Other than Manufacturing and Services***	887	596	623	**2,106**	294	-194	-26	2,803	**2,877**	**4,983**
Noncomparable Imports****	32	65	37	**134**		-194		60	**-134**	**0**
Total intermediate inputs	**2,900**	**4,709**	**2,003**	**9,612**						
Compensation of employees	879	4,261	1,554	**6,693**						
Indirect Taxes and Surpus	523	3,193	1,378	**5,041**						
Total Value Added	**1,402**	**7,454**	**2,932**						**11,734**	
'Total Industry Output	**4,302**	**12,163**	**4,935**		**1,052**	**-1,676**	**55**	**12,303**		**21,346**

Note: Detail may not add to total due to rounding.
* Total Manufacturing includes industry codes 311FT-339
** Total Services includes industry codes 511-GSLG
*** Other than Manufacturing and Services includes industry codes 111CA-23, 42-493, and S002-S004

Source: Bureau of Economic Analysis and Academy staff calculations.

Table 3-2
Outsourcing and Off-Shoring Intensities
Billions of Dollars, Annual Rates of Growth in Percent

Industry Output, Purchased Inputs Domestic Supply and Purchased Services	1998	2004	Annual % Change
Total Industry Output	15,878	21,400	5.8
Total Purchased Inputs	7,158	9,612	0.0
Domestic Supply - Total Services	8,344	11,922	7.1
Total Purchased Services	3,233	4,629	7.2
Services Imports			
Services Comparable Imports	-22	-49	20.0
Services Comparable Imports as a Share of Services Do	0.0027	0.0041	9.0
Intermediate Comparable Services Imports	9	19	20.1
Non Comparable Imports	78	134	11.9
Total Intermediate Imports	87	153	12.7
Services Outsourcing and Off-shoring Intensities			
Services Outsourcing Intensity: Services Used by All Sectors as a Share of Total Industry Output	**0.2036**	**0.2163**	**1.0**
Services Off-shoring Intensity: Estimated Services Imports** as a Share of Total Purchased Inputs**	**0.0121**	**0.0159**	**5.2**

* Comparable services imports are estimated as
(1) total imports of services as a percent of domestic supply of services, times
(2) total intermediate uses of purchased services by all sectors.
Total imports of services are estimated comparable imports of services plus total intermediate uses of non-comparable imports.

Source: Bureau of Economic Analysis and Academy staff calculations on Table 3-1.

Data in Table 3-2 derive from Table 3-1, and have been rearranged for ease of presentation. For example, total industry output, $15,878 billion in 1998, is the sum of the separate industry output column totals for manufacturing ($3,802 billion), services ($8,514 billion) and other than manufacturing and services ($3,563 billion). Purchased inputs is both the sum of Total intermediate inputs and total intermediate uses ($7,158 billion in 1998).

Outsourcing refers to the share of purchased intermediate goods and services relative to total industry output. Increases in this ratio reflect a reduced reliance on internal labor and capital to produce sector output. Reductions in this share indicate increased use of internal labor and capital within the sector' production processes. Services outsourcing is the services component of this measure and reflects the extent to which firms within industries are relying on purchases of intermediate services as opposed to producing them with their own resources. From Table 3-2, intermediate purchases of services by all sectors rose from 20.4 percent of total industry output in 1998 to 21.6 percent by 2004,[41] an annual rate of growth of 1.0 percent.

[41] From Table 3-2, economy wide services outsourcing in 2004 equals total purchased services ($4,629 billion) divided by total industry output ($21,400).

Services off-shoring due to internal business restructuring is measured using *imported* intermediate services as a percent of total purchased inputs. To estimate imported purchases of intermediate goods and services, we assume that the ratio of total comparable imports to domestic supply[42] for each commodity or service is constant for all industries and commodities and services. This critical assumption is needed because we lack direct measures of services (or goods) imports by industry for intermediate use that are separate from final demand. It implies that if imports of services in 1998 ($22 billion) was 0.3 percent of domestic supply, then every firm in every industry that purchased $1 million in services in 1998 imported $3,000 of those purchased services.

During the 1998 to 2004 period comparable imports of services more than doubled, from $22 billion to $49 billion (see Table 3-1). Non-comparable imports—a substantial portion of which included services imports of multinational companies from their affiliates—grew from $78 billion to $134 billion.

Our measure of services off-shoring intensity is substantially the same as that of Feenstra and Hanson—purchases of imported services as a percent of total non-energy intermediate purchases. Purchases of imported services (intermediate services imports) *must* include both comparable and non-comparable services imports, because non-comparable imports are substantially larger than comparable services imports. For this analysis, the services off-shoring indicator consists of the sum of comparable and non-comparable imports of services as a percentage of total intermediate input for all industries output.

Comparable intermediate services imports are calculated as the product of the comparable services import share and total purchases of intermediate services. The comparable services import share is the ratio of comparable imported services to domestic supply of services. In Table 3-2, domestic supply is total commodity output less exports plus imports less change in inventories.

Comparable intermediate services increased from $9 billion in 1998 to $19 billion in 2004, an annual rate of growth of 20 percent. Total intermediate services imports equals these estimated comparable intermediate imports plus total non-comparable imports.[43] It grew from $87 billion in 1998 to $153 billion in 2004, and annual rate of growth of 12.7 percent.

The outsourcing intensity indicator in Table 3-2, purchased intermediates as a percent of total industry output grew from 20.4 percent in 1998 to 21.6 percent in 2004, an annual rate of growth of 1 percent. Off-shoring, while much smaller in magnitude, grew at a faster rate. The off-shoring intensity indicator, imported purchased intermediates as a percent of total purchased

[42] Domestic Supply is the total amount of a good or service available domestically, either in production as an intermediate input, or in final use. Domestic supply is Total Commodity Output (Use Table row total), less exports (not available domestically) plus imports (available domestically) less the change in private inventories, (increased domestic availability when stocks are drawn down). See Smith, George M. and Sherlene K.S. Lum. (December, 2005). "Annual Industry Accounts; Revised Estimates for 2002-2004". Survey of Current Business, pp. 25-26.

[43] Yuskavage, Robert E., Eric H. Strassner, and Gabriel W. Medeiros. (2006) "Outsourcing and Imported Services in BEA's Industry Accounts," indicated that all non-comparable imports are services.

intermediates, increased from 1.2 percent in 1998 to 1.6 percent in 2004, an annual rate of growth of 5.2 percent.

INDUSTRY LEVEL FINDINGS

This methodology in Table 3-2 was used to calculate the more detailed estimates of services outsourcing and off-shoring intensities from each industry sector presented in Table 3-3. As in Table 3-2, detailed estimates involve calculating (1) domestic supply, (2) comparable import share, (3) percentage of intermediate services purchased (outsourcing), and (4) percentage of intermediate services imported (off-shoring).

Table 3-3 shows estimates of services outsourcing and off-shoring for 1998 and 2004 for each sector and the average annual growth in those measures over the period. Sectors are sorted largest to smallest by the growth rates for services off-shoring. They are ranked by the magnitude of their services off-shoring and also their outsourcing growth rates.

These data indicate that services outsourcing is substantially greater than services off-shoring for nearly every industry sector. For some sectors that have been the focus of the current concerns about off-shoring of high tech services, the difference between these two measures is quite large. For example, estimated services off-shoring in the miscellaneous professional, scientific and technical services sector in 2004 was 1.34 percent—virtually unchanged from its 1998 rate. However, services outsourcing for this high technology services sector in 2004 was 34.5 percent and had increased at almost 5 percent per year from 1998.

Second, these data indicate that there is little correlation between the growth in services off-shoring and services outsourcing at these aggregate industry levels. Only two of the industry sectors among the ten with the greatest growth in services off-shoring intensity during this period were also among the top ten in growth for services outsourcing. The correlation (Pearson's r) between these two growth rates was 0.09. The correlation (Pearson's r) between off-shoring and outsourcing rankings for each industry was a similarly small 0.11.

A third observation is that most of the industry sectors with the highest growth in services off-shoring intensity during this period are manufacturing industries—not services industries. Most of the services industries, including the three reviewed intensively using micro-level data in this report, were in the lowest quartile of industries with off-shoring services growth.

Table 3-3
Industry Services Outsourcing and Off-Shoring Intensities and Rates of Growth
By Annual Rate of Growth of Services Off-Shoring, 1998 to 2004

Outsourcing	Off-Shoring		Off-Shoring (Percent)		Annual Growth Rate		Outsourcing (Percent)		Annual Growth Rate
Rank	Rank	Industry Group*	1998	2004	Percent		1998	2004	Percent
59	1	Mining, except oil and gas	1.09	3.39	35.34		8.24	6.57	-3.37
13	2	Apparel and leather and allied products	0.18	0.45	25.73		9.47	10.99	2.68
19	3	Other transportation equipment	0.19	0.43	21.01		8.22	9.40	2.39
22	4	Rental and leasing services and lessors of intangible assets	2.83	6.06	19.04		29.29	33.21	2.23
9	5	Insurance carriers and related activities	2.67	5.30	16.35		41.32	48.61	2.94
40	6	Electrical equipment, appliances, and components	0.94	1.81	15.21		7.54	7.39	-0.32
20	7	Printing and related support activities	0.24	0.45	13.83		8.93	10.20	2.38
7	8	Machinery	0.70	1.25	12.87		8.57	10.74	4.22
46	9	Real estate	0.30	0.50	11.55		18.36	17.16	-1.09
23	10	Food and beverage and tobacco products	0.26	0.45	11.40		9.93	11.21	2.14
31	11	Chemical products	2.62	4.06	9.13		11.21	12.07	1.28
58	12	Motion picture and sound recording industries	0.90	1.39	8.97		50.71	42.24	-2.78
57	13	Primary metals	0.21	0.32	8.82		5.97	5.09	-2.44
17	14	Paper products	0.14	0.22	8.69		6.98	8.01	2.47
27	15	Fabricated metal products	0.49	0.75	8.64		8.87	9.75	1.65
60	16	Farms	0.07	0.11	8.58		12.24	9.15	-4.21
54	17	Funds, trusts, and other financial vehicles	1.52	2.28	8.36		74.05	65.86	-1.84
14	18	Accommodation	0.62	0.93	8.17		19.66	22.81	2.67
3	19	Computer and electronic products	2.05	3.04	8.04		15.09	20.35	5.81
6	20	Textile mills and textile product mills	0.17	0.25	7.91		6.15	7.76	4.35
28	21	Wholesale trade	3.55	5.19	7.71		14.32	15.60	1.50
47	22	Educational services	0.33	0.47	6.78		30.31	28.30	-1.11
21	23	Motor vehicles, bodies and trailers, and parts	0.79	1.08	6.16		8.85	10.04	2.25
11	24	Plastics and rubber products	0.46	0.62	5.85		7.80	9.09	2.77
51	25	Transit and ground passenger transportation	0.14	0.19	5.71		16.44	15.18	-1.28
49	26	Securities, commodity contracts, and investments	6.19	8.20	5.39		34.86	32.24	-1.25
39	27	Amusements, gambling, and recreation industries	0.31	0.41	5.17		24.75	24.31	-0.30
8	28	State and local government enterprises	0.14	0.18	5.04		18.52	22.53	3.60
12	29	Food services and drinking places	0.11	0.15	5.02		16.37	19.09	2.76
61	30	Federal Reserve banks, credit intermediation, and related activities	1.29	1.68	4.98		31.54	23.32	-4.35
38	31	Miscellaneous manufacturing	0.50	0.64	4.86		10.29	10.38	0.14
43	32	Truck transportation	0.85	1.09	4.66		15.90	15.00	-0.94

Outsourcing	Off-Shoring		Off-Shoring (Percent)		Annual Growth Rate		Outsourcing (Percent)		Annual Growth Rate
Rank	Rank	Industry Group*	1998	2004	Percent		1998	2004	Percent
2	33	Federal general government	6.00	7.66	4.60		18.00	25.48	6.92
32	34	Other services, except government	0.18	0.22	4.04		18.98	20.22	1.09
33	35	Publishing industries (includes software)	1.27	1.57	3.96		31.20	33.20	1.07
10	36	Furniture and related products	0.13	0.16	3.81		9.16	10.70	2.80
55	37	Waste management and remediation services	0.23	0.28	3.81		36.33	32.29	-1.85
56	38	Rail transportation	0.92	1.12	3.59		18.31	15.85	-2.24
45	39	Nonmetallic mineral products	0.63	0.76	3.40		8.27	7.76	-1.04
26	40	Retail trade	0.32	0.38	3.20		17.17	19.16	1.93
41	41	Wood products	0.09	0.10	3.02		5.62	5.43	-0.55
52	42	Forestry, fishing, and related activities	0.11	0.12	2.79		5.21	4.77	-1.39
37	43	Warehousing and storage	0.66	0.75	2.33		20.03	20.69	0.56
35	44	Hospitals and nursing and residential care facilities	0.13	0.14	2.22		25.01	26.42	0.94
25	45	Water transportation	16.45	18.61	2.19		25.03	27.98	1.96
53	46	Management of companies and enterprises	0.39	0.44	2.17		32.47	29.50	-1.53
34	47	Ambulatory health care services	0.14	0.16	1.86		19.61	20.75	0.97
36	48	Social assistance	0.16	0.17	1.61		20.78	21.53	0.60
30	49	State and local general government	0.14	0.15	1.30		17.01	18.31	1.28
44	50	Construction	0.21	0.22	1.02		13.07	12.33	-0.95
48	51	Air transportation	17.31	18.21	0.87		23.37	21.76	-1.15
42	52	Performing arts, spectator sports, museums, and related activities	0.39	0.40	0.65		35.96	34.38	-0.73
16	53	Legal services	0.23	0.24	0.62		21.76	25.04	2.51
50	54	Computer systems design and related services	2.87	2.92	0.28		21.75	20.10	-1.27
62	55	Pipeline transportation	0.36	0.36	0.12		39.26	28.21	-4.69
29	56	Federal government enterprises	7.74	7.78	0.07		7.17	7.81	1.48
4	57	Miscellaneous professional, scientific and technical services	1.34	1.34	0.04		26.47	34.28	4.92
63	58	Other transportation and support activities	1.35	1.30	-0.70		18.75	12.51	-5.55
18	59	Administrative and support services	0.66	0.57	-2.27		19.12	21.91	2.43
24	60	Support activities for mining	2.00	1.38	-5.19		13.81	15.55	2.10
64	61	Oil and gas extraction	1.40	0.94	-5.48		23.10	14.63	-6.11
5	62	Information and data processing services	2.45	1.57	-5.97		28.91	37.28	4.83
1	63	Petroleum and coal products	0.31	0.17	-7.40		11.07	16.26	7.80
15	64	Broadcasting and telecommunications	4.65	2.50	-7.69		37.90	43.82	2.60
65	65	Utilities	0.14	0.06	-9.52		7.83	3.00	-10.29

Source: BEA Industry Annual Input-Output Use Tables and Academy Calculations

Finally, growth in services off-shoring over the period varied across the industry sectors. Eight sectors experienced a decline in estimated services off-shoring intensity, including the broadcasting and telecommunications services, information and data processing services, and the administrative and support services sectors. Several of these services sectors with declining rates of services off-shoring over this period represent high technology services that are the focus of much of the current concerns about services off-shoring. While ten sectors experienced growth rates for services off-shoring that exceeded ten percent per year, most of these services off-shoring levels remained relatively small.

In conclusion,

> **The Panel finds that services outsourcing to domestic firms has been substantially larger than services off-shoring for the industry groups examined during the 1998 to 2004 period.**
>
> **The Panel finds that services off-shoring levels have remained small for comparable industry groups and most other industry sectors during the 1998 to 2004 period.**
>
> **The Panel also finds little evidence of consistent growth in services off-shoring among the industry sectors, with substantial variation among individual sectors during this period.**

ASSESSMENT OF THE DATA

Using the methodology of this chapter to calculate off-shoring rates revealed two major problems with the data.

Differences Between Comparable and Non-Comparable Services Imports

Non-comparable imports are considerably greater in aggregate than imputed comparable imports of services by industry and vary widely from industry to industry. In 2004 the overall ratio of non-comparable imports to imputed comparable imports of services was 4.8. Individual industries varied with a range of 0 to 159 and a median value of 11.5. While non-comparable imports nominally are those for which there are no domestic equivalents, they also include all MNC affiliated services imports whether or not domestic analogs exist. Failure to include these affiliated services imports in the estimates of intermediate imports would substantially understate any estimates of the extent of services off-shoring.

A problem is that non-comparable imports are sector specific but not commodity or service specific. Currently, BEA uses different surveys to collect data on affiliated non-comparable and comparable services imports and the unaffiliated survey collects more detail on the types of services imported. Consequently, there is no way of identifying the types of affiliated services are being imported at the same level of detail as comparable, unaffiliated services imports. It is not known whether these affiliated services are engineering, accounting, legal, sales,

administrative support or other technical services. It would be very useful to be able to break out non-comparable imports into categories similar to those for comparable imports.

However, combining these two types of services imports into the non-comparable imports groupings in the I-O use tables would lose valuable information on the current industry allocation of these comparable services imports (presumably for intermediate use). BEA staff have developed an algorithm to allocate these non-comparable imports to specific industries for intermediate use by those industries. This information is exactly what is needed to develop effective indicators of services off-shoring due to internal business restructuring. Retaining that information for affiliated services imports, even if they are reported at the same level of detail as unaffiliated services imports, would provide a way to test the validity of the key assumption made to allocate unaffiliated services imports between intermediate uses and final demand.

Intermediate Goods and Services Import Data

Direct measures of comparable imports for purchases of intermediate goods and services are not available. This data gap necessitates the assumption that all industries import intermediate services at the same rate, equal to the comparable import share of domestic supply. This methodology was used by BEA in determining its Import Matrix for the 1997 benchmark tables and has been widely used by analysts.

However, the assumption has no theoretical or behavioral basis, and in all probability it is inaccurate, since different sectors likely use imports in different proportions to their overall purchases of services. More importantly, within any industry sector individual firms likely use different production processes and mixes of inputs.[44] Unfortunately, we have no way of knowing how inaccurate this assumption may be.

RECOMMENDATIONS

The Panel believes that BEA should make every effort to identify and show imported services currently categorized as non-comparable, when domestic analogs exist. In particular, there should be as much detail on comparable imports by multinational companies from their affiliates as there is from non-multinationals. BEA has indicated it plans to use a common survey in the future to collect similar details on the types of services imports for both affiliated and unaffiliated imports. Consequently, the Panel recommends that:

> **BEA should implement its proposal to collect consistent levels of detail for affiliated and unaffiliated services imports and periodically review this to assure its comprehensiveness and compatibility with details on services contained in other economic data.**

[44] The recent report of the National Research Council of the National Academies, *analyzing the U.S. Content of Imports and the Foreign Content of Exports,* 2006 raised similar concerns about the validity of this critical "import similarity" assumption.

BEA staff should work to remove affiliated imports from the 'non-comparable" imports component within BEA I-O tables and link them more closely with the same type of unaffiliated services.

Further, BEA should determine the extent to which industry sectors import services uniformly, and whether they do so in proportion to the ratio of total imports of comparable services to domestic supply. If there are serious discrepancies in this assumption, BEA should make every effort to provide separate information on comparable imports of intermediate products and services by industry. To begin this effort, the Panel recommends that

BEA should consider limited sampling of MNC service importers to test their ability to distinguish the use of particular types of services imports for their own use rather than for sale to others.

CHAPTER 4

USING OCCUPATION DATA TO IDENTIFY SERVICES OFF-SHORING

INTRODUCTION

Chapter 3 presented sector estimates of the extent of services outsourcing and off-shoring using BEA inter-industry data. That chapter noted the usefulness of estimates of imported purchased intermediate services relative to total purchased inputs for identifying off-shoring of services. It also discussed obstacles to estimating imported intermediate services, including (1) the problem of distinguishing intermediate imports from imports for final demand and (2) the different treatment of non-comparable services imports (which also include all affiliated services imports of multinational companies) relative to comparable services imports in the I-O use tables. However, even if these problems were corrected and detailed estimates of imported purchases of intermediate services by type of service existed, the inter-industry data would still fail to identify the extent of off-shoring from business restructuring.[45]

The problem is that the BEA I-O industry data are based on transactions between establishments. If services are purchased or sold they are measured, but if they are produced within an establishment but not sold separately, they are not counted. Consequently, BEA I-O data cannot track services that are produced internally by establishments but not purchased or sold separately. The I-O accounts include such internally produced services as part of the value added of labor within each industry sector. However, when analysts measure vulnerability of occupations to off-shoring or their tradability[46] of occupations they usually include jobs and occupations internal to establishments.

There are many examples of services produced within establishments that potentially could be purchased or sold, including accounting and payroll, maintenance, advertising, legal, communications, and training. Business restructuring that affects the supply chain may influence these internally supplied services as well as those that are purchased. For example, purchased help desk services may augment or substitute for services currently supplied within establishments.

Outsourcing or off-shoring of services may show up in the unemployment insurance and BLS MLS data, but they can also occur without layoffs, plant closures or announcements if they are phased-in over time and accomplished through attrition and reassignment. Even so, they should produce changes in the occupational structure in the establishments of firms outsourcing or off-shoring particular services. BLS OES data may help identify occupational employment shifts within establishments and industries.

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[45] Off-shoring due to restructuring refers to changes in the value chain of production and the substitution of imported intermediate goods and services for those produced within the firm or establishment. This is separate from the problem of measuring off-shoring from global expansion, where foreign direct investment substitutes for export-targeted domestic growth of establishments and firms. This distinction is discussed in Chapter 2 and estimated using micro-level data in Chapter 6.

[46] See Bardan and Kroll (2004), Jensen and Kletzer (2006), or Van Welsum (2005) for example.

It is not possible to identify changes in the composition of employment within establishments or industries using BEA I-O industry data. I-O analyses that incorporate labor requirements typically assume a fixed occupational structure and focus on the total number jobs associated with shifts in final demand. Because services outsourcing and off-shoring are expected to change demand for specific workers in various industries, it is necessary to use data that are occupation-based, rather than product or services-based.

This chapter and the next present analyses of OES data to determine whether changes in the employment of services producing occupations can be observed in individual industries and whether inferences can be drawn with respect to outsourcing or off-shoring. This chapter explores the extent to which analysis of OES data alone can identify the extent of services off-shoring and its economic effects. The analysis identifies particular service producing occupations core to production of specific services sectors that may be ancillary to the production of goods and services in establishments in other industries. It focuses on changes in employment share for these "core," service-producing occupations in (1) services sectors and (2) all other industries. Declining employment shares for these core occupations in other industries is consistent with potential outsourcing of those services. Increased employment or increased shares of the same occupations within service sectors may suggest domestic outsourcing, while the lack of a corresponding increase in those industries could be the result of a number of factors, including services off-shoring.

Chapter 5 takes a more direct approach for examining employment and occupations effects of services off-shoring. It uses BEA annual I-O industry data to directly measure off-shoring of services in specific industry sectors, as presented in Chapter 3. It then links these data to the OES data to examine differences in employment changes by occupation for sectors experiencing high and low rates of services off-shoring growth. It looks at two components of employment changes: (1) changing occupational structure within sectors, and (2) sectoral growth or decline.

USING OES DATA TO EXAMINE POTENTIAL SERVICES OUTSOURCING AND OFF-SHORING

This chapter describes the development and application of occupation-based measurements from BLS OES data in examining potential services outsourcing and off-shoring activities. Analysis focuses on the four industries, at a 4-digit NAICS level, selected for intensive examination using industry-level data:

- pharmaceutical and medicine manufacturing [3254],
- architectural, engineering and related services [5413],
- computer systems design and related services [5415], and
- business support services [5614].

Methodology

Off-shoring due to business process restructuring is similar to outsourcing, and reflects competitive pressures that encourage firms to focus on their highest return activities. This suggests that successful competitive firms identify what they do best, concentrate on that, and eliminate, or seek other ways to obtain functions not critical to their core, profit-center activities. As firms restructure their internal processes to concentrate on core activities, other functions that still need to be performed may be transformed through re-engineering, consolidation or outsourcing.

If these changes were substantial or protracted over a number of years, OES data should reflect changes in the employment share of occupations within a sector, with some occupations gaining share and some losing. Those occupations that are not core to an industry's function and vulnerable to outsourcing and off-shoring would be expected to experience declining employment shares.

Our methodology in this chapter is straightforward. The objective is to determine whether the changing shares of occupations within 4-digit NAICS industries can identify core service producing occupations that may be declining as a percent of total employment in other industries, and the extent to which those estimated employment changes reflect potential services outsourcing or off-shoring. Specifically, this analysis will:

1. Identify one or more primary or core occupations unique to the production activity for each of the four industries. A core occupation is one that consists of a substantial proportion of the labor force in that industry and which can be seen to define the industry. For example, major occupation class 17-0000, architecture and engineering occupations, accounted for over 51 percent of total employment in the architectural, engineering and related services [5413] industry, in the May, 2005 survey. Occupations that are not essential (do not define what an industry does) are considered ancillary.

   The definitions are not static. Ancillary activities may become more profitable than core activities, resulting in a transformation of the firm, e.g., a computer or software manufacturer transforming itself into an IT and business services entity. Such a transformation involves substantial changes in the mix of occupations employed.

2. Measure the degree to which industries other than the four industries examined are reducing these occupations as a percentage of their work forces. This declining share may be due to outsourcing (e.g., help desks), to increasing productivity of the particular ancillary activity relative to the rest of the labor force (e.g., computer-assisted drafting services), or to changes in demand.

3. Estimate the extent to which the four industries examined are increasing their employment of core occupation workers when it is being reduced in other industries.

If an industry produces primarily for final demand, it is unlikely that other industries will employ substantial numbers of its core workers, or that their attempts to outsource will have any impact

on its activity. This analysis principally applies to industries producing intermediate services, (although for balance we do look at one manufacturing industry-- pharmaceutical and medicine manufacturing [3254]) that produces largely for final demand.

Data Strengths and Limitations

The BLS OES program provides information on employment and compensation by occupation and industry. At the national level, OES provides information on 801 detailed 6-digit SOC occupations for each of 295 NAICS 4-digit industries.[47] It also provides higher levels of occupational aggregation, including 22 major 2-digit classifications. Beginning with the November, 2002 survey, OES tracked occupations by NAICS-classified industries, and semi-annual surveys are available through May 2005, as of this report.

Each OES national survey contains estimates of the total employed in each occupation in each industry and average hourly wage rates and annual salaries and their dispersion (percentile estimates). In addition, for each industry the survey summarizes occupations into 22 major groupings and total employment.

The data are useful for examining internal restructuring within establishments, because the detailed occupational data correspond to activities that take place in the production of goods and services. For example, if an establishment produces and sells only architectural services, it nevertheless may use accountants, clerks, maintenance personnel, marketing staff, and human resource specialists. Assuming different activities require different occupational mixes, the occupational changes measured in OES can reflect changes in these activities. It may be possible to infer increases or reductions for types of work within individual industries, based on changes in their occupational mixes.

However, there are a number of data limitations affecting this analysis. First, availability of BLS occupation by industry data on a NAICS basis only goes back to November, 2002 at the national 4-digit level. Since then, semi-annual surveys have been published in May and November. As a result, we have used only six surveys covering the period 2002 to 2005. Where NAICS and SIC classifications are closely linked, it may be possible to bridge to earlier surveys that were based on SIC codes, but this was beyond the scope of this study.

Second, BLS OES employment statistics measure domestic employment only, so we cannot directly measure jobs that move off-shore. We can only see domestic gains and losses and changes in occupational shares domestically. This limits our ability to draw conclusions about whether services off-shoring is taking place:

- If core service producing occupations are declining in non-service producing industries but increasing in service producing industries by equal amounts, it would appear that little or no off-shoring of these service activities is taking place;

[47] For a summary of the OES survey, see "Off-Shoring: An Elusive Phenomenon", a Report of the Panel of the National Academy of Public Administration, January, 2006, Appendix D. Also, see Bureau of Labor Statistics web site, http://www.bls.gov/bls/occupation.htm

- If core occupation employment in the selected services industries exceeds reductions elsewhere, it would appear that demand for, including net exports of, those services is increasing; and

- If core employment increases in the selected services industries is less than reductions elsewhere, off-shoring may be taking place. Alternately, there may be significant technological or institutional shifts or changes in economic conditions that may account for these differences in employment growth.

Third, even when there are clear shifts in the mix of occupations within industries, the OES data alone cannot identify the reasons for such changes—i.e., whether due to cyclical factors, seasonal factors, competitive factors (such as possible gains from outsourcing), or other structural factors (such as technological change that increases the demand for some occupations relative to others).

Finally, the OES data were never intended to be used as time series by BLS.[48] Since the analysis in this chapter and Chapter 5 cover the relatively short period during which NAICS industry classification were in use by BLS, most of the caveats will not significantly affect the results. The Panel's concern regarding a need for time series occupational employment by industry data is discussed in Chapter 7.

ANALYTICAL RESULTS

Publicly available OES data on occupation by industry have been combined in a Microsoft ACCESS data base (see Appendix D). We analyzed these data at the highly aggregated occupation 2-digit SOC level, and at the more detailed 6-digit SOC level.

Identifying Core Occupations Using Highly Aggregated Data

To identify core occupations within each industry examined at the 2-digit SOC level, we sought occupations accounting for a substantial portion of the work force and that recognizably define the industry. Our criterion was that gains or reductions in the relative employment share of these occupations likely reflect changes in the fundamental nature of the industry. In particular, a decreasing employment share for a core services occupation in other industries suggests that those industries are focusing on their earning activities and de-emphasizing or outsourcing others.

Table 4-1 shows the concentration of employment in major occupational groups for each of the four industries examined over the November, 2002 to May, 2005 period. The percentages represent pooled totals for each industry over the entire period. Core occupational groups for each sector are shaded. Core occupations account for the largest share of employment in each sector. Two of the industry groups shown in Table 4-1 have more than one major core

[48] See http://www.bls.gov/oes/oes_ques.htm#Ques27

occupation, even at this high level of aggregation. For those industries, multiple core occupations are combined.

Table 4-1
Core Occupations in Examined Industries
November, 2002 and May, 2005 Surveys

Occupation Code	Occupation Title	Share of Industry Employment		Cumulative Share	
325400 Pharmaceutical and Medicine Manufacturing					
51-0000	**Production Occupations**	**27.8**	**%**	**27.8**	**%**
19-0000	**Life, Physical, and Social Science Occupations**	**18.4**		**46.3**	
43-0000	Office and Administrative Support Occupations	12.0		58.2	
11-0000	Management Occupations	11.0		69.2	
13-0000	Business and Financial Operations Occupations	6.9		76.1	
541300 Architectural, Engineering and Related Services					
17-0000	**Architecture and Engineering Occupations**	**49.8**		**49.8**	
43-0000	Office and Administrative Support Occupations	13.6		63.4	
11-0000	Management Occupations	9.4		72.8	
19-0000	Life, Physical, and Social Science Occupations	5.4		78.2	
15-0000	Computer and mathematical occupations	4.0		82.2	
541500 Computer Systems Design and Related Services					
15-0000	**Computer and mathematical occupations**	**44.7**		**44.7**	
43-0000	Office and Administrative Support Occupations	13.8		58.6	
11-0000	Management Occupations	10.7		69.2	
15-0000	Computer and Mathematical Science Occupations	8.8		78.0	
13-0000	Business and Financial Operations Occupations	6.8		84.8	
561400 Business Support Services					
43-0000	**Office and Administrative Support Occupations**	**53.8**		**53.8**	
41-0000	**Sales and Related Occupations**	**26.6**		**80.4**	
11-0000	Management Occupations	4.5		85.0	
15-0000	Computer and mathematical occupations	2.9		87.9	
13-0000	Business and Financial Operations Occupations	2.8		90.6	

Source: BLS OES dad and Academy calculations

Pharmaceutical and medicine manufacturing [3254] is oriented to final demand. Because of this, we do not expect significant interaction between primary occupations, production [51-0000] and life, physical and social science [SOC 19-0000] in that and other industries. The remaining industries are more focused on supplying services to other businesses and we would expect stronger interrelationships.

Architectural, engineering, and related services [5413] has a single core occupational group, architecture and engineering occupations [SOC 17-0000], that accounted for nearly half its work force over the 2002 to 2005 period. Similarly computer systems design and related services [5415] also has a single core occupation group, computer and mathematical science occupations [SOC 15-0000], that accounted for nearly 45 percent of its work force.

Finally, business support services [5614] has two major occupation groupings in its core occupation set—office and administrative support occupations [SOC 43-000] and sales and related occupations [SOC 41-0000]. The first grouping is found in the other industries examined as well, often heavily represented in the work force; but in those cases, it more likely ancillary rather than core.

Services Core Employment in Other Industries

To compare historical patterns of employment for these core occupations in all other industries[49], we examined the change in share of total employment in those industries. For example, we looked at employment in architecture and engineering occupations [SOC 17-0000], in industries other than the architectural, engineering, and related service [5413] and measured it as a percentage of total employment in those other industries. Looking at employment shares rather than the raw numbers allows us to avoid reaching conclusions based on factors that affect the demand for workers in all occupations.

The shares differed widely for different core occupations making comparisons difficult. To make comparisons more feasible we standardized shares, expressing each as an index number relative to its value in the November 2002 survey. A decline in the index, indicating slower growth in these relative to other occupations, suggests that outsourcing may have occurred over the period 2002 to 2005.

Analysis of Changes in Occupational Shares

Results at the 2-digit SOC are presented in Table 4-2. There appears to be little evidence of outsourcing for the core occupations in business support services [5614] and for computer systems design and related services [5415]. The index for the first hovered around the 1.000 base, and the index for the latter increased by 4 percent—perhaps reflecting a strong demand for IT services. The 6 percent decline in pharmaceuticals and medicine manufacturing [3254] core occupations in other industries may be something of an anomaly. A major component of the primary labor force in pharmaceutical and medicine manufacturing [3254] is production occupations [SOC 51-0000], and the data may well be identifying potential outsourcing or off-shoring of manufacturing jobs unrelated to the pharmaceutical and medicine manufacturing [3254] industry.

This leaves the architectural, engineering, and related services [5413] industry, where there does appear to have been a decline in the share of architectural and engineering occupations in other industries. In fact Table 4-2 indicates that actual employment levels declined as well, by 73,520 positions during the November 2002 to May 2005 survey period, even while overall employment in the non-architecture and engineering service industries increased by 2.7 million. Chart 1 looks at architecture and engineering occupations [SOC 17-0000], in all sectors except architectural and engineering services [5413]. Over the period covered by NAICS data at a 4-digit level, employment of architects and engineers as a percent of total non-17-0000 employment was declining.

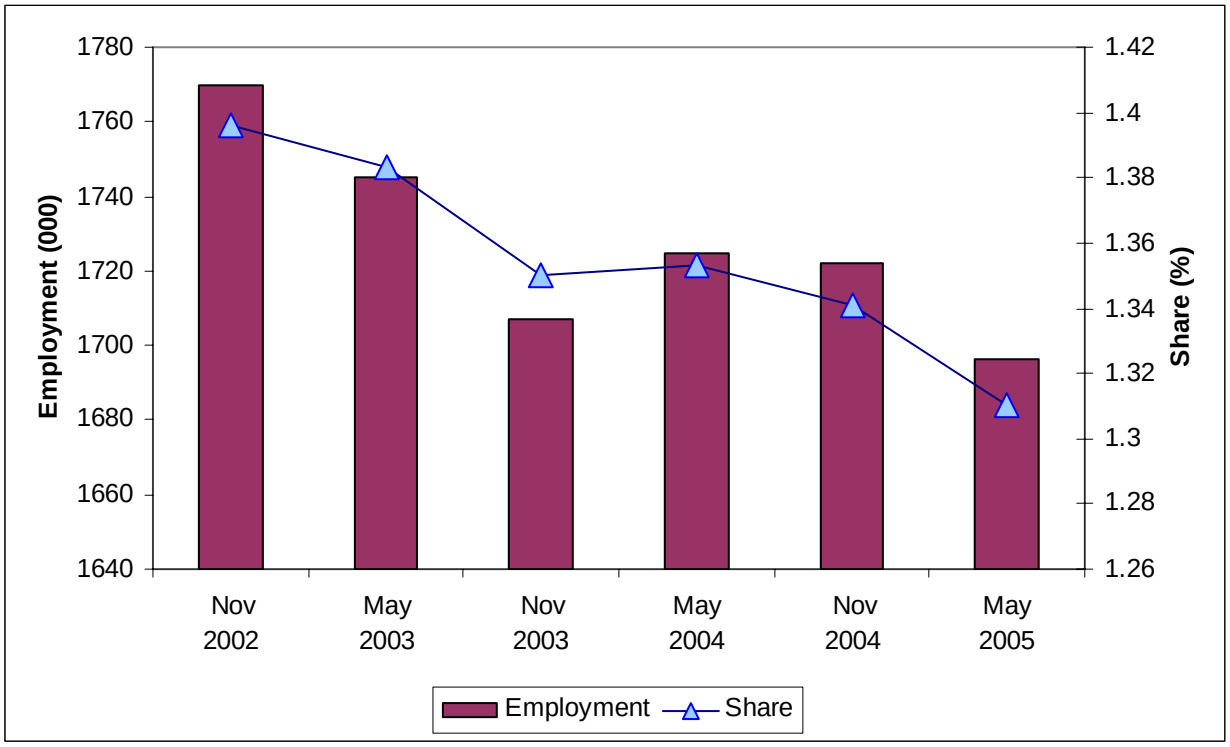
[49] To calculate totals for all other industries, totals were constructed for all industries in the database with the four examined industries omitted.

Table 4-2
Examined Industry Core Employment
in Other Industries

Year	Month	Core Employment	Total Employment	Share of Total	Index
Pharmaceutical and Medicine Manufacturing Core Employment In Other than Pharmaceutical and Medicine Manufacturing Industries					
2002	Dec	11,593,240	126,770,480	9.145	1.000
2003	May	11,299,030	126,149,250	8.957	0.979
2003	Nov	11,082,580	126,434,320	8.765	0.958
2004	May	11,044,720	127,418,350	8.668	0.948
2004	Nov	11,136,530	128,391,460	8.674	0.948
2005	May	11,264,130	129,470,750	8.700	0.951
Architectural, Engineering and Related Services Core Employment In Other than Architectural, Engineering and Related Services Industries					
2002	Dec	1,769,870	126,770,480	1.396	1.000
2003	May	1,745,180	126,149,250	1.383	0.991
2003	Nov	1,707,110	126,434,320	1.350	0.967
2004	May	1,724,570	127,418,350	1.353	0.969
2004	Nov	1,721,810	128,391,460	1.341	0.961
2005	May	1,696,350	129,470,750	1.310	0.938
Computer Systems Design and Related Services Core Employment In Other than Computer Systems Design and Related Services Industries					
2002	Dec	2,171,440	125,950,200	1.72	1.00
2003	May	2,219,540	125,325,830	1.77	1.03
2003	Nov	2,221,890	125,619,840	1.77	1.03
2004	May	2,301,110	126,576,370	1.82	1.05
2004	Nov	2,315,480	127,529,740	1.82	1.05
2005	May	2,297,230	128,576,650	1.79	1.04
Business Support Services Core Employment In Other than Business Support Services Industries					
2002	Dec	35,488,380	126,313,080	28.096	1.000
2003	May	35,586,080	125,691,400	28.312	1.008
2003	Nov	35,526,470	125,983,780	28.199	1.004
2004	May	35,532,540	126,952,700	27.989	0.996
2004	Nov	35,698,920	127,926,320	27.906	0.993
2005	May	36,036,870	128,994,080	27.937	0.994

Source: BLS Occupational Employment Statistics and Academy calculations

Chart 4-1
Architecture and Engineering Employment in Non-Engineering Industries



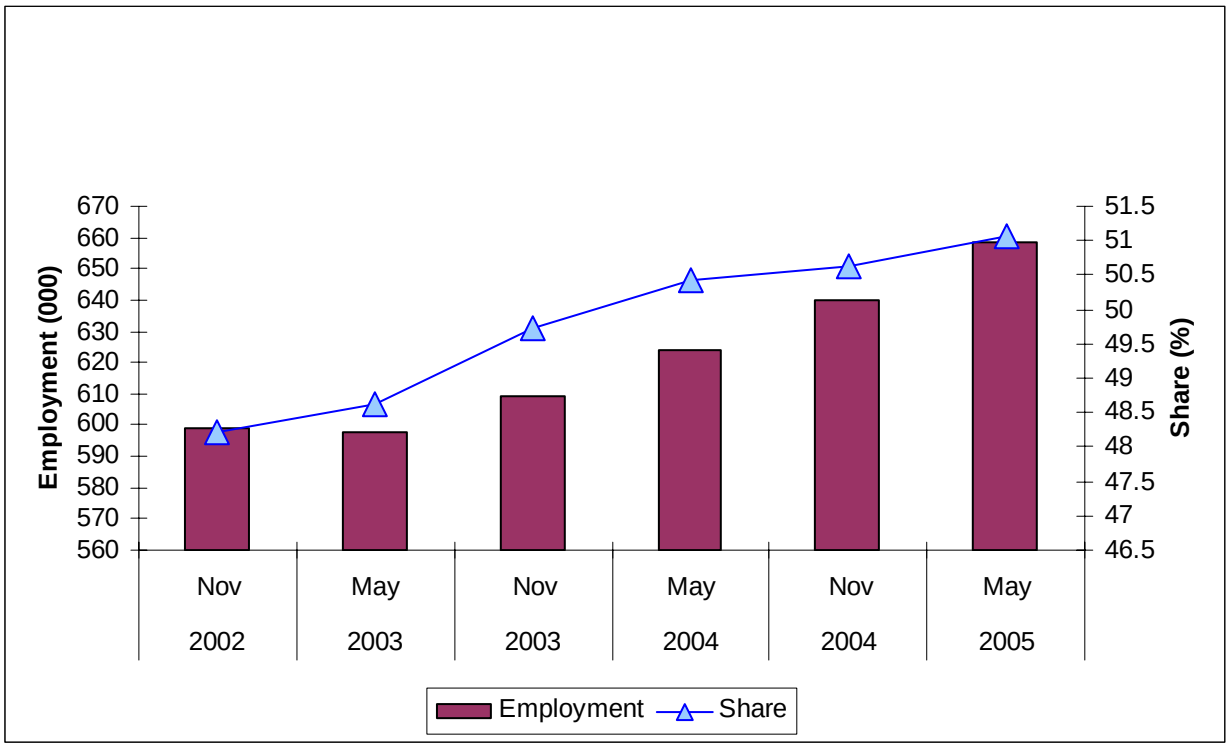
Source: BLS Occupational Employment Statistics and Academy calculations

If we take into account overall growth of the labor force over the period, the numbers are even more substantial. Applying the share of architects and engineers in the 2002 survey (1.40 percent) to total industry employment estimated by the May 2005 survey (129,470,750 employed) produces an estimate of an additional 111,219 architecture and engineering positions "lost" as a result of the changing share of total employment.

During the same period, as shown in Chart 4-2, the number of architecture and engineering jobs in the architectural and engineering services sector increased by 59,620 positions. Domestic outsourcing appears to have accounted for about 81 percent of the reduction of architecture and engineering jobs from firms outside the architectural and engineering services industries.[50] Without additional information, it is not possible to determine whether the remaining structural decline in engineering jobs was due to services off-shoring, greater productivity of engineering services in the specialized industry or if technological and market changes reduced demand.

[50] Domestic outsourcing presumably occurs as engineering employment shifts from other industries to the specialized Architectural, Engineering and Other Technical Services industry.

Chart 4-2
Architectural and Engineering Employment in the Architectural and Engineering Services Industry



Source: BLS Occupational Employment Statistics and Academy calculations

There are a number of caveats to this comparison.

First, as discussed earlier, the analysis only covers a three year period. This makes it difficult to separate out short-term, random and cyclical impacts from longer-term structural changes.

Second, this aggregate occupational analysis may mask changes in specific occupations within the group. For example, computer and mathematical occupational employment may not change if a decline in computer programmer jobs is offset by an increase in computer software engineer jobs.

Third, without additional information, it is not possible to identify reasons for the observed change. A decline in the employment of engineers outside the engineering services industry that exceeds the growth in engineer employment within that industry need not imply off-shoring if engineer occupations are more productive in the specialized industry or if technological changes are reducing demands for engineers in all industries.

Analysis Using Disaggregated (6-Digit) Occupational Data

Finer tuning can help address the aggregation problem that may obscure offsetting movements in employment among different occupations. Table 4-3 identifies primary occupations reported in the four selected industries using more detailed occupational data.

Table 4-3
Core Occupations* in Examined Industries

Occupation Code	Occupation Title	Share	Cumulative Share
	Pharmaceutical and Medicine Manufacturing, NAICS Code 325400		
51-9111	Packaging and Filling Machine Operators and Tenders	7.29	7.29
19-2031	Chemists	4.83	12.12
19-1042	Medical Scientists, Except Epidemiologists	3.37	15.49
51-9011	Chemical Equipment Operators and Tenders	3.06	18.56
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	2.76	21.32
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	2.75	24.06
51-1011	First-Line Supervisors/Managers of Production and Operating Workers	2.69	26.75
19-4021	Biological Technicians	2.58	29.33
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	1.80	31.14
19-4031	Chemical Technicians	1.79	32.93
	Architectural, Engineering and Related Services, NAICS Code 541300		
17-2051	Civil Engineers	8.53	8.53
17-1011	Architects, Except Landscape and Naval	6.27	14.80
17-3011	Architectural and Civil Drafters	6.05	20.85
17-1022	Surveyors	3.25	24.10
17-3031	Surveying and Mapping Technicians	3.24	27.33
17-2141	Mechanical Engineers	3.22	30.55
17-3022	Civil Engineering Technicians	3.19	33.74
17-2071	Electrical Engineers	2.38	36.12
17-3013	Mechanical Drafters	1.53	37.65
17-3023	Electrical and Electronic Engineering Technicians	1.20	38.85
	Computer Systems Design and Related Services, NAICS Code 541500		
15-1031	Computer Software Engineers, Applications	11.65	11.65
15-1021	Computer Programmers	9.88	21.53
15-1051	Computer Systems Analysts	7.94	29.47
15-1041	Computer Support Specialists	7.29	36.76
15-1032	Computer Software Engineers, Systems Software	7.11	43.86
15-1071	Network and Computer Systems Administrators	3.32	47.18
15-1081	Network Systems and Data Communications Analysts	2.40	49.58
15-1061	Database Administrators	1.24	50.82
15-1099	Computer specialists, all other	0.66	51.48
15-1011	Computer and Information Scientists, Research	0.59	52.08
	Business Support Services, NAICS Code 561400		
41-9041	Telemarketers	20.10	20.10
43-4051	Customer Service Representatives	14.85	34.95
43-3011	Bill and Account Collectors	11.77	46.72
43-1011	First-Line Supervisors/Managers of Office and Administrative Support Workers	3.43	50.15
43-2011	Switchboard Operators, Including Answering Service	3.15	53.31
43-9061	Office Clerks, General	2.82	56.13
43-9071	Office Machine Operators, Except Computer	2.64	58.76
43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service	2.02	60.78
43-3031	Bookkeeping, Accounting, and Auditing Clerks	1.31	62.09
41-1012	First-Line Supervisors/Managers of Non-Retail Sales Workers	1.22	63.31

* These are the six digit detailed occupations for the core occupations in Table 4-1. The ten largest sub occupations for each are shown. Shares are based on employment over the six survey periods from November 2002 through May 2005.

Source: BLS OES data and Academy calculations.

The table presents the top ten detailed occupations (based on the total number of employees in the November 2002 to May 2005 OES surveys) for each of the core occupation groups identified in Table 4-1. The top ten 6-digit occupations accounted for a substantial proportion of the work force in each of these four industries, from over 43 percent for the pharmaceutical and medicine manufacturing [3254] industry, to nearly 79 percent for business support services [5614].

As with the 2-digit occupational analysis, we focus on changes in the employment share of the detailed core occupations in other industries. Table 4-4 presents for those industries employment by detailed core occupation, the percent of total employment, and index numbers reflecting changes in the employment shares for each. It is structured the same as Table 4-2 but with the detailed occupations shown in Table 4-3.

For the pharmaceutical and medicine manufacturing [3254] the decline in core occupations as a percent of total industry employment is not uniform. The share of medical scientists, except epidemiologists, increased by over 35 percent; mixing and blending machine setters, operators, and tenders by 25 percent; and biological technicians by almost 48 percent. Chemists, chemical equipment operators and tenders, and chemical technicians took the brunt of the decrease in core occupation employment share.

For architectural and engineering services [5413] core occupations, mechanical drafters as a percent of total non-engineering industry employment increased by almost 15 percent over the period; that of architectural and civil drafters decreased by nearly 30 percent; and employment of electrical and electronic engineering technicians declined by almost 17 percent. The share of employment in most of the other occupations there changed about 5-7 percent in either direction, while that of surveying and mapping technicians and mechanical engineering employment remained relatively flat.

Computer systems design and related services [5415] core occupations in other industries experienced some volatility relative to total employment, but most occupations experienced an increasing share. The share of computer software engineers, applications, rose by 23 percent, computer software engineers, systems software by 34 percent, and network systems and data communications analysts by almost 47 percent. The share of computer programmers declined by 19 percent and database administrators by 7 percent.

Most core occupations of business support services [5614] in other industries experienced declining shares of total employment. Telemarketers declined by 12 percent, and switchboard operators, including answering service; mail clerks and mail machine operators except postal service; and desktop publishers each declined by 19 percent. Customer service representatives experience the largest gain in share of nearly 10 percent but most other occupations were flat.

Table 4-4
Examined Core Employment
in Other Industries
Detailed Occupations

Pharmaceutical and Medicine Manufacturing All Non Case Study Industries					
Year	**Month**	**Core Employment**	**Total Employment**	**Share of Total**	**Index**
Packaging and Filling Machine Operators and Tenders					
2002	Dec	365,410	126,770,480	0.29	1.000
2003	May	373,090	126,149,250	0.30	1.026
2003	Nov	369,170	126,434,320	0.29	1.013
2004	May	383,220	127,418,350	0.30	1.043
2004	Nov	384,220	128,391,460	0.30	1.038
2005	May	361,630	129,470,750	0.28	0.969
Chemists					
2002	Dec	65,110	126,770,480	0.05	1.000
2003	May	65,320	126,149,250	0.05	1.008
2003	Nov	64,180	126,434,320	0.05	0.988
2004	May	63,270	127,418,350	0.05	0.967
2004	Nov	62,510	128,391,460	0.05	0.948
2005	May	61,690	129,470,750	0.05	0.928
Medical Scientists, Except Epidemiologists					
2002	Dec	44,050	126,770,480	0.03	1.000
2003	May	49,670	126,149,250	0.04	1.133
2003	Nov	55,930	126,434,320	0.04	1.273
2004	May	55,730	127,418,350	0.04	1.259
2004	Nov	63,800	128,391,460	0.05	1.430
2005	May	61,390	129,470,750	0.05	1.365
Chemical Equipment Operators and Tenders					
2002	Dec	43,220	126,770,480	0.03	1.000
2003	May	44,400	126,149,250	0.04	1.032
2003	Nov	37,160	126,434,320	0.03	0.862
2004	May	36,540	127,418,350	0.03	0.841
2004	Nov	34,650	128,391,460	0.03	0.792
2005	May	35,860	129,470,750	0.03	0.812
Inspectors, Testers, Sorters, Samplers, and Weighers					
2002	Dec	478,890	126,770,480	0.38	1.000
2003	May	473,390	126,149,250	0.38	0.993
2003	Nov	477,670	126,434,320	0.38	1.000
2004	May	483,250	127,418,350	0.38	1.004
2004	Nov	491,500	128,391,460	0.38	1.013
2005	May	492,050	129,470,750	0.38	1.006

Table 4-4 (continued)

Pharmaceutical and Medicine Manufacturing All Non Case Study Industries					
Year	**Month**	**Core Employment**	**Total Employment**	**Share of Total**	**Index**
Mixing and Blending Machine Setters, Operators, and Tenders					
2002	Dec	89,970	126,770,480	0.07	1.000
2003	May	91,480	126,149,250	0.07	1.022
2003	Nov	97,180	126,434,320	0.08	1.083
2004	May	104,610	127,418,350	0.08	1.157
2004	Nov	108,800	128,391,460	0.08	1.194
2005	May	114,990	129,470,750	0.09	1.251
First-Line Supervisors/Managers of Production and Operating Workers					
2002	Dec	687,180	126,770,480	0.54	1.000
2003	May	682,310	126,149,250	0.54	0.998
2003	Nov	671,450	126,434,320	0.53	0.980
2004	May	675,690	127,418,350	0.53	0.978
2004	Nov	675,490	128,391,460	0.53	0.971
2005	May	660,800	129,470,750	0.51	0.942
Biological Technicians					
2002	Dec	37,930	126,770,480	0.03	1.000
2003	May	41,430	126,149,250	0.03	1.098
2003	Nov	44,310	126,434,320	0.04	1.171
2004	May	49,610	127,418,350	0.04	1.301
2004	Nov	51,410	128,391,460	0.04	1.338
2005	May	57,190	129,470,750	0.04	1.476
Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders					
2002	Dec	27,990	126,770,480	0.02	1.000
2003	May	30,320	126,149,250	0.02	1.089
2003	Nov	23,510	126,434,320	0.02	0.842
2004	May	24,400	127,418,350	0.02	0.867
2004	Nov	31,640	128,391,460	0.02	1.116
2005	May	33,940	129,470,750	0.03	1.187
Chemical Technicians					
2002	Dec	56,030	126,770,480	0.04	1.000
2003	May	54,960	126,149,250	0.04	0.986
2003	Nov	53,980	126,434,320	0.04	0.966
2004	May	53,930	127,418,350	0.04	0.958
2004	Nov	53,300	128,391,460	0.04	0.939
2005	May	51,270	129,470,750	0.04	0.896

Table 4-4 (continued)

Architectural and Engineering Services All Non Case Study Industries					
Year	**Month**	**Core Employment**	**Total Employment**	**Share of Total**	**Index**
Civil Engineers					
2002	Dec	103,170	125,822,780	0.08	1.000
2003	May	103,770	125,211,730	0.08	1.011
2003	Nov	105,650	125,500,230	0.08	1.027
2004	May	108,560	126,468,330	0.09	1.047
2004	Nov	111,120	127,414,360	0.09	1.064
2005	May	110,720	128,467,560	0.09	1.051
Architects, Except Landscape and Naval					
2002	Dec	12,540	125,822,780	0.01	1.000
2003	May	12,390	125,211,730	0.01	0.993
2003	Nov	13,170	125,500,230	0.01	1.053
2004	May	13,830	126,468,330	0.01	1.097
2004	Nov	13,820	127,414,360	0.01	1.088
2005	May	13,330	128,467,560	0.01	1.041
Architectural and Civil Drafters					
2002	Dec	27,650	125,822,780	0.02	1.000
2003	May	23,430	125,211,730	0.02	0.852
2003	Nov	22,870	125,500,230	0.02	0.829
2004	May	21,540	126,468,330	0.02	0.775
2004	Nov	20,200	127,414,360	0.02	0.721
2005	May	18,930	128,467,560	0.01	0.671
Surveyors					
2002	Dec	11,640	125,822,780	0.01	1.000
2003	May	10,590	125,211,730	0.01	0.914
2003	Nov	10,780	125,500,230	0.01	0.928
2004	May	11,200	126,468,330	0.01	0.957
2004	Nov	11,550	127,414,360	0.01	0.980
2005	May	11,580	128,467,560	0.01	0.974
Surveying and Mapping Technicians					
2002	Dec	17,000	125,822,780	0.01	1.000
2003	May	17,000	125,211,730	0.01	1.005
2003	Nov	15,980	125,500,230	0.01	0.942
2004	May	18,180	126,468,330	0.01	1.064
2004	Nov	16,750	127,414,360	0.01	0.973
2005	May	17,510	128,467,560	0.01	1.009
Mechanical Engineers					
2002	Dec	161,710	125,822,780	0.13	1.000
2003	May	160,140	125,211,730	0.13	0.995
2003	Nov	167,960	125,500,230	0.13	1.041
2004	May	170,520	126,468,330	0.13	1.049
2004	Nov	166,620	127,414,360	0.13	1.017
2005	May	166,230	128,467,560	0.13	1.007

Table 4-4 (continued)

Architectural and Engineering Services All Non Case Study Industries					
Year	**Month**	**Core Employment**	**Total Employment**	**Share of Total**	**Index**
Civil Engineering Technicians					
2002	Dec	48,360	125,822,780	0.04	1.000
2003	May	49,470	125,211,730	0.04	1.028
2003	Nov	46,660	125,500,230	0.04	0.967
2004	May	46,630	126,468,330	0.04	0.959
2004	Nov	46,860	127,414,360	0.04	0.957
2005	May	46,570	128,467,560	0.04	0.943
Electrical Engineers					
2002	Dec	112,870	125,822,780	0.09	1.000
2003	May	108,600	125,211,730	0.09	0.967
2003	Nov	111,450	125,500,230	0.09	0.990
2004	May	109,710	126,468,330	0.09	0.967
2004	Nov	113,520	127,414,360	0.09	0.993
2005	May	110,830	128,467,560	0.09	0.962
Mechanical Drafters					
2002	Dec	45,910	125,822,780	0.04	1.000
2003	May	49,710	125,211,730	0.04	1.088
2003	Nov	52,500	125,500,230	0.04	1.146
2004	May	54,900	126,468,330	0.04	1.190
2004	Nov	54,740	127,414,360	0.04	1.177
2005	May	53,860	128,467,560	0.04	1.149
Electrical and Electronic Engineering Technicians					
2002	Dec	172,510	125,822,780	0.14	1.000
2003	May	156,530	125,211,730	0.13	0.912
2003	Nov	164,260	125,500,230	0.13	0.955
2004	May	158,270	126,468,330	0.13	0.913
2004	Nov	155,940	127,414,360	0.12	0.893
2005	May	146,490	128,467,560	0.11	0.832

Table 4-4 (continued)

Computer Systems Design and Related Services All Non Case Study Industries					
Year	**Month**	**Core Employment**	**Total Employment**	**Share of Total**	**Index**
Computer Software Engineers, Applications					
2002	Dec	234,110	125,950,200	0.19	1.000
2003	May	249,440	125,325,830	0.20	1.071
2003	Nov	260,230	125,619,840	0.21	1.114
2004	May	277,100	126,576,370	0.22	1.178
2004	Nov	285,600	127,529,740	0.22	1.205
2005	May	294,770	128,576,650	0.23	1.233
Computer Programmers					
2002	Dec	327,570	125,950,200	0.26	1.000
2003	May	306,630	125,325,830	0.24	0.941
2003	Nov	285,900	125,619,840	0.23	0.875
2004	May	298,920	126,576,370	0.24	0.908
2004	Nov	283,310	127,529,740	0.22	0.854
2005	May	270,770	128,576,650	0.21	0.810
Computer Systems Analysts					
2002	Dec	355,380	125,950,200	0.28	1.000
2003	May	371,670	125,325,830	0.30	1.051
2003	Nov	384,720	125,619,840	0.31	1.085
2004	May	399,260	126,576,370	0.32	1.118
2004	Nov	408,830	127,529,740	0.32	1.136
2005	May	403,500	128,576,650	0.31	1.112
Computer Support Specialists					
2002	Dec	395,520	125,950,200	0.31	1.000
2003	May	397,440	125,325,830	0.32	1.010
2003	Nov	397,350	125,619,840	0.32	1.007
2004	May	400,820	126,576,370	0.32	1.008
2004	Nov	407,490	127,529,740	0.32	1.018
2005	May	404,050	128,576,650	0.31	1.001
Computer Software Engineers, Systems Software					
2002	Dec	165,690	125,950,200	0.13	1.000
2003	May	199,280	125,325,830	0.16	1.209
2003	Nov	187,270	125,619,840	0.15	1.133
2004	May	223,940	126,576,370	0.18	1.345
2004	Nov	228,770	127,529,740	0.18	1.364
2005	May	227,280	128,576,650	0.18	1.344

Table 4-4 (continued)

Computer Systems Design and Related Services All Non Case Study Industries					
Year	**Month**	**Core Employment**	**Total Employment**	**Share of Total**	**Index**
Network and Computer Systems Administrators					
2002	Dec	192,710	125,950,200	0.15	1.000
2003	May	198,490	125,325,830	0.16	1.035
2003	Nov	206,760	125,619,840	0.16	1.076
2004	May	216,630	126,576,370	0.17	1.119
2004	Nov	221,970	127,529,740	0.17	1.138
2005	May	226,230	128,576,650	0.18	1.150
Network Systems and Data Communications Analysts					
2002	Dec	101,930	125,950,200	0.08	1.000
2003	May	111,210	125,325,830	0.09	1.096
2003	Nov	118,910	125,619,840	0.09	1.170
2004	May	136,020	126,576,370	0.11	1.328
2004	Nov	142,070	127,529,740	0.11	1.377
2005	May	150,500	128,576,650	0.12	1.446
Database Administrators					
2002	Dec	84,000	125,950,200	0.07	1.000
2003	May	79,610	125,325,830	0.06	0.952
2003	Nov	81,170	125,619,840	0.06	0.969
2004	May	81,020	126,576,370	0.06	0.960
2004	Nov	81,660	127,529,740	0.06	0.960
2005	May	79,690	128,576,650	0.06	0.929
Computer specialists, all other					
2002	Dec	N/A	125,950,200	NA	
2003	May	N/A	125,325,830	NA	
2003	Nov	N/A	125,619,840	NA	
2004	May	100,920	126,576,370	0.08	1.000
2004	Nov	98,860	127,529,740	0.08	0.972
2005	May	87,080	128,576,650	0.07	0.849
Computer and Information Scientists, Research					
2002	Dec	16,460	125,950,200	0.01	1.000
2003	May	14,380	125,325,830	0.01	0.878
2003	Nov	15,370	125,619,840	0.01	0.936
2004	May	14,730	126,576,370	0.01	0.890
2004	Nov	15,850	127,529,740	0.01	0.951
2005	May	16,590	128,576,650	0.01	0.987

Table 4-4 (continued)

Business Support Services All Non Case Study Industries					
Year	**Month**	**Core Employment**	**Total Employment**	**Share of Total**	**Index**
Telemarketers					
2002	Dec	255,820	126,313,080	0.20	1.000
2003	May	215,230	125,691,400	0.17	0.845
2003	Nov	221,440	125,983,780	0.18	0.868
2004	May	252,110	126,952,700	0.20	0.981
2004	Nov	247,170	127,926,320	0.19	0.954
2005	May	231,200	128,994,080	0.18	0.885
Customer Service Representatives					
2002	Dec	1,740,590	126,313,080	1.38	1.000
2003	May	1,764,060	125,691,400	1.40	1.018
2003	Nov	1,788,100	125,983,780	1.42	1.030
2004	May	1,893,900	126,952,700	1.49	1.083
2004	Nov	1,923,000	127,926,320	1.50	1.091
2005	May	1,946,810	128,994,080	1.51	1.095
Bill and Account Collectors					
2002	Dec	322,330	126,313,080	0.26	1.000
2003	May	327,380	125,691,400	0.26	1.021
2003	Nov	327,690	125,983,780	0.26	1.019
2004	May	342,620	126,952,700	0.27	1.058
2004	Nov	341,500	127,926,320	0.27	1.046
2005	May	329,970	128,994,080	0.26	1.002
First-Line Supervisors/Managers of Office and Administrative Support Workers					
2002	Dec	1,353,490	126,313,080	1.07	1.000
2003	May	1,376,420	125,691,400	1.10	1.022
2003	Nov	1,374,590	125,983,780	1.09	1.018
2004	May	1,375,020	126,952,700	1.08	1.011
2004	Nov	1,311,270	127,926,320	1.03	0.957
2005	May	1,263,610	128,994,080	0.98	0.914
Switchboard Operators, Including Answering Service					
2002	Dec	199,200	126,313,080	0.16	1.000
2003	May	185,230	125,691,400	0.15	0.934
2003	Nov	179,780	125,983,780	0.14	0.905
2004	May	177,170	126,952,700	0.14	0.885
2004	Nov	174,320	127,926,320	0.14	0.864
2005	May	165,470	128,994,080	0.13	0.813
Office Clerks, General					
2002	Dec	2,830,000	126,313,080	2.24	1.000
2003	May	2,892,830	125,691,400	2.30	1.027
2003	Nov	2,930,810	125,983,780	2.33	1.038
2004	May	2,927,720	126,952,700	2.31	1.029
2004	Nov	2,922,430	127,926,320	2.28	1.020
2005	May	2,971,640	128,994,080	2.30	1.028

Table 4-4 (continued)

Business Support Services All Non Case Study Industries					
Year	**Month**	**Core Employment**	**Total Employment**	**Share of Total**	**Index**
Office Machine Operators, Except Computer					
2002	Dec	67,050	126,313,080	0.05	1.000
2003	May	62,780	125,691,400	0.05	0.941
2003	Nov	58,840	125,983,780	0.05	0.880
2004	May	72,890	126,952,700	0.06	1.082
2004	Nov	63,760	127,926,320	0.05	0.939
2005	May	62,360	128,994,080	0.05	0.911
Mail Clerks and Mail Machine Operators, Except Postal Service					
2002	Dec	147,120	126,313,080	0.12	1.000
2003	May	130,040	125,691,400	0.10	0.888
2003	Nov	132,190	125,983,780	0.10	0.901
2004	May	125,990	126,952,700	0.10	0.852
2004	Nov	123,210	127,926,320	0.10	0.827
2005	May	122,280	128,994,080	0.09	0.814
Desktop Publishers					
2002	Dec	31,690	126,313,080	0.03	1.000
2003	May	30,500	125,691,400	0.02	0.967
2003	Nov	30,470	125,983,780	0.02	0.964
2004	May	30,260	126,952,700	0.02	0.950
2004	Nov	27,230	127,926,320	0.02	0.848
2005	May	26,220	128,994,080	0.02	0.810
First-Line Supervisors/Managers of Non-Retail Sales Workers					
2002	Dec	300,190	126,313,080	0.24	1.000
2003	May	310,430	125,691,400	0.25	1.039
2003	Nov	301,160	125,983,780	0.24	1.006
2004	May	295,020	126,952,700	0.23	0.978
2004	Nov	289,620	127,926,320	0.23	0.953
2005	May	279,380	128,994,080	0.22	0.911

Source: BLS Occupational Employment Statistics data and Academy calculations

The disaggregated occupational analysis reveals the more extensive changes in occupational employment shares that are taking place in both the specialized services industries—at least the four selected industries—and all other industries. But as can be seen in the table, these changes in employment shares vary substantially for different detailed core occupations. However, even if a consistent pattern had emerged indicating faster growth in employment shares for these core occupations within the specialized industries, it would not be possible to attribute the reason for these differences in occupational employment shares without more data.

Table 4-5 presents information on the employment by detailed core occupation in these four industries and other industries. It provides useful information on employment changes and the extent to which declines in other industries are offset by growth in employment in the four industries. This was discussed earlier for the architecture and engineering jobs at a more aggregated level. While it is informative to look at the actual numbers instead of shares, we can't put them into the context of outsourcing, because it is not clear whether the occupational shares of total employment are increasing or decreasing. In addition, the detailed estimates

underestimate actual employment, because of the need of statistical agencies to protect the confidentiality of respondents.

Over the survey period there was overall growth of some 38,850 jobs that are core to the pharmaceutical and medicine manufacturing [3254] industry. Of this, 35,030 were in other industries. Declines in other industries of chemists, first line supervisors of production workers and operating workers, and chemical technicians were accompanied by reductions in the pharmaceutical and medicine manufacturing [3254] industry. Only for chemical equipment operators and tenders was there an increase in pharmaceutical and medicine manufacturing [3254] counter to declines elsewhere.

For the detailed architectural and engineering service [5413] core occupations, employment growth in the selected industry offset declines elsewhere for architectural and civil drafters, surveyors, and civil engineering technicians. The robust growth for other core occupations that were also growing outside the specialized industry suggests some degree of engineering services outsourcing within these non-architecture and engineering services industries. Table 4-4 confirms the declining share of architectural and civil drafters, suggesting that this occupation may have been domestically outsourced. There is no such offset for the decline in electrical and electronic engineering technicians, which fell by 17 percent among the other industry workforce, suggesting that these jobs have disappeared due to technological change or been off-shored. Overall growth in these occupations within the architectural and engineering Services industry accounts for all of the net growth of some 46,550 core engineering occupation jobs.

Computer systems design and related services [5415] core occupations had the largest growth among the four selected industries, but much of this growth occurred in industries other than the specialized services industry. A decline of computer systems analysts within the specialized industry [5415] was more than offset by growth in other industries. Only computer programmers showed a consistent decline during the period.

Business support services [5614] core occupations experienced the second largest increase, in both the four industries examined and in all other industries. Declines in first line supervisors of office and administrative support workers; switchboard operators, including answering service; mail clerks and mail machine operators, except postal service; office machine operators, except computer; and telemarketers in other industries were not offset, even though there was general growth in these occupations in the Business support services [5614] industry. Most of the growth in these core occupations in both the specialized industry and all other industries was in customer service representatives and office clerks, general.

Table 4-5
Examined Industry Core Occupations
Employment in Examined Industries and Other Industries

Pharmaceutical and Medicine Manufacturing, NAICS Code 325400					
SOC Code	Occupation Title	Survey	Employment		
			Case Study Industry	Other Industries	Net Gain/Loss
51-9111	Packaging and Filling Machine Operators and Tenders	Nov-02	20,370	365,410	
	Packaging and Filling Machine Operators and Tenders	May-05	21,990	361,630	
	Change Nov-02 to May-05		1,620	-3,780	-2160
19-2031	Chemists	Nov-02	14,280	65,110	
	Chemists	May-05	12,920	61,690	
	Change Nov-02 to May-05		-1,360	-3,420	-4780
19-1042	Medical Scientists, Except Epidemiologists	Nov-02	8,770	44,050	
	Medical Scientists, Except Epidemiologists	May-05	10,350	61,390	
	Change Nov-02 to May-05		1,580	17,340	18920
51-9011	Chemical Equipment Operators and Tenders	Nov-02	9,150	43,220	
	Chemical Equipment Operators and Tenders	May-05	10,820	35,860	
	Change Nov-02 to May-05		1,670	-7,360	-5690
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	Nov-02	8,560	478,890	
	Inspectors, Testers, Sorters, Samplers, and Weighers	May-05	8,620	492,050	
	Change Nov-02 to May-05		60	13,160	13220
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	Nov-02	7,780	89,970	
	Mixing and Blending Machine Setters, Operators, and Tenders	May-05	9,040	114,990	
	Change Nov-02 to May-05		1,260	25,020	26280
51-1011	First-Line Supervisors/Managers of Production and Operating Workers	Nov-02	9,020	687,180	
	First-Line Supervisors/Managers of Production and Operating Workers	May-05	7,420	660,800	
	Change Nov-02 to May-05		-1,600	-26,380	-27980
19-4021	Biological Technicians	Nov-02	6,400	37,930	
	Biological Technicians	May-05	8,640	57,190	
	Change Nov-02 to May-05		2,240	19,260	21500
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	Nov-02	4,670	27,990	
	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	May-05	4,770	33,940	
	Change Nov-02 to May-05		100	5,950	6050
19-4031	Chemical Technicians	Nov-02	6,660	56,030	
	Chemical Technicians	May-05	4,910	51,270	
	Change Nov-02 to May-05		-1,750	-4,760	-6510
	Total Change, Nov-02 to May-05		**3,820**	**35,030**	**38,850**

Table 4-5 (continued)

Architectural and Engineering Services, NAICS Code 54130					
SOC Code	Occupation Title	Survey	Employment		
			Case Study Industry	Other Industries	Net Gain/Loss
17-2051	Civil Engineers	Nov-02	100,640	103,170	
17-2051	Civil engineers	May-05	115,810	110,720	
	Change Nov-02 to May-05		15,170	7,550	22,720
			0		
17-1011	Architects, Except Landscape and Naval	Nov-02	73,310	12,540	
17-1011	Architects, except landscape and naval	May-05	82,150	13,330	
	Change Nov-02 to May-05		8,840	790	9,630
			0		
17-3011	Architectural and Civil Drafters	Nov-02	72,030	27,650	
17-3011	Architectural and civil drafters	May-05	80,460	18,930	
	Change Nov-02 to May-05		8,430	-8,720	-290
			0		
17-1022	Surveyors	Nov-02	41,180	11,640	
17-1022	Surveyors	May-05	41,860	11,580	
	Change Nov-02 to May-05		680	-60	620
			0		
17-3031	Surveying and Mapping Technicians	Nov-02	36,730	17,000	
17-3031	Surveying and mapping technicians	May-05	45,060	17,510	
	Change Nov-02 to May-05		8,330	510	8,840
			0		
17-2141	Mechanical Engineers	Nov-02	34,010	161,710	
17-2141	Mechanical engineers	May-05	47,060	166,230	
	Change Nov-02 to May-05		13,050	4,520	17,570
			0		
17-3022	Civil Engineering Technicians	Nov-02	36,130	48,360	
17-3022	Civil engineering technicians	May-05	41,830	46,570	
	Change Nov-02 to May-05		5,700	-1,790	3,910
			0		
17-2071	Electrical Engineers	Nov-02	29,250	112,870	
17-2071	Electrical engineers	May-05	30,570	110,830	
	Change Nov-02 to May-05		1,320	-2,040	-720
			0		
17-3013	Mechanical Drafters	Nov-02	17,730	45,910	
17-3013	Mechanical drafters	May-05	19,610	53,860	
	Change Nov-02 to May-05		1,880	7,950	9,830
			0		
17-3023	Electrical and Electronic Engineering Technicians	Nov-02	14,900	172,510	
17-3023	Electrical and electronic engineering technicians	May-05	15,360	146,490	
	Change Nov-02 to May-05		460	-26,020	-25,560
	Total Change, Nov-02 to May-05		**63,860**	**-17,310**	**46,550**

Table 4-5 (continued)

Computer Systems Design and Related Services, NAICS Code 541500					
SOC Code	Occupation Title	Survey	Employment		
			Case Study Industry	Other Industries	Net Gain/Loss
15-1031	Computer Software Engineers, Applications	Nov-02	116,430	234,110	
15-1031	Computer software engineers, applications	May-05	149,290	294,770	
	Change Nov-02 to May-05		32,860	60,660	93,520
15-1021	Computer Programmers	Nov-02	119,700	327,570	
15-1021	Computer programmers	May-05	114,580	270,770	
	Change Nov-02 to May-05		-5,120	-56,800	-61,920
15-1051	Computer Systems Analysts	Nov-02	96,240	355,380	
15-1051	Computer systems analysts	May-05	85,020	403,500	
	Change Nov-02 to May-05		-11,220	48,120	36,900
15-1041	Computer Support Specialists	Nov-02	82,520	395,520	
15-1041	Computer support specialists	May-05	85,760	404,050	
	Change Nov-02 to May-05		3,240	8,530	11,770
15-1032	Computer Software Engineers, Systems Software	Nov-02	67,790	165,690	
15-1032	Computer software engineers, systems software	May-05	86,710	227,280	
	Change Nov-02 to May-05		18,920	61,590	80,510
15-1071	Network and Computer Systems Administrators	Nov-02	38,050	192,710	
15-1071	Network and computer systems administrators	May-05	40,280	226,230	
	Change Nov-02 to May-05		2,230	33,520	35,750
15-1081	Network Systems and Data Communications Analysts	Nov-02	22,810	101,930	
15-1081	Network systems and data communications analysts	May-05	31,550	150,500	
	Change Nov-02 to May-05		8,740	48,570	57,310
15-1061	Database Administrators	Nov-02	14,570	84,000	
15-1061	Database administrators	May-05	14,680	79,690	
	Change Nov-02 to May-05		110	-4,310	-4,200
15-1099	Computer specialists, all other	Nov-02	NA	N/A	
15-1099	Computer specialists, all other	May-05	15,780	87,080	
	Change Nov-02 to May-05		NA	N/A	N/A
15-1011	Computer and Information Scientists, Research	Nov-02	5,960	16,460	
15-1011	Computer and information scientists, research	May-05	7,090	16,590	
	Change Nov-02 to May-05		1,130	130	1,260
	Total Change, Nov-02 to May-05		**50,890**	**200,010**	**250,900**

Table 4-5 (continued)

Business Support Services, NAICS Code 561400					
SOC Code	Occupation Title	Survey	Employment		
			Case Study Industry	Other Industries	Net Gain/Loss
41-9041	Telemarketers	Nov-02	155,430	255,820	
41-9041	Telemarketers	May-05	155,660	231,200	
	Change Nov-02 to May-05		230	-24,620	-24,390
43-4051	Customer Service Representatives	Nov-02	105,570	1,740,590	
43-4051	Customer service representatives	May-05	117,040	1,946,810	
	Change Nov-02 to May-05		11,470	206,220	217,690
43-3011	Bill and Account Collectors	Nov-02	78,400	322,330	
43-3011	Bill and account collectors	May-05	97,010	329,970	
	Change Nov-02 to May-05		18,610	7,640	26,250
43-1011	First-line supervisors/managers of office and administrative support workers	Nov-02	25,550	1,353,490	
43-1011	First-line supervisors/managers of office and administrative support workers	May-05	26,910	1,263,610	
	Change Nov-02 to May-05		1,360	-89,880	-88,520
43-2011	Switchboard Operators, Including Answering Service	Nov-02	23,870	199,200	
43-2011	Switchboard operators, including answering service	May-05	24,500	165,470	
	Change Nov-02 to May-05		630	-33,730	-33,100
43-9061	Office Clerks, General	Nov-02	20,110	2,830,000	
43-9061	Office clerks, general	May-05	23,930	2,971,640	
	Change Nov-02 to May-05		3,820	141,640	145,460
43-9071	Office Machine Operators, Except Computer	Nov-02	19,640	67,050	
43-9071	Office machine operators, except computer	May-05	20,650	62,360	
	Change Nov-02 to May-05		1,010	-4,690	-3,680
43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service	Nov-02	10,250	147,120	
43-9051	Mail clerks and mail machine operators, except postal service	May-05	18,480	122,280	
	Change Nov-02 to May-05		8,230	-24,840	-16,610
43-9031	Desktop Publishers	Nov-02	370	31,690	
43-9031	Desktop publishers	May-05	600	26,220	
	Change Nov-02 to May-05		230	-5,470	-5,240
41-1012	First-Line Supervisors/Managers of Non-Retail Sales Workers	Nov-02	8,410	300,190	
41-1012	First-line supervisors/managers of non-retail sales workers	May-05	9,450	279,380	
	Change Nov-02 to May-05		1,040	-20,810	-19,770
	Total Change, Nov-02 to May-05		**46,630**	**151,460**	**198,090**

Source: BLS OES national data, Academy calculations

ASSESSMENT OF THE DATA

The OES data are essential for identifying changes in the occupational structure of industries and for measuring associated employment effects, providing a fine level of industry and occupational detail. They can identify changes in occupations that may not appear in BEA data that primarily measure purchases and sales of output by firms and establishments or even in other BLS surveys that depend on unemployment insurance information.

There are some limitations to this data set, however. The most serious is the lack of 3-digit occupational detail. While the analyst can aggregate the OES data manually, doing so will result in undercounting employment, due to BLS holding back detailed occupational data to prevent disclosure. This can be serious; aggregating from 6-digit to 2-digit occupational data would have significantly changed the data in Table 4-2 and Charts 4-1 and 4-2, and would have led to missing the declining industry shares for core pharmaceuticals and medicine manufacturing and architectural and engineering services occupations. It was seen in Tables 4-4 and 4-5 that the detailed occupations within the core set did not move uniformly, and that some level of detail finer than the major occupation level (2-digit) is needed. The next chapter also makes a compelling case for the usefulness of 3-digit occupational detail compiled by BLS.

However, even if the level of detail were ideal the OES would still be limited in what it can tell us about services outsourcing and off-shoring. The data may suggest the presence of outsourcing by providing information on the shares of employment in various industries, but since the surveys only cover domestic employment, there is little they can tell us about off-shoring. Analysis of OES data can identify potentially significant changes in the occupational employment shares of occupations perceived to be vulnerable to outsourcing and off-shoring, but it is not enough. More information is needed to identify industries that are increasing purchases of the intermediate goods or services produced by workers in these occupations to determine whether services outsourcing is occurring and how it is affecting their occupational mix. To examine the extent and effects of services off-shoring, additional data on those industries importing services for intermediate use are needed.

These additional data needs require integrating these BLS OES data with BEA industry data—in particular, the I-O use tables, described in Chapter 3. In the next chapter, we present the results of this linked analysis.

CHAPTER 5

OCCUPATIONAL CHANGES WITHIN SECTORS OFF-SHORING SERVICES

INTRODUCTION

As the analysis in the Chapter 4 demonstrated, the strength of OES data is that they identify detailed changes in the composition of the work force over time for specific industries or sectors. The weakness for our purposes is that they cannot determine the reasons for those occupational changes, including shifting due to outsourcing or off-shoring. For example, if there is a decline in employment in an occupation as a percent of total industry employment, it may be due to outsourcing or off-shoring, but it may also be due to industry consolidation, changes in technology or productivity, changes in compensation in competing occupations requiring similar skills or other reasons.

One way to relate changes in the occupational structures of industries to off-shoring is to combine the BLS OES with the BEA industry data. This allows an examination of changes in the occupational structures of those industries importing intermediate services or increasing use of purchased intermediate services and to determine whether occupational shares of services producing occupations have been declining. Results of that effort are discussed in this chapter.

METHODOLOGY

This next section presents a methodology for using OES data to analyze changes in employment for occupations within I-O sectors, by breaking total change in employment into two components, (1) employment changes due to changes in the occupational structure, and (2) changes due to overall sector growth or decline. The methodology is illustrated with the four examined industries.

The section following that combines the methodology with measures of off-shoring by the 65 I-O sectors as developed and discussed in Chapter 3. To simplify the analysis, these 65 sectors are grouped into quartiles by their average annual rates of growth of off-shoring over the 1998 to 2004 period. The first quartile (highest rates) and fourth quartile (lowest rates) are compared to determine whether there have been any significant differences in occupational structural changes between the two groups.

The analyses of changes in occupational structures in this chapter focus on two levels of detail—2-digit (22 categories) and 3-digit occupational groups (92 categories). OES data at the NAICS 4-digit industry level are publicly available only since 2002. The period of analysis extends therefore only from the November 2002 survey period through that of May 2005.

The Components of Employment Change

All of the sectors experienced changes in employment by occupation over the 2002 to 2005 survey period. These changes in employment can be categorized into two components: (1) changes due to a shift in the occupational structure of the industries,[51] and (2) changes due to all other factors, which together result in sector growth or decline (referred to as sector growth in this chapter).

The occupational structure of an industry or I-O sector includes all of its occupational shares. An occupational share is the percentage of total employment in the sector accounted for by a particular occupation. If the structure is unchanged over time, then individual occupational shares are also unchanged, even though total employment increases or decreases. If the structure does change, say between 2002 and 2005, we can estimate the effect of that change on employment for a particular occupation by multiplying its 2002 employment share by 2005 sector employment and comparing that result to the actual 2005 employment for that occupation.

Suppose that our 2005 estimate of the number of engineers in a particular industry is 1,000 if its occupational structure (the employment share of engineers in that industry) were unchanged, but there were only 900 engineers actually employed in that industry in 2005. This loss of 100 engineering jobs would be due to the change in the occupational structure. If actual employment of engineers in 2005 were 1,200 in that industry, the changing occupational structure (the increased employment share for engineers) would have produced a net gain of 200 jobs.

Employment changes for each occupation resulting from overall industry growth are simply the difference between the actual changes observed in the OES data and the employment increases or decreases resulting from shifts in the occupational structure for each sector. For example, if the estimated net change in engineer employment due to occupational structure was an increase of 200 jobs, but the actual net change in engineering jobs in a particular sector was actually 250, we would infer that sector growth accounted for the remaining 50 jobs.

The sums of the two components of employment change by occupation are consistent with these definitions. Since the occupational shares within each sector sum to one, the sum of increases and decreases resulting from occupational share changes will be zero.[52] The residual employment contains all of the growth, and the sum of this component of employment change for all occupations is exactly equal to the change in aggregate employment.

OCCUPATIONAL EMPLOYMENT CHANGES IN FOUR INDUSTRY SECTORS

Tables 5-1 through 5-4 present findings for four industry sectors that each contain one of the four industries examined. Of the four industries examined, only one—computer systems design and related services [5415]—is separately broken out in the BEA I-O industry classification system,

[51] The occupational structure of a sector is the percentage of sector employment accounted for by each of the occupations.

[52] Changes in occupational structure will result in allocating 2005 employment in a different pattern, but since total employment does not change, the differences between actual and forecast employment will sum to zero.

called the computer systems design and related services sector. The others are part of larger sector groupings: pharmaceutical and medicine manufacturing [3254] in the chemical products sector; architectural, engineering and related services [5413] in the miscellaneous professional, scientific and technical services sector; and business support services [5614] in the administrative and support services sector. In this analysis we use the broader, BEA I-O sector classification, as we will later associate it with the services off-shoring indicators calculated in Chapter 3.

Table 5-1 shows the components of the change in employment for the major occupation groupings in the computer systems design and related services sector. The occupations are ranked from the lowest to highest net change in employment. Between the November 2002 and the May 2005 OES surveys, employment grew by 72,480 jobs. About 70 percent of the change, or 50,470 jobs, was in the sector's core occupation grouping—computer and mathematical science occupations.[53] For this core service producing occupational group, occupational structural changes (i.e., growth in that occupation's share of total employment), reflecting perhaps increasing specialization within the industry, accounted for 9,435 jobs or 19 percent of the increase, while sectoral growth accounted for the other 81 percent. The next largest occupational categories, office and administrative support occupations, and management occupations, had relatively little growth or a small decline in net employment over this period. Both occupational groups had substantial employment declines due to occupational structure changes that nearly, or more than offset changes due to sectoral growth. There was also a sharp increase in net employment for business and financial occupations, primarily the result of increasing occupational share.

[53] See discussion in chapter 4 that defines core service producing occupations in these four selected industries.

Table 5-1
Changes in Occupational Structure and Employment Growth
in the Computer Systems Design and Related Services Sector

Occupation	Employment			Employment Changes Due To	
	2002	2005	Change	Occupation Structural Change	Sector Growth
Installation, Maintenance, and Repair Occupations	18,750	16,310	-2,440	-3,791	1,351
Production Occupations	4,210	3,090	-1,120	-1,423	303
Management Occupations	112,400	111,320	-1,080	-9,182	8,102
Building and Grounds Cleaning and Maintenance Occupations	1,180	540	-640	-725	85
Transportation and Material Moving Occupations	2,040	1,810	-230	-377	147
Legal Occupations	660	480	-180	-228	48
Protective Service Occupations	1,150	1,120	-30	-113	83
Healthcare Practitioner and Technical Occupations	370	570	200	173	27
Construction and Extraction Occupations	260	580	320	301	19
Education, Training, and Library Occupations	360	1,360	1,000	974	26
Office and Administrative Support Occupations	153,290	154,740	1,450	-9,599	11,049
Sales and Related Occupations	43,100	44,770	1,670	-1,437	3,107
Arts, Design, Entertainment, Sports, and Media Occupations	16,720	19,110	2,390	1,185	1,205
Life, Physical, and Social Science Occupations	4,320	7,120	2,800	2,489	311
Architecture and Engineering Occupations	25,160	28,940	3,780	1,966	1,814
Business and Financial Operations Occupations	52,280	66,400	14,120	10,352	3,768
Computer and Mathematical Science Occupations	569,300	619,770	50,470	9,435	41,035
Total	**1,005,550**	**1,078,030**	**72,480**	**0.00**	**72,480**

Correlation between Employment Change and Occupation Structural Change 0.6448

Source: BLS Occupational Employment Statistics, BEA Inter-industry Analysis Classifications, and Academy calculations

Table 5-2 shows the components of changes in employment for occupations in the miscellaneous professional, scientific and technical services sector. Overall employment increased by 305,080 over the period. Architecture and engineering occupations—the core service producing occupation for the architectural, engineering and related services [5413] industry—accounted for the largest share of this net employment increase, about 25 percent (or 98,220 jobs). The net employment increase for this core occupation was almost evenly split between rising specialization (occupational structure changes) and overall sector growth. Several other specialized service producing occupations—business and financial operations, life, physical, and social science, and computer and mathematical science— also had net employment increases that were reinforced by structural occupational changes. On the other hand, office and administrative support employment grew, but occupational structural changes reduced that net growth and total employment for management occupations fell due to a significant decline in its occupational employment share.

Table 5-3, presents the components of employment changes for the administrative and support services sector. Overall there was an increase of 450,150 jobs, of which 156, 020, or 35 percent were in building and grounds cleaning and maintenance occupations. Growth here reflected both an increasing occupational share and overall sector growth. The decline in office and administrative support functions was due to the large decline in occupational share that more than offset sectoral growth. Production occupations grew, as did healthcare practitioner and technical occupations, due to increased occupational share and overall sector growth. Management occupations declined, as structural occupational changes more than offset sector growth.

Table 5-4 shows employment changes and its components for the chemical products sector, which includes the pharmaceutical and medicine manufacturing [3254] industry. Overall employment declined by 840 jobs over the survey period. Production jobs increased by 23,440 due to changes in the occupational share. Employment in management occupations declined sharply, again primarily due to changing occupational share, as did office and administrative support occupations. Employment in the life, physical and social science occupations increased modestly due to favorable occupational structural changes.

In general, for the four selected industries, the core service producing occupations appear to have gained employment due to occupational structural changes that are consistent with the possibility of increased services outsourcing among other (non-service producing) industry sectors. Management occupations in all sectors declined due to occupational structural changes that suggest a streamlining or flattening of business organizational structures.[54] Sectoral increases moderated or overcame changes in occupational structure in a few instances, so that employment effects from declining occupational employment shares were masked by overall growth in employment.

[54] BLS has suggested that in recent years manager occupations have been more carefully measured and edited. As a result, some portion of the observed flattening in the management structure may be the result of BLS' estimation procedures.

Table 5-2
Changes in Occupational Structure and Employment Growth in the Miscellaneous Professional, Scientific and Technical Services Sector

Occupation	Employment			Employment Changes Due To	
	2002	2005	Change	Occupation Structural Change	Sector Growth
Management Occupations	387,290	333,750	-53,540	-84,376	30,836
Production Occupations	83,730	79,330	-4,400	-11,067	6,667
Transportation and Material Moving Occupations	47,680	43,760	-3,920	-7,716	3,796
Installation, Maintenance, and Repair Occupations	35,450	32,600	-2,850	-5,673	2,823
Building and Grounds Cleaning and Maintenance Occupations	38,130	36,760	-1,370	-4,406	3,036
Personal Care and Service Occupations	24,080	23,010	-1,070	-2,987	1,917
Education, Training, and Library Occupations	5,960	5,120	-840	-1,315	475
Food Preparation and Serving Related Occupations	1,190	1,160	-30	-125	95
Protective Service Occupations	5,730	5,750	20	-436	456
Legal Occupations	6,780	6,820	40	-500	540
Farming, Fishing, and Forestry Occupations	2,360	2,410	50	-138	188
Community and Social Services Occupations	2,730	3,440	710	493	217
Construction and Extraction Occupations	43,910	48,010	4,100	604	3,496
Healthcare Support Occupations	59,360	66,300	6,940	2,214	4,726
Healthcare Practitioner and Technical Occupations	115,030	124,470	9,440	281	9,159
Sales and Related Occupations	161,400	171,170	9,770	-3,081	12,851
Arts, Design, Entertainment, Sports, and Media Occupations	211,540	239,750	28,210	11,367	16,843
Computer and Mathematical Science Occupations	220,620	262,840	42,220	24,654	17,566
Life, Physical, and Social Science Occupations	201,810	249,810	48,000	31,932	16,068
Office and Administrative Support Occupations	1,037,110	1,087,180	50,070	-32,505	82,575
Business and Financial Operations Occupations	509,220	584,530	75,310	34,766	40,544
Architecture and Engineering Occupations	630,560	728,780	98,220	48,014	50,206
Total	**3,831,670**	**4,136,750**	**305,080**	**0.00**	**305,080**

Correlation between Employment Change and Occupation Structural Change 0.7673

Source: BLS Occupational Employment Statistics, BEA Inter-industry Analysis Classifications, and Academy calculations

Table 5-3
Changes in Occupational Structure and Employment Growth
in the Administrative and Support Services Sector

Occupation	Employment			Employment Changes Due To	
	2002	2005	Change	Occupation Structural Change	Sector Growth
Office and Administrative Support Occupations	1,667,590	1,633,170	-34,420	-148,350	113,930
Sales and Related Occupations	433,290	418,210	-15,080	-44,683	29,603
Management Occupations	212,570	203,200	-9,370	-23,893	14,523
Architecture and Engineering Occupations	40,940	38,390	-2,550	-5,347	2,797
Arts, Design, Entertainment, Sports, and Media Occupations	25,940	26,130	190	-1,582	1,772
Community and Social Services Occupations	3,060	4,540	1,480	1,271	209
Healthcare Support Occupations	96,020	97,880	1,860	-4,700	6,560
Life, Physical, and Social Science Occupations	7,870	10,300	2,430	1,892	538
Education, Training, and Library Occupations	9,840	14,800	4,960	4,288	672
Legal Occupations	10,720	16,740	6,020	5,288	732
Farming, Fishing, and Forestry Occupations	8,710	17,200	8,490	7,895	595
Protective Service Occupations	613,620	623,130	9,510	-32,413	41,923
Personal Care and Service Occupations	36,770	49,730	12,960	10,448	2,512
Computer and Mathematical Science Occupations	103,400	117,670	14,270	7,206	7,064
Installation, Maintenance, and Repair Occupations	121,440	141,530	20,090	11,793	8,297
Construction and Extraction Occupations	150,150	177,610	27,460	17,202	10,258
Food Preparation and Serving Related Occupations	70,410	109,730	39,320	34,510	4,810
Transportation and Material Moving Occupations	839,000	878,340	39,340	-17,981	57,321
Business and Financial Operations Occupations	129,360	176,380	47,020	38,182	8,838
Healthcare Practitioner and Technical Occupations	130,510	181,310	50,800	41,884	8,916
Production Occupations	448,510	517,860	69,350	38,708	30,642
Building and Grounds Cleaning and Maintenance Occupations	1,429,090	1,585,110	156,020	58,384	97,636
Total	**6,588,810**	**7,038,960**	**450,150**	**0.00**	**450,150**

Correlation between Employment Change and Occupation Structural Change 0.6914

Source: BLS Occupational Employment Statistics, BEA Inter-industry Analysis Classifications, and Academy calculations

Table 5-4
Changes in Occupational Structure and Employment Growth
in the Chemical Products Sector

Occupation	Employment			Employment Changes Due To	
	2002	2005	Change	Occupation Structural Change	Sector Growth
Management Occupations	69,840	55,780	-14,060	-13,987	-73
Office and Administrative Support Occupations	103,470	95,030	-8,440	-8,331	-109
Architecture and Engineering Occupations	34,640	31,920	-2,720	-2,684	-36
Installation, Maintenance, and Repair Occupations	59,710	57,730	-1,980	-1,917	-63
Business and Financial Operations Occupations	25,620	24,390	-1,230	-1,203	-27
Construction and Extraction Occupations	6,500	6,180	-320	-313	-7
Protective Service Occupations	1,670	1,430	-240	-238	-2
Computer and Mathematical Science Occupations	15,660	15,590	-70	-54	-16
Legal Occupations	1,310	1,260	-50	-49	-1
Arts, Design, Entertainment, Sports, and Media Occupations	1,200	1,270	70	71	-1
Healthcare Practitioner and Technical Occupations	2,020	2,100	80	82	-2
Building and Grounds Cleaning and Maintenance Occupations	5,430	5,520	90	96	-6
Education, Training, and Library Occupations	100	230	130	130	0
Healthcare Support Occupations	520	710	190	191	-1
Sales and Related Occupations	26,750	27,320	570	598	-28
Transportation and Material Moving Occupations	61,980	63,050	1,070	1,135	-65
Life, Physical, and Social Science Occupations	80,430	83,060	2,630	2,715	-85
Production Occupations	302,200	325,640	23,440	23,758	-318
Total	**799,050**	**798,210**	**-840**	**0.00**	**-840**

Correlation between Employment Change and Occupation Structural Change 1.0000

Source: BLS Occupational Employment Statistics, BEA Inter-industry Analysis Classifications and Academy calculations.

Linked Data Sets and Off-Shoring Quartiles

In the remainder of the chapter, we summarize the components of employment gains or losses by occupation for all 65 I-O sectors, following the methodology of Tables 5-1 through 5-4. The summaries are at the 2- and 3-digit occupation levels for each I-O industry sector.[55] The sectors have been ordered by off-shoring intensity growth rates over the period 1998 to 2004, from highest to lowest, and grouped into quartiles of employment based on employment levels in the May, 2005 OES national survey data.[56] To identify possible effects from services off-shoring, occupational employment growth and its components in the highest off-shoring quartile are compared with those in the lowest.

Table 5-5 lists the industry sectors by quartile, and shows their annual rates of growth of services off-shoring over the period 1998 to 2004 and total employment from the May, 2005 OES survey. Quartile I covers the group of industries with the highest rates of services off-shoring, and quartile IV, the group with the lowest.

While each quartile has a mix of manufacturing and service industry sectors, it appears that quartile I, with the highest rates of services off-shoring increases (median annual growth of 9 percent), also includes the greatest concentration of manufacturing industries (64 percent). Quartile IV, with the lowest growth in services off-shoring (median annual growth of –0.7 percent), contains a substantial number of service sector industries (47 percent). In particular, two high technology white collar services sectors that have been the focus of much of the off-shoring concern—sector 541OP, miscellaneous professional, scientific, and technical services, and the computer systems design services [5415] industry—are both in the fourth quartile. One possible explanation is that these service producing occupations are more likely outsourced and off-shored in other industries, where they are not the core occupations and primary profit centers.

[55] The BLS OES does not contain data summarized by 3-digit SOC code. We constructed our own by (1) obtaining the 3-digit occupation codes and titles from the BLS web site (http://www.bls.gov/soc/soc_majo.htm), manually creating a 3-digit to 6-digit occupation code bridge table in Microsoft Excel, importing that table into the Microsoft Access database, and merging the 3-digit occupation code into each record. The 3-digit bridge table is part of the database available with other data files for this report on the NAPA web site.

[56] The tables in the chapter were summarized from cross tabulations, with occupations as rows and industry sectors as columns, and which show (1) changes in total employment over the survey period; (2) employment change due to occupational structural changes; and (3) employment change due to sectoral growth. The complete crosstabs for 2-digit, 3-digit and 6-digit occupations are on the NAPA web site or by request.

Table 5-5
Input-Output Industry Sector Quartiles Ranked by Off-Shoring Growth Rates
(Quartiles based on OES May, 2005 Employment)

I-O Industry Code	Industry	Off-Shoring Intensity			Employment		
		1998	2004	Annual Growth Rates	Sector	Cumulative	Quartile
212	Mining, except oil and gas	1.0863	3.3898	35.341	210,610	210,610	I
315AL	Apparel and leather and allied products	0.1788	0.4549	25.729	309,650	520,260	I
3364OT	Other transportation equipment	0.1923	0.4348	21.010	666,160	1,186,420	I
532RL	Rental and leasing services and lessors of intangible assets	2.8272	6.0563	19.035	670,760	1,857,180	I
524	Insurance carriers and related activities	2.6744	5.2979	16.349	2,129,930	3,987,110	I
335	Electrical equipment, appliances, and components	0.9442	1.8060	15.213	439,240	4,426,350	I
323	Printing and related support activities	0.2436	0.4458	13.829	652,360	5,078,710	I
333	Machinery	0.7044	1.2482	12.867	1,150,930	6,229,640	I
531	Real estate	0.2958	0.5008	11.554	1,437,840	7,667,480	I
311FT	Food and beverage and tobacco products	0.2647	0.4457	11.401	1,669,970	9,337,450	I
325	Chemical products	2.6236	4.0614	9.134	875,640	10,213,090	I
512	Motion picture and sound recording industries	0.9047	1.3917	8.970	386,890	10,599,980	I
331	Primary metals	0.2113	0.3230	8.816	467,510	11,067,490	I
322	Paper products	0.1445	0.2198	8.687	487,560	11,555,050	I
332	Fabricated metal products	0.4915	0.7464	8.642	1,511,940	13,066,990	I
111CA	Farms	0.0738	0.1118	8.580	304,260	13,371,250	I
525	Funds, trusts, and other financial vehicles	1.5167	2.2778	8.364	88,510	13,459,760	I
721	Accommodation	0.6210	0.9256	8.172	1,789,430	15,249,190	I
334	Computer and electronic products	2.0505	3.0394	8.037	1,312,840	16,562,030	I
313TT	Textile mills and textile product mills	0.1724	0.2543	7.914	397,280	16,959,310	I
42	Wholesale trade	3.5495	5.1908	7.706	5,736,020	22,695,330	I
61	Educational services	0.3310	0.4657	6.781	12,137,430	34,832,760	32,576,983
3361MV	Motor vehicles, bodies and trailers, and parts	0.7904	1.0824	6.159	1,118,660	35,951,420	II
326	Plastics and rubber products	0.4614	0.6234	5.855	804,410	36,755,830	II
485	Transit and ground passenger transportation	0.1417	0.1903	5.715	406,390	37,162,220	II
523	Securities, commodity contracts, and investments	6.1929	8.1953	5.389	781,290	37,943,510	II
713	Amusements, gambling, and recreation industries	0.3143	0.4118	5.167	1,339,410	39,282,920	II
722	Food services and drinking places	0.1118	0.1454	5.021	9,053,140	48,336,060	II
521CI	Federal Reserve banks, credit intermediation, and related activities	1.2932	1.6798	4.983	2,863,610	51,199,670	II
339	Miscellaneous manufacturing	0.4968	0.6415	4.857	652,900	51,852,570	II
484	Truck transportation	0.8545	1.0935	4.661	1,387,340	53,239,910	II

I-O Industry Code	Industry	Off-Shoring Intensity			Employment		
		1998	2004	Annual Growth Rates	Sector	Cumulative	Quartile
GFG	Federal general government	6.0018	7.6567	4.596	1,799,620	55,039,530	II
81	Other services, except government	0.1771	0.2201	4.039	3,811,120	58,850,650	II
511	Publishing industries (includes software)	1.2718	1.5739	3.960	906,090	59,756,740	II
337	Furniture and related products	0.1304	0.1602	3.806	567,950	60,324,690	II
562	Waste management and remediation services	0.2256	0.2771	3.806	335,420	60,660,110	II
482	Rail transportation	0.9250	1.1244	3.593	212,880	60,872,990	II
327	Nonmetallic mineral products	0.6291	0.7573	3.397	507,360	61,380,350	II
44RT	Retail trade	0.3182	0.3793	3.202	15,369,460	76,749,810	65,153,965
321	Wood products	0.0856	0.1011	3.024	557,680	77,307,490	III
113FF	Forestry, fishing, and related activities	0.1068	0.1247	2.789	65,050	77,372,540	III
493	Warehousing and storage	0.6616	0.7542	2.333	582,250	77,954,790	III
622HO	Hospitals and nursing and residential care facilities	0.1263	0.1432	2.225	8,086,620	86,041,410	III
483	Water transportation	16.4544	18.6138	2.187	57,920	86,099,330	III
55	Management of companies and enterprises	0.3864	0.4366	2.167	1,739,370	87,838,700	III
621	Ambulatory health care services	0.1446	0.1607	1.865	5,064,620	92,903,320	III
624	Social assistance	0.1596	0.1750	1.608	2,082,680	94,986,000	III
GSLG	State and local general government	0.1397	0.1506	1.304	7,640,280	102,626,280	97,730,948
23	Construction	0.2108	0.2237	1.022	7,215,250	109,841,530	IV
481	Air transportation	17.3096	18.2131	0.870	507,660	110,349,190	IV
711AS	Performing arts, spectator sports, museums, and related activities	0.3861	0.4012	0.650	504,320	110,853,510	IV
5411	Legal services	0.2311	0.2397	0.623	1,164,070	112,017,580	IV
5415	Computer systems design and related services	2.8691	2.9173	0.280	1,181,910	113,199,490	IV
486	Pipeline transportation	0.3571	0.3597	0.122	37,750	113,237,240	IV
5412OP	Miscellaneous professional, scientific and technical services	1.3392	1.3423	0.039	4,582,060	117,819,300	IV
487OS	Other transportation and support activities	1.3547	1.2979	-0.699	1,938,980	119,758,280	IV
561	Administrative and support services	0.6624	0.5723	-2.266	7,766,820	127,525,100	IV
213	Support activities for mining	2.0007	1.3775	-5.191	206,990	127,732,090	IV
211	Oil and gas extraction	1.3971	0.9377	-5.480	122,360	127,854,450	IV
514	Information and data processing services	2.4533	1.5747	-5.969	431,000	128,285,450	IV
324	Petroleum and coal products	0.3087	0.1716	-7.402	112,500	128,397,950	IV
513	Broadcasting and telecommunications	4.6488	2.5035	-7.691	1,357,540	129,755,490	IV
22	Utilities	0.1430	0.0613	-9.524	552,440	130,307,930	130,307,930

Source: BEA Input-Output Analysis accounts, BLS Occupational Employment Statistics, and Academy calculations.

Changes in Total Employment, November, 2002 to May, 2005, by Industry Sector and 2-Digit Occupation

Table 5-6 compares the change in total employment and its occupational structure and sector growth components for 2-digit occupations between the November, 2002 and May, 2005 OES national surveys. The table is sorted by change in employment by occupation in the first quartile industry sectors, from greatest employment loss to greatest gain. The table also shows the change in employment by occupation and its components in fourth quartile industry sectors and their rankings based on overall change in employment. These data provide a direct comparison of employment gains and losses in industries experiencing the highest growth in services off-shoring with those industries experiencing the lowest growth.

Table 5-6 suggests that at a high level of aggregation, services off-shoring does not appear to have had a significant impact on the overall change in employment over the 2002 to 2005 period. There is a high correlation between occupational structure changes, suggesting that off-shoring of services has had even less impact on changes in employment due to changing employment shares.

The occupation group with the greatest loss of employment among both the most and the least rapidly off-shoring industries was management occupations. It was the only occupation to show a decline in employment in the industries in the fourth quartile. A substantial increase due to sector growth was not enough to overcome the decline associated with occupational structure. It appears that businesses were simplifying or flattening out their organizational structures during this time period.

The occupation class with the second greatest loss of occupational share among rapidly off-shoring industries was production occupations. These occupations had the sixth largest gain in employment among the least rapidly off-shoring industries. Among sectors with the highest rates of growth of services off-shoring, the drop in the number employed was driven by sectoral decline.

Architecture and engineering occupations showed increased employment in sectors with the highest and lowest rates of growth of services off-shoring. First quartile employment gains were driven by changes in occupational structure, while fourth quartile gains were associated with sectoral growth.

Computer and mathematical science occupations, and business and financial operations occupations also showed increases in sectors with the highest and lowest rates of growth of services off-shoring. First quartile gains were driven by changes in occupational share, but fourth quartile gains were split among changing share and increased overall sector growth.

The occupation group with the greatest increase in employment among the most rapidly off-shoring industries was education, training, and library occupations. Almost all of the change was

driven by sectoral growth. For the least rapidly growing off-shoring industries it had the third weakest record of growth in employment among those sectors showing increases.[57]

Sales and related occupations had the second greatest increase in employment among industries with the greatest increases in services off-shoring. However among industries with the lowest growth in off-shoring, employment growth was significantly weaker, second from the bottom of sectors with growing employment. In this quartile employment increases due to sectoral growth more than offset declines due to structural change.

Job gains appeared to be the result of factors other than off-shoring. Five of the ten top-ranked occupational groups in industry sectors with the greatest growth in off-shoring were also in the top ten occupational groups in industries with the least growth in off-shoring. The correlation between the overall change in employment by occupation in the highest and lowest off-shoring quartiles was 0.2175. Between change in employment due to shifts in the occupational structure it was 0.7208, and due to sectoral growth it was 0.1378. This suggests that overall there is little relationship between occupation employment changes at the two digit level in high and low services off-shoring industries. If occupations in the high off-shoring industry sectors were affected differently from occupation in the low off-shoring industries, the correlation should have been negative.

Finally, looking at just the changes related to sectoral growth, architecture and engineering occupations showed a negative change in employment related to sectoral growth component among sectors with the greatest rates of increase in the off-shoring of services and a relatively large increase in employment in sectors with the slowest rates of growth in services off-shoring. Similarly, the growth-related changes in employment in legal occupations was twenty-one times higher among sectors in the fourth quartile compared to sectors in the first, and five times higher for computer and mathematical science occupations. This may be one of the few positive indicators of an impact from services off-shoring from this analysis, but it does not show up in the total changes.

[57] This may be due to the heavy concentration of jobs in the quartile with the highest services off-shoring growth in just three sectors, Educational Services (90.0 percent in 2005), Social Assistance (5.9 percent), and State and Local General Government (1.9 percent). None of these was in the fourth quartile of sectors.

Table 5-6
Change in Employment by Occupation for Highest and Lowest Off-Shoring Quartiles

2 Digit SOC	Occupation	Quartile I*				Quartile 4**			
				Change Resulting from				Change Resulting from	
		Rank	Change in Employment	Occupational Structure	Sectoral Growth	Rank	Change in Employment	Occupational Structure	Sectoral Growth
11-	Management Occupations	1	-218,530	-269,831	51,301	1	-191,560	-271,477	79,917
51-	Production Occupations	2	-51,860	26,599	-78,459	17	66,670	21,157	45,513
35-	Food Preparation and Serving Related Occupations	3	-45,700	-78,285	32,585	9	33,920	27,681	6,239
37-	Building and Grounds Cleaning and Maintenance Occupations	4	-16,310	-64,560	48,250	20	153,060	48,703	104,357
47-	Construction and Extraction Occupations	5	-16,200	-28,777	12,577	22	336,320	28,683	307,637
31-	Healthcare Support Occupations	6	-2,260	-4,075	1,815	5	8,800	-2,486	11,286
45-	Farming, Fishing, and Forestry Occupations	7	-800	-2,615	1,815	6	9,980	9,124	856
33-	Protective Service Occupations	8	2,400	-4,046	6,446	7	10,190	-33,266	43,456
23-	Legal Occupations	9	4,300	3,232	1,068	11	44,510	21,625	22,885
21-	Community and Social Services Occupations	10	7,910	-2,687	10,597	2	2,230	1,801	429
29-	Healthcare Practitioner and Technical Occupations	11	15,660	5,374	10,286	13	60,410	42,266	18,144
39-	Personal Care and Service Occupations	12	16,060	6,176	9,884	8	23,070	26,862	-3,792
17-	Architecture and Engineering Occupations	13	19,000	23,098	-4,098	18	106,870	48,408	58,462
53-	Transportation and Material Moving Occupations	14	47,010	-6,153	53,163	12	50,220	-32,738	82,958
15-	Computer and Mathematical Science Occupations	15	53,100	41,946	11,154	19	123,030	65,218	57,812
19-	Life, Physical, and Social Science Occupations	16	56,120	52,810	3,310	15	60,940	42,720	18,220
49-	Installation, Maintenance, and Repair Occupations	17	81,240	45,406	35,834	16	64,210	36,306	27,904
27-	Arts, Design, Entertainment, Sports, and Media Occupations	18	89,820	85,160	4,660	10	41,010	21,327	19,683

2 Digit SOC	Occupation	Quartile I*					Quartile 4**			
				Change Resulting from					Change Resulting from	
		Rank	Change in Employment	Occupational Structure	Sectoral Growth		Rank	Change in Employment	Occupational Structure	Sectoral Growth
43-	Office and Administrative Support Occupations	19	91,980	-61,447	153,427		14	60,460	-182,355	242,815
13-	Business and Financial Operations Occupations	20	132,430	108,510	23,920		21	181,070	119,811	61,259
41-	Sales and Related Occupations	21	195,480	109,247	86,233		3	3,920	-46,822	50,742
25-	Education, Training, and Library Occupations	22	302,650	14,917	287,733		4	8,380	7,452	928
	Total Change in Employment		**763,500**	**0**	**763,500**			**1,257,710**	**0**	**1,257,710**

Correlation:	Change in Employment	**0.2175**
	Occupational Structure	**0.7208**
	Sectoral Growth	**0.1378**

Source: Bureau of Labor Statistics, Occupational Employment Statistics, 2002, May 2005
Bureau of Economic Analysis, Annual Industry Input-Output Use Tables, 1998 to 2004
Academy calculations

Changes in Total Employment, November, 2002 to May, 2005, by Industry Sector and 3-Digit Occupation

It may be that the high level of aggregation of occupations is disguising the impact from services off-shoring on changes in particular occupations, especially if these changes affect relatively small segments of the work force. Table 5-7 presents information similar to that in Table 5-6, but using a more detailed occupational breakout (92 occupations rather than 22). The results are substantially the same.

Top executives had the greatest loss of employment in sectors with both the fastest and the slowest rates of growth of services off-shoring (-129,820 jobs and -93,130 jobs respectively). Increases due to sectoral growth were insufficient to offset reductions due to occupational shifts, suggesting a general flattening in organizational structures.

Several occupations showed sharp differences between high and low off-shoring quartiles.

- Construction trades workers lost 18,740 jobs in sectors with high rates of off-shoring, but gained 278,270 jobs in sectors with the lowest rates of services off-shoring.[58] In the first quartile, the loss was largely due to changing occupational structure, but in the fourth quartile the gain was primarily driven by sector growth.

- Assemblers and fabricators lost 36,000 jobs in sectors with the greatest growth in services off-shoring but gained 102,590 jobs in sectors with the slowest growth. Most of the change in both quartiles was associated with changes in occupational shares.

- Primary, secondary, and special education school teachers gained 144,030 jobs among industries with high services off-shoring intensity, but only 5,750 jobs among industries with low services off-shoring rates. First quartile employment gains were driven by sector growth, despite a loss due to changing occupational share.

These differences may be the result of high concentration of the occupations in one or more industry groups that fell into particular quartiles, rather than off-shoring as such. Off-shoring would have a stronger explanatory power if the jobs were evenly distributed in first and fourth quartile industries and different pattern of growth were observed.

Neither services nor production occupations appear to be at the top or the bottom of the rankings. This may reflect the broad mix of occupations in both service and manufacturing industries.

Even with the additional disaggregation of jobs there does not appear to be substantial differences in employment change that could be plausibly attributed to off-shoring.

- Four of the ten occupations with the greatest employment losses industries in the first quartile were also among the ten occupations with the greatest employment losses in industries in the fourth quartile.

[58] Construction workers are heavily concentrated in the Construction sector (82 percent), which is in the fourth quartile.

- The correlation between changes in employment in 3-digit occupations in industries with the greatest growth and those with the least growth in services off-shoring of 0.2054.

- The correlation for employment changes due to changes in occupational structure (0.4110) and sectoral growth (0.1263) similarly suggest that services off-shoring was not a principal driver of employment changes during the 2002 to 2005 period.

Those service occupations that have been perceived to have been adversely affected by services off-shoring in recent years—engineers, computer specialists, business operations specialists, and financial specialists—were among the occupations with the greatest employment gains in those industry sectors with the highest rates of growth of services off-shoring. These high technology, white collar service sector occupations also experienced high employment growth in those industry sectors in the fourth quartile. For these occupations, employment gains were driven by changing occupational share—the occupations gained in importance. There do not appear to be large differences in employment gains in sectors with the most rapid and least rapid rates of growth of services off-shoring.

However, some engineering and architectural occupations experienced employment losses in the first quartile but gains in fourth quartile industries due to structural shifts. For drafters, engineering and mapping technicians, losses of 22,080 jobs in the first quartile were offset by 22,720 jobs gained in fourth quartile industries. For architects, surveyors and cartographers, a negligible 80 jobs lost in the first quartile were far offset by a gain of 15.040 jobs in low off-shoring sectors.

Looking at just the employment changes associated with growth, we find that:

- Jobs lost in sectors with the highest rates of growth in services off-shoring were predominantly production related, including 2,236 engineering and 1,979 drafters, engineering and mapping technician jobs. Job losses for 4th quartile sectors were in air transportation and transportation, tourism and lodging.

- Top executives and other management occupations showed increased employment associated with growth, although not enough to outweigh the negative structural impact on their employment.

- Computer specialists, financial specialists, business operations specialists, and office and administrative support workers all showed increased employment associated with industry growth in both first and fourth quartiles.

Table 5-7
Change in Employment Due to Occupational Structure and Sector Growth by Occupation for Highest and Lowest Off-Shoring Quartiles

2 Digit SOC	Occupation	Quartile I*				Quartile 4**			
				Change Resulting from				Change Resulting from	
		Rank	Change in Employment	Occupational Structure	Sectoral Growth	Rank	Change in Employment	Occupational Structure	Sectoral Growth
11-1	Top Executives	1	-129,820	-145,543	15,723	1	-93,130	-130,390	37,260
51-6	Textile, Apparel and Furnishings Workers	2	-76,600	-20,998	-55,602	16	-5,430	-6,932	1,502
11-3	Operations Specialties Managers	3	-68,440	-75,480	7,040	2	-49,720	-65,259	15,539
43-5	Material Rcording, Scheduling, Dispatching and Distributing Workers	4	-48,440	-60,720	12,280	72	21,840	6,160	15,680
35-2	Cooks and Food Preparation Workers	5	-44,490	-59,460	14,970	23	-590	-2,068	1,478
51-2	Assemblers and Fabricators	6	-36,000	-30,625	-5,375	90	102,590	95,258	7,332
41-1	Supervisors, Sales Workers	7	-28,420	-37,048	8,628	47	2,510	-943	3,453
43-1	Supervisors, Office and Administrative Support Workers	8	-24,650	-33,898	9,248	9	-12,940	-26,625	13,685
11-2	Advertising, Marketing, Promotions, Public Relations and Sales Managers	9	-22,180	-26,164	3,984	4	-29,690	-37,843	8,153
17-3	Drafters, Engineering and Mapping Technicians	10	-22,080	-20,101	-1,979	73	22,720	2,004	20,716
35-9	Other Food Preparation and Serving Related Workers	11	-21,850	-25,827	3,977	18	-2,920	-4,282	1,362
47-2	Construction Trades Workers	12	-18,740	-27,223	8,483	92	278,270	43,356	234,914
51-5	Printing Workers	13	-16,070	-4,463	-11,607	11	-10,920	-13,612	2,692
37-1	Supervisors, Building and Grounds Cleaning and Maintenance Workers	14	-16,030	-20,053	4,023	57	7,130	-632	7,762
51-1	Supervisors, Production Workers	15	-12,770	-8,821	-3,949	12	-9,360	-11,822	2,462
49-3	Vehicle and Mobile Equipment Mechanics, Installers and Repairers	16	-11,240	-21,054	9,814	7	-17,650	-17,384	-266
51-3	Food Processing Workers	17	-7,370	-1,856	-5,514	32	230	91	139
31-1	Nursing, Psychiatric and Home Health Aides	18	-5,710	-6,800	1,090	52	4,690	-523	5,213
39-3	Entertainment Attendants and Related Workers	19	-5,140	-5,371	231	54	5,190	2,994	2,196
43-2	Communications Equipment Operators	20	-4,570	-5,603	1,033	5	-19,380	-22,948	3,568
51-7	Woodworkers	21	-4,060	-4,416	356	29	30	-491	521
45-1	Supervisors, Farming, Fishing, and Forestry Workers	22	-3,140	-3,246	106	25	-130	-201	71

2 Digit SOC	Occupation	Quartile I*					Quartile 4**			
				Change Resulting from					Change Resulting from	
		Rank	Change in Employment	Occupational Structure	Sectoral Growth		Rank	Change in Employment	Occupational Structure	Sectoral Growth
35-1	Supervisors, Food Preparation and Serving Workers	23	-2,720	-5,811	3,091		19	-1,980	-2,473	493
39-5	Personal Appearance Workers	24	-1,270	-1,496	226		26	-80	-210	130
47-1	Supervisors, Construction and Extraction Workers	25	-1,240	-2,629	1,389		82	51,730	24,840	26,890
37-3	Grounds Maintenance Workers	26	-1,170	-6,484	5,314		88	88,620	56,472	32,148
19-2	Physical Scientists	27	-1,000	-1,097	97		66	12,600	6,428	6,172
47-4	Other Construction and Related Workers	28	-540	-659	119		58	8,140	3,337	4,803
33-9	Other Protective Service Workers	29	-280	-6,168	5,888		59	8,870	-33,075	41,945
33-2	Fire Fighting and Prevention Workers	30	-200	-231	31		38	1,090	706	384
39-6	Transportation, Tourism and Lodging Attendants	31	-190	-1,564	1,374		51	4,050	13,111	-9,061
53-5	Water Transportation Workers	32	-120	-164	44		50	3,560	3,082	478
17-1	Architects, Surveyors and Cartographers	33	-80	-197	117		69	15,450	4,359	11,091
25-4	Librarians, Curators and Museum Technicians	34	-20	-6,380	6,360		31	210	491	-281
39-4	Funeral Service Workers	35	0	0	0		28	0	0	0
33-1	First-Line Supervisors/Managers, Protective Service Workers	36	180	110	70		22	-730	-896	166
53-4	Rail Tranportation Workers	37	190	176	14		40	1,270	1,256	14
47-3	Helpers, Construction Trades	38	240	210	30		8	-16,860	-39,733	22,873
45-4	Forest, Conservation and Logging Workers	39	260	270	-10		24	-270	-314	44
21-2	Religious Workers	40	360	260	100		30	40	38	2
39-1	Supervisors, Personal Care and Service Workers	41	370	-222	592		43	1,720	1,653	67
29-9	Other Healthcare Practitioners and Technical Occupations	42	870	703	167		27	-50	-65	15
37-2	Building Cleaning and Pest Control Workers	43	890	-38,022	38,912		83	57,310	-7,137	64,447
23-1	Lawyers, Judges and Related Workers	44	1,150	505	645		70	16,650	2,122	14,528
31-2	Occupational and Physical Therapists Assistants and Aides	45	1,320	1,268	52		39	1,140	1,114	26
39-2	Animal Care and Service Workers	46	1,530	1,478	52		46	2,260	71	2,189
11-9	Other Management Occupations	47	1,910	-22,643	24,553		6	-19,020	-37,985	18,965
45-2	Agricultural Workers	48	2,080	361	1,719		64	10,380	9,639	741
31-9	Other Healthcare Support Occupations	49	2,130	1,457	673		49	2,970	-3,077	6,047

2 Digit SOC	Occupation	Quartile I*				Quartile 4**			
				Change Resulting from				Change Resulting from	
		Rank	Change in Employment	Occupational Structure	Sectoral Growth	Rank	Change in Employment	Occupational Structure	Sectoral Growth
15-2	Mathematical Science Occupations	50	2,430	1,981	449	21	-790	-2,606	1,816
33-3	Law Enforcement Workers	51	2,700	2,243	457	37	960	-1	961
51-8	Plant and System Operators	52	3,050	2,910	140	60	9,210	7,904	1,306
53-7	Material Moving Workers	53	3,140	-10,311	13,451	81	40,700	-24,728	65,428
23-2	Legal Support Workers	54	3,150	2,727	423	76	27,860	19,503	8,357
53-2	Air Transportation Workers	55	3,170	3,043	127	36	950	7,109	-6,159
43-6	Secretaries and Administrative Assistants	56	3,690	-36,829	40,519	15	-6,160	-68,941	62,781
29-2	Heath Technologists and Technicians	57	3,740	1,758	1,982	77	29,910	21,432	8,478
47-5	Extraction Workers	58	4,080	1,525	2,555	68	15,040	-3,117	18,157
49-2	Electrical and Electronic Equipment Mechanics, Installers and Repairers	59	6,040	2,750	3,290	71	17,520	14,186	3,334
27-4	Media and Communication Equipment Workers	60	6,160	6,257	-97	20	-1,420	-4,513	3,093
51-4	Metal Workers and Plastic Workers	61	6,980	-15,382	22,362	13	-7,270	-15,804	8,534
21-1	Counselors, Social Workers and Other Community and Social Service Specialists	62	7,550	-2,947	10,497	45	2,190	1,763	427
41-2	Retail Sales Workers	63	8,960	-10,187	19,147	14	-6,230	-12,745	6,515
53-3	Motor Vehicle Operators	64	9,370	-26,796	36,166	33	330	-20,949	21,279
29-1	Health Diagnosing and Treating Practitioners	65	11,050	2,912	8,138	78	30,550	20,899	9,651
53-6	Other Transportation Workers	66	11,800	10,957	843	44	1,970	1,829	141
49-1	Supervisors of Installation, Maintenance and Repair Workers	67	11,920	8,894	3,026	56	6,850	4,833	2,017
25-3	Other Teachers and Instructors	68	12,420	6,388	6,032	34	340	85	255
19-4	Life, Physical and Social Science Technicians	69	13,900	13,602	298	65	11,500	6,746	4,754
19-1	Life Scientists	70	14,880	14,289	591	62	9,740	7,187	2,553
27-3	Media and Communication Workers	71	15,070	13,691	1,379	74	24,250	19,124	5,126
27-1	Art and Design Workers	72	17,680	17,664	16	67	13,040	2,372	10,668
41-9	Other Sales and Related Workers	73	19,130	7,538	11,592	61	9,520	-11,011	20,531
43-3	Financial Clerks	74	19,230	-580	19,810	86	80,430	35,614	44,816
53-1	Supervisors, Transportation and Material Moving Workers	75	19,460	16,942	2,518	42	1,440	-336	1,776
39-9	Other Personal Care and Service Workers	76	20,760	13,350	7,410	63	9,930	9,241	689
35-3	Food and Beverage Serving Workers	77	23,360	12,813	10,547	80	39,410	36,505	2,905
43-9	Other Office and Administrative Support Workers	78	23,560	-16,692	40,252	3	-35,540	-99,770	64,230
19-3	Social Scientists and Related Workers	79	28,340	26,016	2,324	75	27,100	22,359	4,741

2 Digit SOC	Occupation	Quartile I*					Quartile 4**			
				Change Resulting from					Change Resulting from	
		Rank	Change in Employment	Occupational Structure	Sectoral Growth		Rank	Change in Employment	Occupational Structure	Sectoral Growth
41-3	Sales Representatives, Services	80	33,540	26,039	7,501		17	-4,700	-14,633	9,933
17-2	Engineers	81	41,160	43,396	-2,236		85	68,700	42,045	26,655
15-1	Computer Specialists	82	50,670	39,965	10,705		91	123,820	67,824	55,996
25-9	Other Education, Training and Library Occupations	83	50,690	-2,407	53,097		41	1,320	904	416
27-2	Entertainers and Performers, Sports and Related Workers	84	50,910	47,548	3,362		53	5,140	4,343	797
13-2	Financial Specialists	85	65,210	54,503	10,707		87	83,880	52,767	31,113
13-1	Business Operations Specialists	86	67,220	54,007	13,213		89	97,190	67,044	30,146
49-9	Other Installers, Maintenance and Repair Occupations	87	74,520	54,816	19,704		84	57,490	34,671	22,819
51-9	Other Production Occupations	88	90,980	110,250	-19,270		10	-12,410	-33,433	21,023
25-1	Postsecondary Teachers	89	95,530	50,221	45,309		35	760	743	17
43-4	Information and Record Clerks	90	123,160	92,874	30,286		79	32,210	-5,845	38,055
25-2	Primary, Secondary and Special Education School Teachers	91	144,030	-32,906	176,936		55	5,750	5,229	521
41-4	Sales Representatives, Wholesale and Manufacturing	92	162,270	122,905	39,365		48	2,820	-7,489	10,309
	Total Change in Employment		**763,500**	**0**	**763,500**			**1,257,710**	**0**	**1,257,710**
Correlation:	Change in Employment		**0.2054**							
	Occupational Structure		**0.4110**							
	Sectoral Growth		**0.1263**							

* Sectors with Greatest Growth in Services Off-shoring, 1998 to 2004

** Sectors with Slowest Growth in Services Off-shoring, 1998 to 2004

Source: Bureau of Labor Statistics, Occupational Employment Statistics, 2002, May 2005
Bureau of Economic Analysis, Annual Industry Input-Output Use Tables, 1998 to 2004
Academy calculations

CONCLUSIONS AND DATA RECOMMENDATIONS

The analysis in this chapter could not identify clear differences changing occupational structures due to off-shoring. Undoubtedly part of the problem is the comparatively brief three year survey period, much of which was dominated by economic forces related to recovery from a recession. Many factors could account for employment changes over this period, including structural/technological changes in the economy, mergers and acquisitions of firms, qualitative changes in the response of firms to economic recession and recovery, and a flattening of the occupational structure due to better control and coordination. While services off-shoring may be one such factor, its importance relative to these and other influences did not emerge from this analysis. For the 65 I-O industry sectors, these analyses did not reveal any significant impact on changes in occupational shares based on differences in the rates of growth in services off-shoring intensities over this period.

We have pushed the published data hard, and it appears that the BEA industry-based off-shoring data is too aggregated and the BLS data cover too short a period to identify the extent of off-shoring within industries. The results suggest a need to look more closely at the performance of individual firms, rather than highly aggregated industry totals. At the micro-level, it may be possible to identify firms within the same industry that import services (or do not import them) and their associated occupational employment patterns. These results reinforce the Panel's view that detailed analyses of micro-level data are needed to produce more definitive findings on the employment effects of services outsourcing or off-shoring due to business restructuring.

Interest and concerns about services off-shoring will most likely continue and may grow, particularly if aggregate labor market conditions deteriorate in the future. Improvements in publicly available industry level data could enhance understanding of future changes in services off-shoring and its broad economic effects. The above analysis has demonstrated that a comprehensive assessment of the effects of services off-shoring requires linking BLS employment and occupational data with BEA trade data. However, this industry analysis also showed that aggregation at the industry level may hide critical underlying differences in occupational structures, net employment levels, and other economic changes for individual firms within those industries.

While the statistical agencies should continue to make publicly available the finest detail consistent with confidentiality of respondents and quality of the data, an assessment of the employment and other economic effects of firm decisions to off-shore services will ultimately require analysis of confidential, micro-level data. As chapter 7 describes in greater detail, the statistical agencies collect data on business enterprises at different organizational levels, for different purposes and at different time intervals. But, a critical first step in facilitating linking of specific micro-level data sets between individual agencies is to ensure that there are consistent identifiers of business entities at various organizational levels. Therefore,

- **The Panel recommends that BEA, BLS and Census should work together to develop and maintain a consistent set of identifiers for each level of organization within every consolidated business entity in the United States.**

This would include shared location data for various entities and consistent methodology for assigning industrial classifications to them.

In addition, the industry-level analysis in this chapter required the aggregation of publicly available 6-digit SOC data to 3-digit levels. There undoubtedly were quality issues due to missing data to prevent disclosure. BLS should be able to provide higher quality data from its complete surveys. Thus,

The Panel recommends that BLS should provide OES data at a 3-digit level on its website, and addition to the 2- and 6- digit SOC levels already provided.

CHAPTER 6

IDENTIFYING SERVICES OFF-SHORING USING MICRO-LEVEL DATA

INTRODUCTION

This chapter presents analyses of BEA micro-level (firm) cross-border trade in services and foreign direct investment data to determine whether they can identify the extent and impacts of services off-shoring. Analyses include off-shoring from both business restructuring and global expansion. Results from business restructuring off-shoring are contrasted with estimates of outsourcing. Although BEA surveys for unaffiliated services imports include both MNCs and other firms, most analyses in this chapter focus on MNCs only. Analyses also concentrate primarily on the four industries selected for intensive examination—pharmaceutical and medicine manufacturing [3254], architectural, engineering and related services [5413], computer systems design and related services [5415], and business support services [5614].

The first two sections of this chapter present research approaches and datasets used, describe the role of MNCs in the global economy, and briefly detail the methodology for developing indicators of services off-shoring and outsourcing given available data. The final two sections outline data limitations and assumptions of the micro-level analysis and present estimates of services off-shoring and outsourcing. Appendix E provides a more detailed explanation of the data adjustments and statistical procedures followed to estimate services off-shoring using available data, and includes more detailed data supporting the summary tables and charts presented in the text.

Despite data limitations and other necessary caveats, results of the micro-level data analyses for potential services off-shoring due to business restructuring suggest the following: first, there is little evidence of widespread services off-shoring by U.S. MNCs for the industries examined, but outsourcing of services appears much more prevalent. Second, there does not appear to be significant growth in services off-shoring during the period 1999–2003, but this result must be taken cautiously given the limited time period covered. Third, there is variation in the level of outsourcing and off-shoring for MNCs, but this cannot be generalized to the universe of MNCs due to the small sample sizes in these industries. Fourth, most MNC off-shoring from parent business restructuring appears to involve goods rather than services. Finally, those MNCs off-shoring services appear to perform better than other MNCs in the same industry based on their total sales, net income, total sales per employee and other financial measures.

The comparison of the growth in affiliate sales, employment, and net income relative to their parents over this period indicates that affiliate performance exceeded parents. However, for three of the four industries studied, the preponderance of foreign affiliate sales tended to be in different industries than the parent's principal industry. Moreover, most foreign affiliate sales occurred in the foreign markets where they are located. These results support the view that growth in foreign affiliate sales–an indicator of potential services off-shoring due to global expansion—may also reflect more complex objectives, such as greater diversification and access to previously restricted foreign markets.

RESEARCH APPROACH AND DATA SOURCES

Our review of off-shoring studies found little consensus about either the extent and impact of services off-shoring or the methodologies and data used to develop those estimates. For example, not only did estimates of U.S. job losses from services off-shoring vary widely, they also relied on a variety of methodologies, including analyses of announced layoffs, interviews and surveys of company officials, and other proprietary methods.[59] None of these studies employed micro-level data from either BEA or BLS. The few that used micro-level data were private research group studies using proprietary data from their own surveys and non-transparent methodologies that were not easy to evaluate or replicate.

Most previous studies relied on industry-level data. Chapters 3 and 4 presented industry-level analysis of BEA I-O data and BLS OES data to determine whether reasonable and reliable estimates of services outsourcing and off-shoring could be derived. This chapter employs a similar analysis for services off-shoring and outsourcing using BEA micro-level data for MNCs.[60]

In its first report, the Panel concluded that a comprehensive review of off-shoring needed additional research using micro-level data for two reasons. First, since services off-shoring decisions reflect strategic business choices made at the firm level, micro-level data could best distinguish between firms that had decided to off-shore services and those that had not. Second, micro-level data could avoid aggregation issues that arise using industry-level data, since not all firms within the industry choose to off-shore services. This additional micro-level research would have to focus on a few key industries, given resource and time constraints. This chapter focuses on two objectives:

1. develop estimates of the extent of off-shoring in four selected industries and to the extent feasible, estimate off-shoring's key economic effects, and

2. determine the adequacy of currently available micro-level data in estimating the scope and scale of off-shoring activity and its key economic effects.

The four industries selected for examination were chosen because of their size and overall economic impact; their potential vulnerability to off-shoring; their diversity in both industry type and occupational mix; and their level of integration into the economy, producing potential spillover effects on other sectors. Chapter 4 provided detailed information on the occupational distribution of these four industries.

The Role of MNCs

[59] See Off-shoring: An Elusive Phenomenon; A Report by a Panel of the National Academy of Public Administration, January 2006.

[60] Disclosure rules under the International Investment and Trade Services Act precludes the presentation of certain micro-level data which may impinge confidentiality.

A "U.S. MNC parent company" comprises the U.S. (domestic) operations of a MNC and is engaged in foreign direct investment with at least one affiliate located outside the U.S. A "U.S. foreign affiliate" is a firm located outside the U.S. in which a U.S. MNC parent has a direct investment interest. BEA defines a "majority owned foreign affiliate" (MOFA) as a foreign affiliate with a combined ownership of all U.S. MNC parents exceeding 50 percent.[61]

U.S. MNCs contribute substantially to overall U.S. economic activity. In 2003, the operations of U.S. MNC parents accounted for one-half of U.S. profits and one-fourth of U.S. gross domestic product. In that year, U.S. MNC operations accounted for roughly one-fifth of U.S. employment.[62] MNCs also play a significant role in U.S. international trade. They accounted for an estimated 57 percent of U.S. goods exports and 37 percent of U.S. goods imports for 2003.[63] MNCs also account for an even larger share of services imports that are considered most vulnerable to off-shoring—other private services, especially business, professional and technical (BPT) services. In 2004, almost 70 percent of the estimated $40.7 billion of imported BPT services,—$28.2 billion—were affiliated imports. These affiliated services imports reflect transactions between a MNC and its foreign affiliates.[64]

MNCs have continued to account for a substantial amount of U.S economic activity even though the number of parent MNCs has declined 7.4 percent from 3872 in 1999 to 3587[65] in 2003. Table 6-1 shows MNC employment in key industry sectors, including the four industries selected for this micro-level examination. While MNC employment appears to be more heavily concentrated in manufacturing rather than services industries, MNC employment still accounts for between 7.5 and 14.5 percent of total U.S. employment in the three examined services industries.

The detailed industry comparisons contained in Table 6-1 can also reflect differences in the business organizational levels used by BLS and BEA to report their separate employment numbers. BEA employment MNC data are at a firm-level, while the BLS data are at an establishment level. MNCs are often large, complex firms with multiple establishments. BEA's industry classification for MNCs reflects the preponderance of the firm's sales in a particular industry. BLS uses the same approach for classifying establishments by industry. But a multi-establishment firm, e.g. a MNC classified as a pharmaceutical and medicine manufacturing firm, may have some establishments that sell pharmaceutical products (and are classified as pharmaceutical and medicine manufacturing establishments), but others that produce R&D services (and are therefore classified as R&D services establishments). These organizational

[61] Ray Mataloni, "A Guide to BEA Statistics on U.S. Multinational Companies," (Washington: Bureau of Economic Analysis- from March 1995 Survey of Current Business), p. 2.
[62] J. Steven Landefeld and Raymond Mataloni, "Offshore Outsourcing and Multinational Companies," (Washington: Bureau of Economic Analysis- power point presentation presented at the Brookings Institution, 2004), p. 19.
[63] R. Mataloni, "U.S. Multinational Companies: Operations in 2003", SCB July 2005 p. 13.
[64] E. Nephew, J. Koncz, M. Borga and M. Mann, "U.S. International Services: Cross0-border Trade in 2004 and Sales through Affiliates in 2003. SCB October 2005, Table 1 p. 46.
[65] This number includes those MNC parents exempt from reporting all but a few items on the benchmark survey because of the small size of their foreign operations. The data published by BEA exclude these parent companies from their number counts. In 2003, the BEA tabulation of MNC parents is 2,384 rather than 3,587. There are differences between MNC parent and foreign affiliate number counts in tables throughout this chapter and BEA tabulations found in BEA reports for the same reason.

differences for industry classifications make detailed industry comparisons between the BEA and BLS employment data difficult.[66]

Table 6-1
Employment for Select 4 Digit Service Industries
(Employment in 000's)

		U.S. Economy (1) Totals			MNC Parents (2) Totals		Percent	US Total
Industry	NAICS code	2002	2003	2004	2002	2003	2002	2003
Total		130341	129999	131480	22117.6	21701.1	17.0%	16.7%
Manufacturing		15259	14510	14329	8357.9	8152.9	54.8%	56.2%
Pharmaceuticals	3254	294.9	291.5	287.6	378.2	384.1	128.2%	131.8%
Services		107784	108182	109596	12979.1	12890.3	12.0%	11.9%
Professional,Technical & Scientific	541	6643	6621.1	6673.2	962.8	946.4	14.5%	14.3%
Architectural, Engineering, Related	5413	1242.4	1225.6	1237.7	92.9	92.4	7.5%	7.5%
Computer Systems Design	5415	1119.2	1106	1129.6	372.6	356.7	33.3%	32.3%
Administrative Support Services	561	7450.8	7375.1	7533	986.4	977.1	13.2%	13.2%
Business Support Services	5614	753.3	742.3	753.6	126.9	128.6	16.8%	17.3%

(1) BLS OES data
(2) BEA MNC data

Data Sources

Data for this analysis came from two datasets collected and maintained by BEA: "financial and operating" data of MNCs, and "international transactions" data. The majority of the economic indicators used came from the MNC financial and operating data that included data for both MNC parents and their majority owned foreign affiliates. The principal exception was MNC parent unaffiliated services imports; these data were extracted from the international transactions dataset. The analysis focused primarily on MNCs; other domestic U.S. firms that may be importing services from unaffiliated foreign persons were not examined.

BEA Financial and Operating Data for MNCs

BEA designs and conducts mandatory surveys to collect financial and operating data on MNCs. These data are collected annually with a benchmark survey conducted every five years. The micro-data are made available a year and seven months following the close of the year covered by the data.[67] Financial and operating data cover U.S. MNC parent companies, their foreign

[66] These differences also imposed significant challenges in matching micro-level data between the two agencies, as will be reported more fully in the third report.
[67] The BEA faces some practical constraints that make accelerating the release of their data difficult: (1) their survey reports are not due until 5 months following the reference year; (2) there are a significant number of delinquent reports; and (3) many reporting companies file forms that contain missing and/or questionable data, which often requires time consuming follow-up with companies.

affiliates, and affiliates of foreign MNCs residing in the U.S.[68] Financial and operating data include:

- balance sheets and income statements
- sales by type (e.g. goods and services)
- destination of sales by foreign affiliates
- value added
- employment
- employee compensation
- external financing
- capital expenditure
- research and development
- reconciliations of changes in property, plant and equipment
- income taxes, and
- affiliated and unaffiliated trade (with the exception of unaffiliated trade in services).

International Transactions in Private Services Data

BEA international transactions in private services data cover U.S. residents' transactions with unaffiliated foreign residents. U.S. residents include both MNCs and non-MNCs. A U.S. international transaction is one made between a U.S. resident and a non-resident, or "foreigner," that is, a cross-border transaction between a U.S. company located in the U.S. and a foreign entity. In accordance with international standards, BEA considers U.S. foreign affiliates to be residents of the countries where they are located. Sales abroad by U.S. foreign affiliates are regarded as transactions between foreigners and not considered to be U.S. international transactions.[69] Thus, transactions of U.S. MNC parents are covered by the international transactions in private services data, but transactions between their affiliates are not.

Reporting for international transactions in private services surveys is mandatory and the confidentiality of the data for reporting companies is protected under the International Investment and Trade in Services Survey Act.[70] The BEA collects most of its international transaction data through the Annual and Benchmark Survey of Selected Services Transactions with Unaffiliated Foreign Persons, which primarily cover business, professional and technical services.[71] BEA also conducts 8 specialized surveys for this dataset:

- Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets;

- Quarterly Survey of Foreign Airline Operators' Revenues and Expenses in the United States;

[68] Data on U.S. affiliates of foreign MNC parents are not included in the analysis in this report, but will be covered in the third report.
[69] "U.S. International Transactions in Private Services: A Guide to the Surveys Conducted by the Bureau of Economic Analysis," (Washington: Bureau of Economic Analysis, 1998), p. 9.
[70] "U.S. International Transactions in Private Services," p. 1.
[71] "U.S. International Transactions in Private Services," p. 11.

- Foreign Ocean Carriers' Expenses in the United States;
- Ocean Freight Revenues and Foreign Expenses of United States Carriers;
- U.S. Airline Operators' Foreign Revenues and Expenses;
- Quarterly Survey of Insurance Transactions by U.S. Insurance Companies with Foreign Persons;
- Benchmark Survey of Financial Services Transactions Between U.S. Financial Services Providers and Unaffiliated Foreign Persons; and
- Quarterly Survey of Financial Services Transactions Between U.S. Financial Services Providers and Unaffiliated Foreign Persons.

ESTIMATING SERVICES OFF-SHORING DUE TO BUSINESS RESTRUCTURING

This analysis used BEA MNC and unaffiliated trade in services data to identify firms that have outsourced or off-shored some of their service functions due to business restructuring during the 1999 to 2003 time period. MNCs were divided into two sub-groups: the first group—group I—represents those MNCs with the preponderance of their sales in one of the selected industries—pharmaceutical and medicine manufacturing [3254], architectural, engineering and related services [5413], computer systems design and related services [5415], and business support services [5614]; and the second group—group II—is a diverse set of MNCs classified in a range of other industries but with some sales in one of these four industries.

Thus, a company may be classified as part of NAICS industry 3361 because its primary line of business is motor vehicle manufacturing, but if it also sells business support services because it operates a call center or debt collection center, it would be included as a non-concentrated MNC (group II) for business support services [5614]. Since these ancillary activities—the call center or debt collection center—could be vulnerable to outsourcing or even off-shoring, a structural change to off-shore this ancillary activity should ultimately generate a services import to the parent, even though the parent company may have all of their vehicle production plants within the United States. This analysis distinguishes the varying levels of services outsourcing and off-shoring activity between these group I and group II MNC parents.

Table 6-A1 in Appendix E shows the number of MNC parents in groups I and II for the four industries examined. Although sample sizes for most of the sub-groups of industries are small, they are large enough to avoid most confidentiality issues that restrict disclosure of specific data.

Development of Key Measures

Total Purchased Inputs

Total purchased inputs are a key variable for analyzing potential outsourcing and off-shoring activity for MNC parents. BEA does not directly obtain this information through its MNC surveys but instead derives it from other survey data. BEA and Academy staff use a similar methodology to derive total purchased inputs—taking the difference between each MNC parent's annually reported total sales and value added.

Outsourcing Intensity Indicator

To assess the extent of outsourcing and any changes in outsourcing activity over this period, an indirect indicator of outsourcing was developed. This "outsourcing intensity" indicator is the ratio of total purchased inputs to total sales. When a MNC parent increases its use of purchased inputs relative to its total sales (our proxy for total output), this "outsourcing intensity" ratio will increase to reflect that increase in outsourcing. MNC parents with higher outsourcing intensity ratios utilize purchased inputs more extensively in their production processes than those with lower outsourcing intensity ratios. A MNC parent with an increasing outsourcing indicator can mean either that the MNC parent has substituted greater amounts of purchased inputs for its own employees or capital in its production processes; or that the MNC parent may have changed its product mix toward a good or service that relies more heavily on purchased inputs.

Because this study focuses on off-shoring of services rather than manufactured goods, we would have preferred to distinguish between services and goods outsourcing. However, BEA financial and operating data for MNCs currently do not allow separate estimates of purchased services inputs. This data gap not only precluded estimates of services outsourcing among MNCs but also affected the indicator for services off-shoring.[72]

Off-Shoring and Services Off-shoring Intensity Indicators

Two indirect indicators of off-shoring were derived: "off-shoring intensity," calculated as the ratio of total imports to total purchased inputs; and "services off-shoring intensity," calculated as the ratio of total service imports to total purchased inputs.[73] A significant number of MNC parents in groups I and II for each of the four industries did not have any goods and/or services imports; for these MNC parents, the off-shoring and/or services off-shoring intensity indicator was zero.

[72] The feasibility of modifying BEA surveys to collect these data depends to a large extent on the ability of business accounting systems to supply that level of detail. See Chapter 7 for more discussion of the practical difficulties of collecting these data.

[73] Academy staff would have preferred to use a more precise indicator—the ratio of intermediate services imports to purchased services inputs, but BEA data do not distinguish among end uses of imports and did not allow a separate estimate of purchased services inputs.

The "total imports" component in the "off-shoring intensity" indicator included total affiliated and unaffiliated goods imports, and affiliated service imports for groups I and II for all years. Unaffiliated services imports were included for group I MNC parents for years 2001 to 2003. SIC codes rather than NAICS codes were used for unaffiliated services importers prior to 2001. The "total services imports" component of the "services off-shoring intensity" indicator was constructed in the same way as the "total imports" component.

Data Limitations

There are six substantive data limitations that affect this micro-level analysis (see Chapter 7 for an in-depth description of these limitations).

MNC Services Imports Do Not Distinguish Imports for Intermediate Use

Services imports used to estimate the services off-shoring intensity indicator included all imports and not simply those used by the MNC parent in its internal production processes. While this failure to distinguish between intermediate and final demand use may not be as significant for services as it is for goods, this data limitation overstated the services off-shoring intensity indicator. While many imported services, for example architectural, engineering and related services [5413] or most computer design and related services [5415], are likely to be included within the MNC parent's own production processes, some may also meet customer needs directly. Although the direction of this limitation is known—the off-shoring intensity indicator is overstated—its extent and significance is not.

MNC Value Added Not Separated For Goods and Services

BEA surveys do not collect data on a MNC parent's purchased inputs directly. Instead, purchased inputs are estimated as the difference between a MNC parent's total sales and value added. Current BEA surveys do distinguish sales of services from total sales, but they do not collect separate information to distinguish between goods and services for the individual components of value added. Consequently, purchased services inputs could not be distinguished from all purchased inputs and a separate services outsourcing indicator could not be developed. This data limitation also means that the services off-shoring intensity indicator is approximated as the ratio of imported services relative to total purchased inputs rather than total purchased services inputs. Because total purchased inputs (goods and services) most likely exceed purchased services inputs alone, the resulting services off-shoring indicator will be distorted downward.[74]

[74] The distortion is downward since the denominator of the intensity ratio is overstated when total purchased inputs exceed purchased services inputs. However, many economists have used a services off-shoring indicator that is the ratio of imported intermediate services divided by total inputs (or total output). This ratio is the product of the services off-shoring intensity indicator (imported services/total purchased inputs) and the outsourcing intensity indicator (total purchased inputs/total sales) where total sales is the proxy for total output=total input.

MNC Annual Surveys Exclude Inventory Estimates

BEA collects data on MNC parent inventories in their benchmark surveys every five years, but data are not collected on annual surveys. Lack of data on the annual change in inventories for MNC parents affects the accuracy of the derived estimates of purchased inputs used by BEA. Because a MNC parent's total output in any year includes not only its total sales but also any change in its inventory, sales may not be a good proxy for total output when large inventory changes occur. In a few cases, this approximation for purchased inputs resulted in negative values when value added exceeded sales in a particular year (e.g. when inventories increased significantly).

Total purchased inputs identify outsourcing, total off-shoring and services off-shoring intensity among MNC parents. Negative values for total purchased inputs distort these indicators by producing nonsensical negative values. This data gap distorts the estimates of purchased inputs used to develop our outsourcing and off-shoring indicators. The direction of the distortion for an individual MNC parent in any particular year is unclear, since inventory changes can be either positive (inventories are increasing) or negative (inventories are decreasing).

Limited Time Series for MNC Micro-Data Analysis

Micro-level analyses using MNC parent data examined a limited 1999 to 2003 time period. Data prior to 1999 use the SIC system for categorizing industries. Developing a detailed crosswalk between the NAICS and SIC was outside the scope of this study. Complete micro-level MNC parent data for 2004 were unavailable as of September 2006. The effect of this truncated time period of analysis is to limit the ability to discern any significant trends in outsourcing, total off-shoring and services off-shoring.

MNC Data Include Estimated Rather Than Reported Data for Some Variables in Some Years

BEA financial and operating data come from various surveys which MNCs are required to complete on a quarterly or annual basis. In some instances, firms may leave some survey items unanswered. In those cases, BEA staff usually impute a value for that particular item based on prior actuals and other criteria. The data base assigns different document type codes to distinguish estimates from actual reported data. No attempt was made to determine what proportion of the values for the MNCs analyzed were reported versus estimated since BEA staff indicated that MNC parent data were usually complete; imputed values were more likely to occur in the data for foreign affiliates.

Analytic Approach

Outsourcing, total off-shoring and services off-shoring intensity indicators were estimated for each MNC with concentrated (group I) or non-concentrated (group II) sales in one of the four selected industries between 1999 and 2003. Group averages for each of these measures, displayed in Table 6-A1 of Appendix E, were compared statistically using difference of means

tests to identify the statistical significance of any observed differences (Table 6-2). In addition to examining differences in the levels of outsourcing and off-shoring, analyses also focused on changes in these levels over time (Table 6-3**)**. The key issue was whether there were any significant growth trends in any of these indicators.

Analysis of these indicators also identified two distinct groups of MNC parents—those that were off-shoring services and those that were not for both concentrated (group I) and non-concentrated (group II) firms in all four industries. These two groups were analyzed to determine whether the off-shoring MNC parents differed significantly from non-off-shoring MNC parents in the same industry group by descriptive characteristics or financial performance measures (Table 6-A4 of Appendix E).

KEY FINDINGS

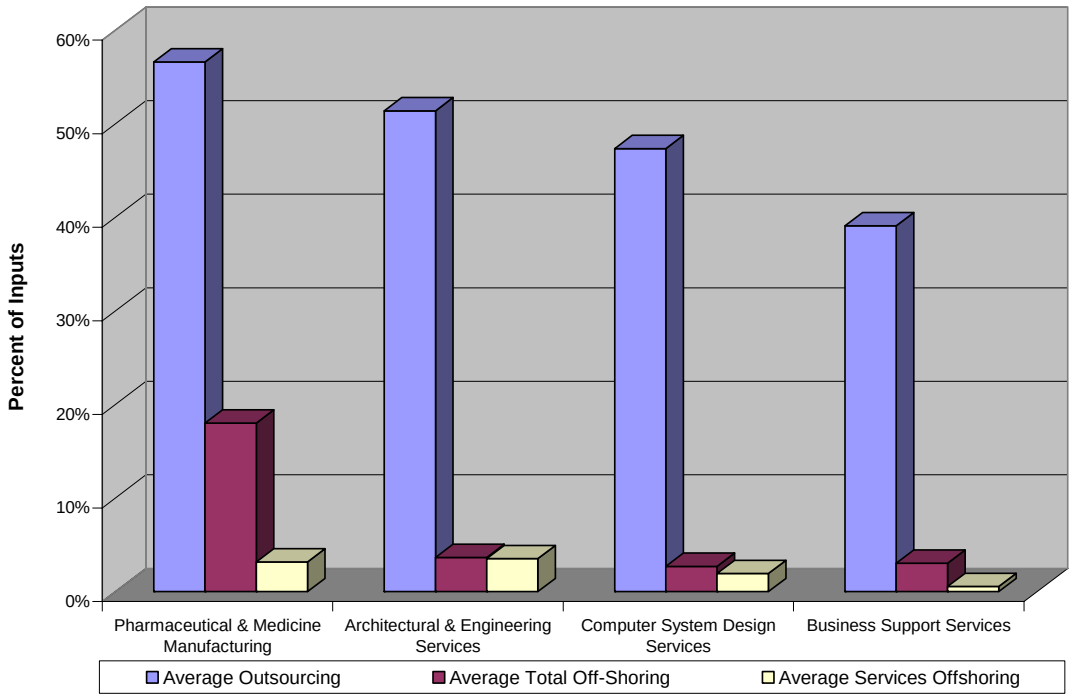
Levels of Outsourcing and Off-shoring

The comparison of outsourcing, off-shoring and services off-shoring indicators for the MNC parents in the four industries reviewed showed that services off-shoring was quite small relative to outsourcing for all groups during the 1999 to 2003 period. Chart 6-1 illustrates the differences between average levels of outsourcing, off-shoring, and services off-shoring during this period for these MNC parents.[75] The highest average level of outsourcing (pharmaceutical and medicine manufacturing [3254], 57 percent) was almost 16 times larger than the highest average level of services off-shoring (architectural, engineering and related services [5614], 4 percent).

Table 6-A1 of Appendix E compares the outsourcing, total off-shoring and services off-shoring indicators for MNC parents in each of the four industries (groups I and II) for the 1999 to 2003 period. It shows that in 2003, services off-shoring ranged from an average of .005 for MNC parents in business support services [5614] (group II), to a high of .052 for those in architectural, engineering and related services [5413] (group I). The median was .014. By contrast, outsourcing was much higher and ranged from an average of .427 for MNC parents in the business support services [5614] industry (group I) to a high of .657 for those in pharmaceutical and medicine manufacturing [3254] (group II). The difference between the services off-shoring intensity indicator and the outsourcing intensity indicator at the high end is over twelve-fold. This general pattern remained the same throughout the 1999 to 2003 period.

[75] This is an industry average for each measures over four years (1999 – 2003).

Chart 6-1
Average Outsourcing Total Off-Shoring and Services Off-Shoring for MNCs in Selected Industries (1999 to 2003)



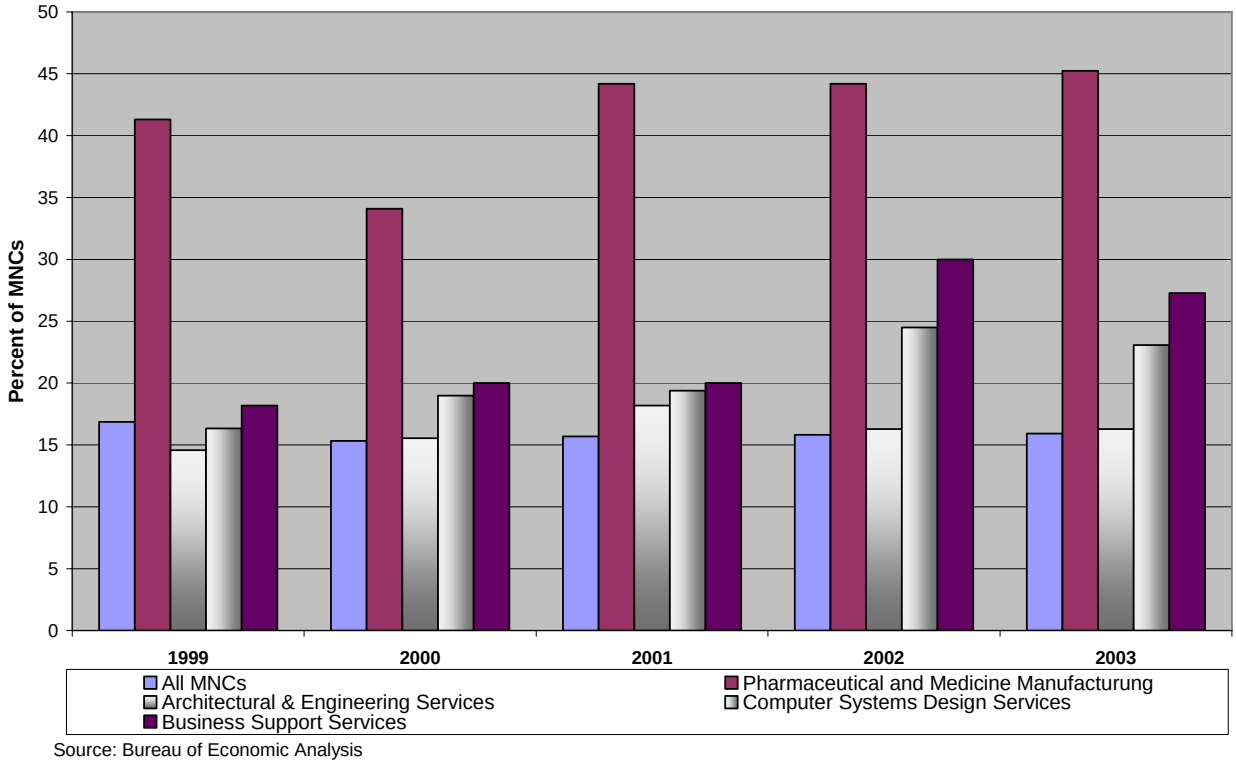
Source: Bureau of Economic Analysis

One explanation for the relatively small levels of services off-shoring is that only a limited number of MNC parents imported services during the period. Chart 6-2 below shows that with the exception of MNC parents[76] in pharmaceutical and medicine manufacturing [3254] and business support services [5614] in 2002 and 2003, the proportion of MNC parents importing services was less than 25 percent in each group. Data also indicate that for the universe of MNCs in the BEA database, the percent importing services over this period stayed fairly constant at approximately 16 percent.[77]

[76] The very small sample size for the business support services [5614] means that even an increase in one MNC importing services in a given year can increase the percent of MNC service importers by 10 percent.

[77] This number includes those MNC parents exempt from reporting all but a few items on the benchmark survey because of the small size of their foreign operations. The data published by BEA exclude these parent companies from their official number counts.

Chart 6-2
MNCs Importing Services (1999 to 2003)



Source: Bureau of Economic Analysis

Despite the limitations in the outsourcing, off-shoring and services off-shoring indicators used, the potential biases created, and other caveats:

> **The Panel finds that the level of services off-shoring due to business restructuring among MNC parents in the industries reviewed has been small during the 1999 to 2003 period.**
>
> **The Panel finds that outsourcing and total off-shoring have been substantially larger than services off-shoring for the MNC parents examined during the 1999 to 2003 period.**

The small levels of services off-shoring due to business restructuring is also consistent with the results from the industry-level analyses presented in Chapter 3.

The Panel recognized that the inability to develop a separate services outsourcing indicator due to data gaps and other data issues may have understated the services off-shoring indicator and resulting estimates**.** But the potential underestimate of services off-shoring imposed by these data limitations did not appear sufficient to account for the size of the differences that were

found consistently among all four industries, including the two MNC sub-groups. The corroboration of these micro-level results by the industry-level analyses only strengthened that belief.

Variance Among Industries

Table 6A-1 in Appendix E provides detailed data indicating the extent of differences in both the outsourcing and services off-shoring indicators for MNC parents in groups I and II from 1999 to 2003. In 2003, the services off-shoring indicator average for group I MNC parents in architectural, engineering and related services was .052. This was four times as large as that for the MNC parents in business support services (.012), twice as large as that for computer systems design (.022), and significantly larger than pharmaceutical and medicine manufacturing (.037).

For group II MNC parents, the services off-shoring indicator average in 2003 for those in architectural, engineering and related services (.014) and in pharmaceutical and medicine manufacturing (.015) was almost the same. But those services off-shoring indicators were much larger than for those in either business support service or computer systems design and related services (.005 and .010, respectively). A similar pattern exists for each of the other years during the period.

MNC parents in pharmaceutical and medicine manufacturing [3254] (3 out of 5 years) and architectural, engineering and related services [5413] (2 out of 5 years) consistently had the higher levels of services off-shoring. MNC parents in business support services [5614] have the lowest levels of services off-shoring among the four industries examined.

Table 6-2 below shows the differences in the five-year average servicing off-shoring and outsourcing indicators for MNC parents in each of the four industries (group I) from 1999 to 2003. Reading across each row in the table, the data indicate that services off-shoring among MNC parents in business support services [5614] was consistently and significantly[78] smaller than that for parents in each of the other three industries. For MNC parents in architectural, engineering and related services [5413], services off-shoring tended to be higher than for parents in the other three industries, but the difference with parents in pharmaceutical and medicine manufacturing [3254] was not significant.

The data in Table 6-2 also show significantly higher outsourcing for MNC parents in pharmaceutical and medicine manufacturing [3254] relative to MNC parents in the other industries and significantly lower outsourcing for MNC parents in business support services [5614] relative to parents in the other industries.

[78]Difference-of-means tests were used to determine whether the differences in these averages for each group were statistically significant.

Table 6-2: Differences in Average Services Off-Shoring and Outsourcing for Group I MNC Parents

Differences in Average Services Off-shoring

Industry	3254	5413	5415	5614
3254	-	-.010	.007	.017 **
5413	.010	-	.017 **	.027 **
5415	-.007	-.017 **	-	.009 **
5614	-.017 **	-.027 **	-.009	-

Differences in Average Outsourcing

Industry	3254	5413	5415	5614
3254	-	-.028 **	.062 **	.115 **
5413	-.028 **	-	.034	.086 **
5415	-.062 **	-.034 **	-	.052 **
5614	-.115 **	-.086 **	-.052 **	-

** Statistically significant at the 5 percent significance level.

While these data indicate that services off-shoring did vary among MNC parents in the four industries reviewed, these results can be affected by the small sample sizes analyzed in some cases. Even an un-weighted group average can be impacted by one or two individual firms accounting for a disproportionate share of imported services within a small group of MNCs. With that caveat in mind,

> **The Panel finds that the extent of outsourcing and services off-shoring varies substantially among the MNC parents in the four industries examined over the 1999 to 2003 time period.**

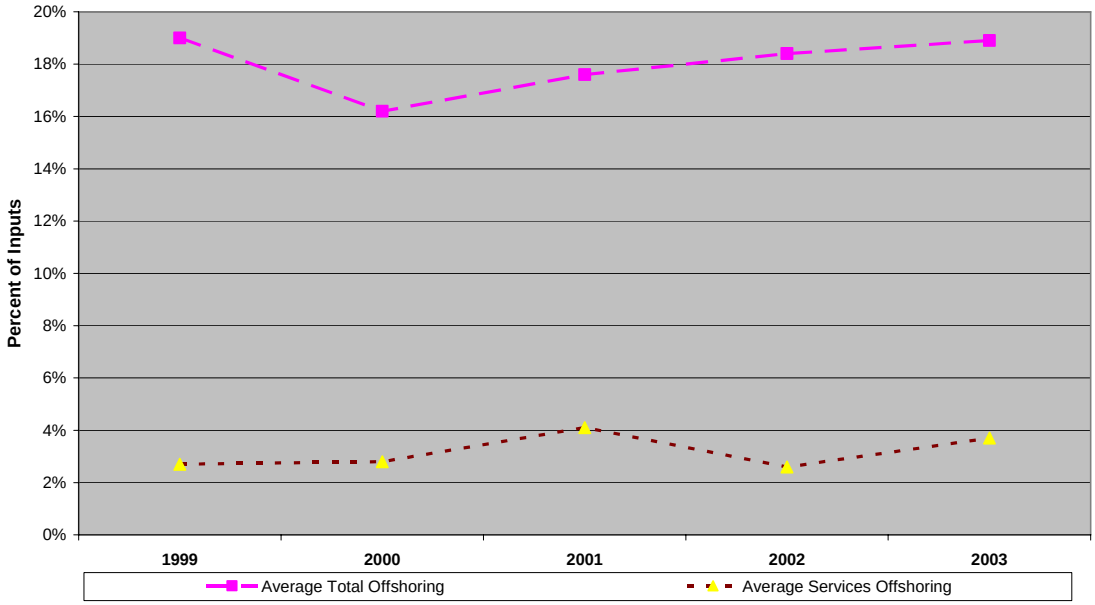
Again, this finding is consistent with results from the industry-level analysis contained in Chapter 3, where outsourcing and off-shoring measures varied considerably. These substantial differences in the extent of services off-shoring among industries suggest that it is difficult to develop national conclusions about the extent of services off-shoring from a limited set of industries. This variation among industries may also help explain the range of results found in the previous off-shoring studies reviewed in the first report.

Trends in Services Off-Shoring

Charts 6-3 to 6-6 show the average annual rates of total off-shoring and services off-shoring for MNC parents in the four industries examined from 1999 to 2003. These charts do not indicate

any consistent growth in services off-shoring for MNC parents in these industries. While the average growth in services off-shoring appeared to increase gradually over the five-year period for MNC parents in architectural, engineering and related services [5413] and business support services [5614], these apparent increases started from very small levels.[79] In computer systems design and related services [5415], growth remained relatively flat, while services off-shoring in pharmaceutical and medicine manufacturing [3254] fluctuated, peaking at 4 percent in 2001. During this period, average services off-shoring rates remained below 5 percent of purchased inputs, and in most instances well below 5 percent, for MNC parents in the four industries. The only exception was for MNC parents in architectural, engineering and related services [5413] in 2003, when their average services off-shoring rate was 5.2 percent of total purchased inputs.

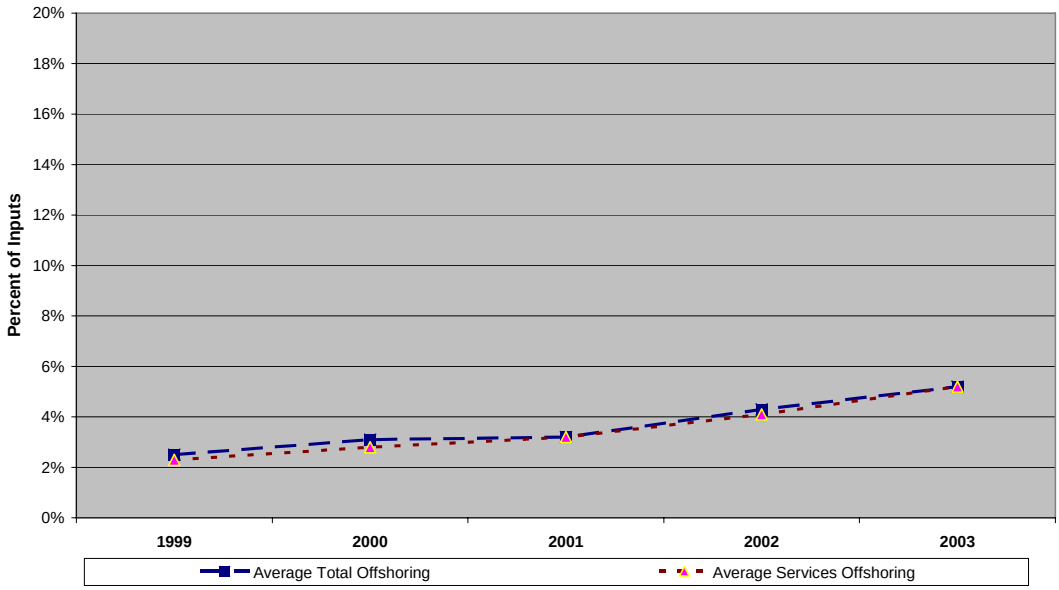
Chart 6-3
Average total and Services Off-Shoring Rates for MNC Parents in Pharmaceuticals and Medicine Manufacturing [3254] (1999 to 2003)



Source: Bureau of Economic Analysis

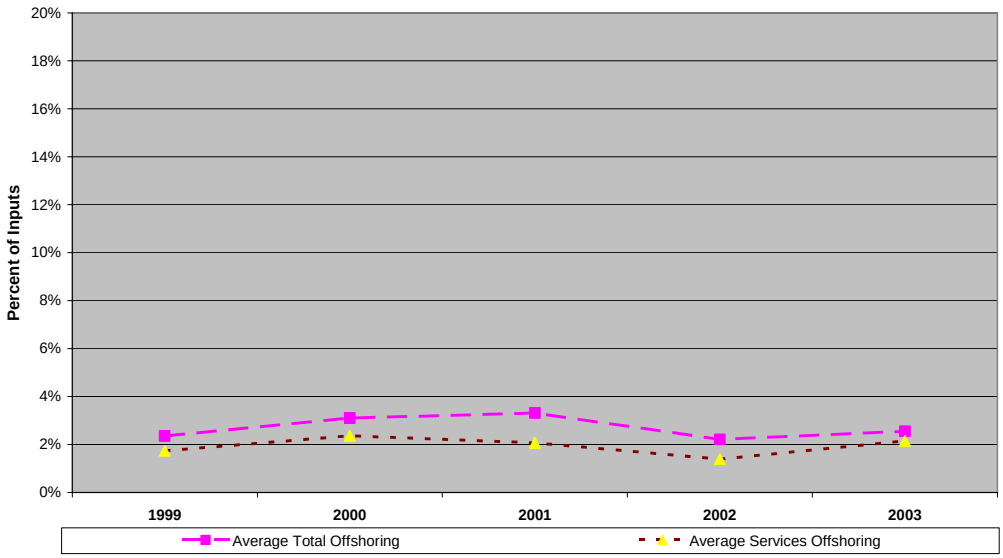
[79] From Table 6A-1 in Appendix E, the average services off-shoring rates in 1999 were about 2.3 percent of purchased inputs for parents in architectural, engineering and related services [5413] and less than one-quarter of one percent for parents in business support services [5614].

Chart 6-4
Average Total and Services Off-Shoring Rates for MNC Parents in Architectural and Engineering and Related Services [5413] (1999 to-2003)



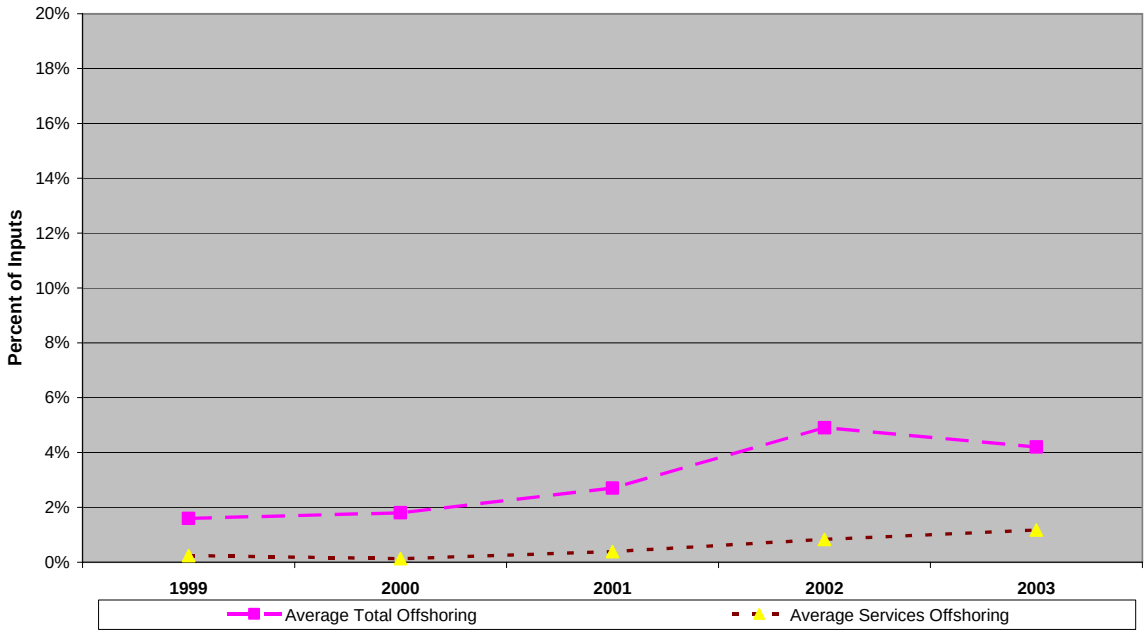
Source: Bureau of Economic Analysis

Chart 6-5
Average Total and Services Off-Shoring Rates for MNC Parents in Computer Systems Design and Related Services [5415] (1999 to 2003)



Source: Bureau of Economic Analysis

Chart 6-6
Average Total and Services Off-Shoring Rates for MNC Parents in Business Support Services [5614] (1999 to 2003)



Source: Bureau of Economic Analysis

The truncated 1999 to 2003 time period and the limited sample sizes for the sub- groups of MNC parents for the four industries make it difficult to discern growth trends. More importantly, the limited time period and sample sizes raise concerns about the susceptibility of these group averages to small sample effects. To determine whether any statistically significant trends exist, semi-log regressions were run for pooled cross-section and time series data for MNC parents in groups I and II for each industry that were either "services off-shorers" or "non- services off-shorers." The data for average outsourcing among MNC parents were also run and those results are shown in Table 6-3.

For four of the eight MNC parent groups tested, the coefficients for services off-shoring were negative, but none were statistically significant. Only the MNC parents in the pharmaceutical and medicine manufacturing [3254] industry showed any statistically significant average annual growth (about 22 percent) in their level of service off- shoring from 1999 to 2003.[80]

[80] The semi-log regressions were done using 'year' as the independent variable and the semi-logs of the intensity indicators, outsourcing and services off-shoring, as the dependent variables. The regression coefficients for the independent variable represents the annual percentage change for the particular indicator.

Table 6-3
Outsourcing and Services Off-Shoring Estimated Proportional Changes

MNC Group	Services Off-Shoring		Outsourcing	
	Group I	Group II	Group I	Group II
Pharmaceutical and Medicine Manufacturing [3254]				
• Services Off-Shoring MNCs	0.222 **	-0.033	0.163	0.139
• Other MNCs	-	-	-0.136	0.043
Architectural, Engineering and Related Services [5413]				
• Services Off-Shoring MNCs	0.101	0.190	-0.265	0.141
• Other MNCs	-	-	-0.027	0.004
Computer Systems Design and Related Services [5415]				
• Services Off-Shoring MNCs	-0.036	-0.140	-0.063	0.019
• Other MNCs	-	-	-0.017	-0.047
Business Support Services [5614]				
• Services Off-Shoring MNCs	0.205	-0.037	0.080	0.164
• Other MNCs	-	-	0.031	0.100

** Statistically significant at the 5 percent significance level.

This same result was obtained for outsourcing: the signs on the coefficients were both positive and negative; the sizes of the coefficients varied; and none of the coefficients were statistically significant.[81] Consequently,

> **The Panel finds little evidence of consistent growth in services off-shoring from business restructuring among MNC parents in the industries examined over the 1999 to 2003 period.**

This finding is also consistent with the industry-level results reported in Chapter 3.

Differences Between Services Off-Shoring MNCs and Non-Services Off-Shoring MNCs

Charts 6-7 to 6-9[82] show that MNC parents that off-shored services from 1999 to 2003 tended to be larger, and accounted for more sales, value added, employment and net income than other parents in the three industries that could be presented. Each bar in Charts 6-7 through 6-9 shows the percent of each variable accounted for by MNC parents in a specific industry that off-shored services in 2003, with the remainder accounted for by the other MNC parents in that same industry.

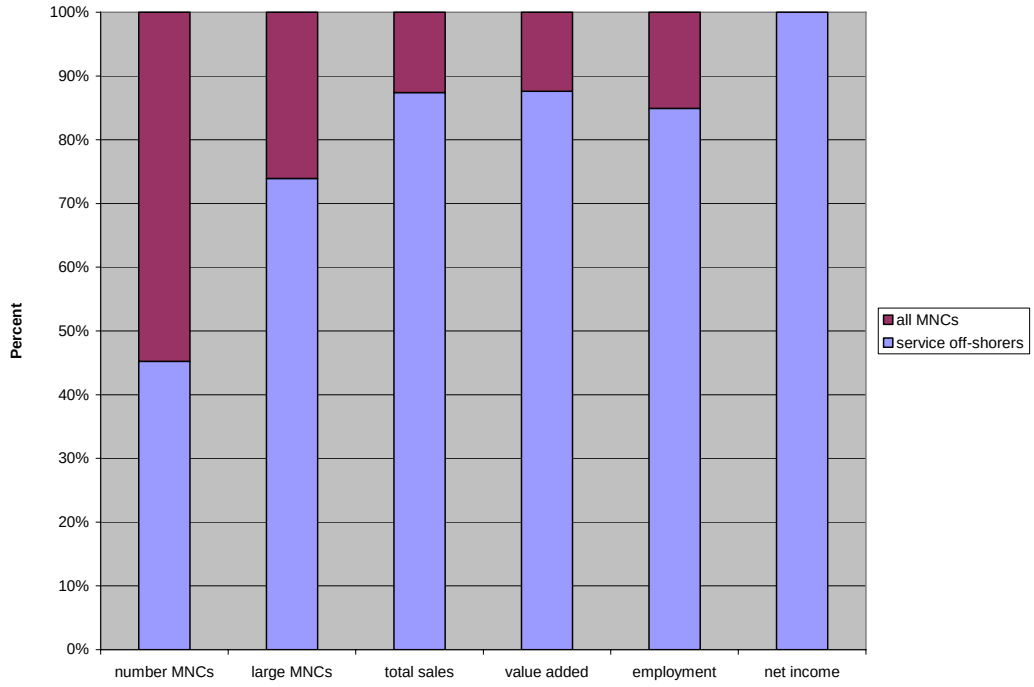
The data reveal a number of differences between MNC parents off-shoring services and those that do not in the same industry. First, services off-shoring MNC parents were a minority of the MNCs in each industry for the five-year period. Second, MNC parents off-shoring services were a majority of the large MNC parents[83] concentrated in the pharmaceutical and medicine

[81] A more detailed table with regression results for other variables such as employment and sales can be found in the Appendix E, Table 6A-3.
[82] Confidentiality issues precluded presenting results for MNC parents concentrated in business support services [5614].
[83] Size is based on total employment, with large MNCs having more than 1000 employees.

manufacturing [3254] industry and a disproportionate share of those concentrated in architectural, engineering and other related services [5413] and computer systems design and related services [5415]. Services off-shoring parents also accounted for a disproportionate share[84] of the key financial indicators shown in Charts 6-7 through 6-9—total sales, value added, total employment and net income. One exception was net income for services off-shoring MNC parents concentrated in architectural, engineering and related services [5413].

Table 6A-4 in Appendix E contains detailed data on the shares of various descriptive and financial measures accounted for by services off-shoring MNC parents relative to the rest of the MNC parents in their sub-group and industry. These measures include number of MNC parents; size characteristics (as measured by employment); and a number of financial or economic variables including: total sales, value-added (a measure of gross output less intermediate inputs), employment, employee compensation, average employee compensation, total sales per employee, total imports, net income, and capital expenditure (property, plant and equipment spending).

Chart 6-7
Differences Between Services Off-Shoring and Non- Services Off-Shoring MNCs in Selected Financial Variables



[84] Disproportionate share is relative to the proportion of MNCs in the industry that services off-shoring parents account for.

Chart 6-8
Architectural, Engineering and Related Services [5413] (2003)

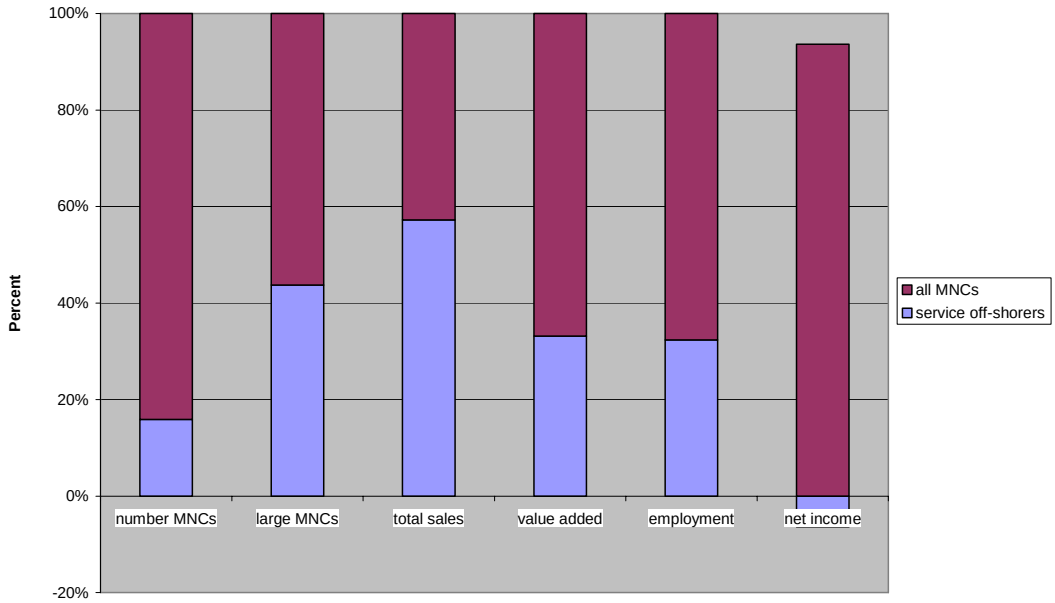


Chart 6-9
Computer Systems Design and Related Services [5415] (2003)

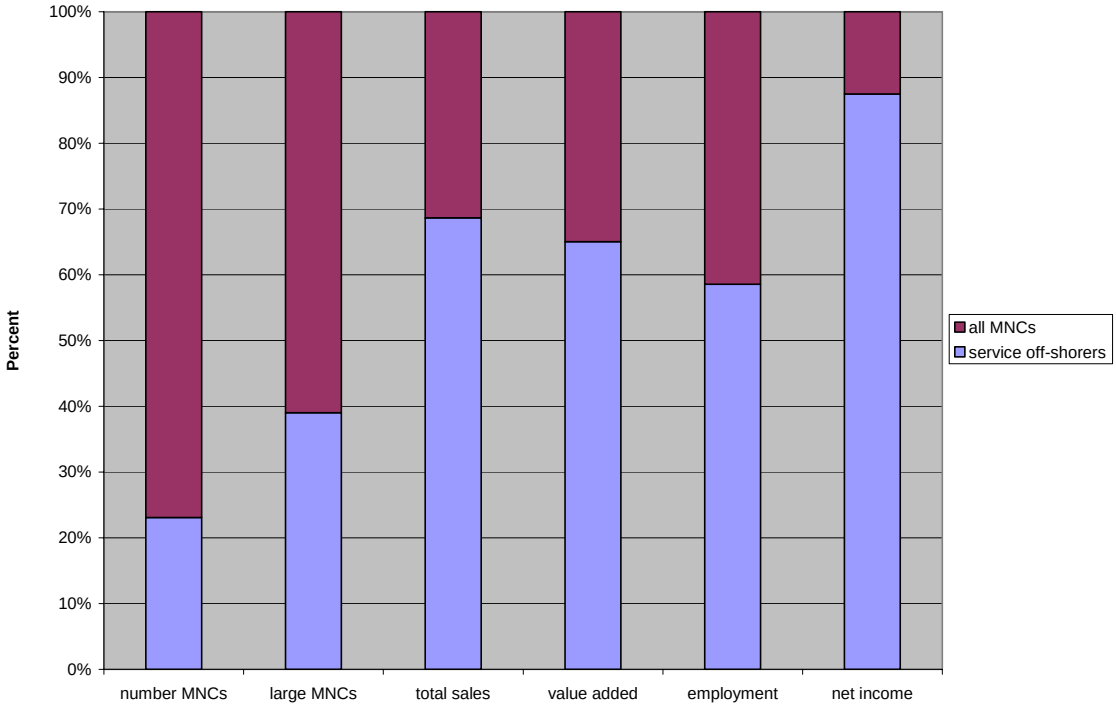


Table 6A-4 in Appendix E shows that the services off-shoring MNC parents also had consistently higher sales per employee and average compensation rates than non-services off-shoring MNC parents from 1999 to 2003. While sales per employee for off-shoring MNCs concentrated in pharmaceutical and medicine manufacturing [3254] averaged between one and three percent higher than the overall group average over this period, this difference was even greater in the services industries examined. The greatest differences in sales per employee occurred among MNC parents concentrated in architectural, engineering and related services [5413] where sales per employee for services off-shoring MNC parents ranged between 39 and 77 percent above the total group average.[85]

These observed differences in the shares of various financial indicators accounted for by those MNC parents off-shoring services were found statistically significant for all industries and sub-groups except parents concentrated in the business support services [5614] industry (group I).[86]

While these results suggest that services off-shoring MNC parents may be doing better than MNC parents not off-shoring services, no attempt was made to establish a causal link between services off-shoring and performance in these financial variables. More sophisticated analytical techniques are needed to determine whether such a relationship exists.

> **The Panel finds that those MNC parents off-shoring services from 1999 to 2003 appear to be larger, account for disproportionate amounts of total sales and net income, and have higher sales per employee than non-services off-shoring MNC parents in the same sub-groups and industries.**

Analyses of Services Off-Shoring from Global Expansion

This section describes efforts to identify the extent of services off-shoring due to global expansion rather than business restructuring. As discussed in Chapter 2, this form of services off-shoring is limited to MNCs but is more complex and difficult to identify. BEA financial and operating data for MNCs also include information on foreign affiliates of U.S. MNC parents. Differences between MNC parent and foreign affiliate growth rates in total sales and sales of services were analyzed to determine whether MNC parents in the four examined industries were shifting and expanding production activities, particularly service production, to their foreign affiliates. Differences in growth rates for other key economic indicators were also examined to assess the economic performance of parents relative to their foreign affiliates between 1999 and

[85] The data in Table 6A-4 in Appendix E show the percent of a sub-group total accounted for by services off-shoring MNC parents. If sales per employee for these services off-shoring MNC parents exceed the overall sub-group average, their percentage share will be greater than 100 percent. The amount in excess of 100 percent indicates how much larger the services off-shoring MNC parents' sales per employee average is relative to the average for all MNC parents in that sub-group.

[86] Table 6A-5 in Appendix E contains the results of these difference-of-means statistical tests. It should be noted however that because of the small samples of MNC parents, the differences may be due to the wide dispersion of the data across MNCs. Thus, these results may not be representative of the performance of all services off-shoring MNC parents.

2003.[87] Analyses of the distribution of foreign affiliate sales by industry indicated whether the preponderance of affiliate sales were in the same industries as the parents. Similarly, analyses of the market destination of foreign affiliate sales indicated which markets and customers were being served by affiliate production. MNC parent export data were also examined to determine whether affiliate production activity affected parent export growth.

Data Sources and Their Limitations

Comparative Growth Rates for MNC Parents and their Foreign Affiliates

This comparative analysis of parent and foreign affiliate financial indicators focused on seven financial indicators from BEA financial and operating data—total sales, value added, employment, employee compensation, average employee compensation, sales per employee, and net income. Academy staff estimated growth rates for each indicator over the 1999 to 2003 period for both MNC parents with sales concentrated in one of the four industries examined (group I) and their foreign affiliates. To minimize potential confidentiality issues, the results of these growth rate comparisons are presented at aggregate group I levels for each industry. Although the period of analysis was shorter than desired, consistent growth rates were developed over the five-year period for both MNC parents and their foreign affiliates.

These aggregate financial data however provide little information on some critical distributional differences that might exist between MNC parents and their foreign affiliates. For example, although these data identify aggregate changes in employment for MNC parents and foreign affiliates over this period, they do not identify differences in employment levels for specific occupations and therefore cannot determine which types of occupations had the greatest employment growth. Nor do they distinguish between the percentage of employment in high- or low-skill occupations in foreign affiliates relative to parents in their specific services or manufacturing industries. The employee compensation data can provide information on differences in average compensation between MNC parents and their foreign affiliates, but they do not indicate whether these reflect lower wages for the same occupations or different occupational mixes.

Comparison of these MNC parent and foreign affiliate financial indicator growth rates can identify the extent of differences but cannot determine the reason for them. Thus, differences in the growth of parent and foreign affiliate net income cannot identify whether these differences reflect accounting policies (e.g. transfer pricing issues) or real economic difference, nor can the reasons for any real economic difference be identified without additional data. Differences in growth rates between the MNC parent and its foreign affiliate(s) in the variables that are generated by nominal dollar values such as sales and employee compensation can also be due to inflation and exchange rate differences between the U.S. and the host countries.

[87] The entry and exit of foreign affiliates from year to year in the four industries examined may affect the results in the analysis of services off-shoring from global expansion. Some of the results may be due to changes in the composition of the foreign affiliate panel rather than changes in foreign affiliate behavior.

Distribution of Affiliate Sales

BEA surveys collect financial and operating data on foreign affiliates at disaggregated levels that distinguish between type of industry, market destination—sales to local market of foreign affiliates, to U.S. market, or to other foreign markets—and customers served—sales to U.S. parent, other foreign affiliates of U.S. parent, or unaffiliated customers. These total sales data are further disaggregated into sales of services for the same set of sales destinations and customers. Academy staff analyzed these data for foreign affiliates with parents in the four industries to measure the amount of sales going to local and foreign markets versus the amount of sales to the United States.

These data can measure the extent to which foreign affiliates are serving local and other foreign markets rather than meeting U.S domestic needs. They can also measure the proportion of foreign affiliate sales remaining within the MNC entity either as sales to their parents or to other foreign affiliates of the parent. Foreign affiliate sales to U.S. MNC parents and sales to other U.S persons represent U.S. affiliated and unaffiliated imports, respectively.

Although we can measure the growth of foreign affiliate sales to local and foreign markets, these data alone cannot tell us the extent to which foreign affiliate sales are substituting for MNC parent exports. Linking parent export data by market destination with these foreign affiliate sales data may provide some indication of the degree of substitution for current exports, but cannot measure forgone export growth opportunities and the potential impact on U.S. employment. In addition, these data alone cannot distinguish among various reasons for growth in foreign affiliate sales to local or foreign markets. For example, they cannot determine whether growth is due to:

- MNC parents shifting services or manufacturing activities from the U.S. to their foreign affiliates—global expansion off-shoring;

- MNC parents choosing to serve new, previously untapped, local (host country) or foreign markets via their foreign affiliates; or

- a response to an increase in local or foreign market demand for those areas currently served by foreign affiliate production.

Additional data and analyses are needed to distinguish among these potential reasons for differential growth in foreign affiliate relative to parent sales.

Distribution of MNC Parent Exports

MNC parent export data provide information on the distribution of MNC parent exports between affiliated and unaffiliated recipients. Changes in the composition of total parent exports from 2001 to 2003—between exports to their foreign affiliates and exports to foreign unaffiliated persons—were examined for MNC parents in the four industries to identify the effect of foreign affiliate growth on MNC parent exports. These data however cannot measure U.S. job creation resulting from increased MNC parent affiliate exports. Nor can they measure the extent of

forgone exports to unaffiliated foreign persons due to foreign affiliate sales to local and other foreign markets.

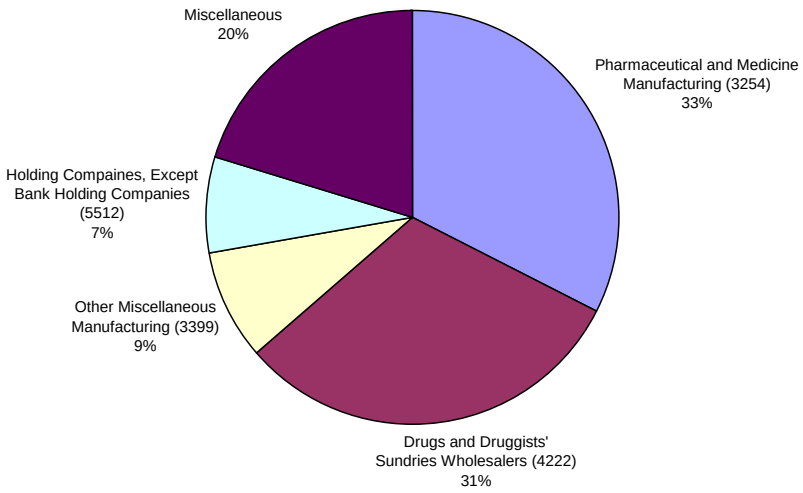
Key Findings and Conclusions from Foreign Affiliate Data Analysis

Industry Classifications of Foreign Affiliates

BEA generally classifies MNC parents and their foreign affiliates according to the industry with the preponderance of the entity's sales. The analysis of MNC parents in this report distinguished between parents whose sales were concentrated (group I) in one of the four industries selected for review and those parents with only some sales in these industries (group II). The comparative analysis for parents and their foreign affiliates included only group I parents to identify differences in industry categories for foreign affiliates relative to parents. If foreign affiliates have a different industry classification than their parents, then the preponderance of their sales are in another industry. This result would suggest that one goal of strategic business decisions to expand globally and off-shore services is to diversify into other product lines.

Charts 6-10 to 6-13 show the primary industry classifications for foreign affiliates relative to their group I parents based on affiliates sales in 2003.[88]

Chart 6-10
NAICS Classifications for Foreign Affiliates with MNC Parents in Pharmaceuticals and Medicine Manufacturing [3254] (2003)



[88] The classification numbers are a combination of 1997 and 2002 NAICS codes with the exception of 5329 and 5512 which are classifications described in BEA's "Guide to Industry and Foreign Trade Classifications for International Surveys."

Chart 6-11
NAICS Classifications for Foreign Affiliates with MNC Parents in Architectural, Engineering and Related Services [5413] (2003)

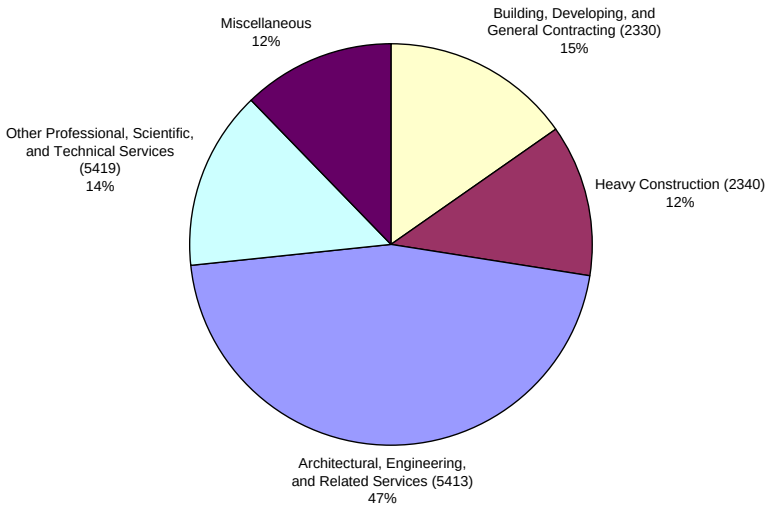


Chart 6-12
NAICS Classifications for Foreign Affiliates with MNC Parents in Computer Systems Design and Related Services [5415] (2003)

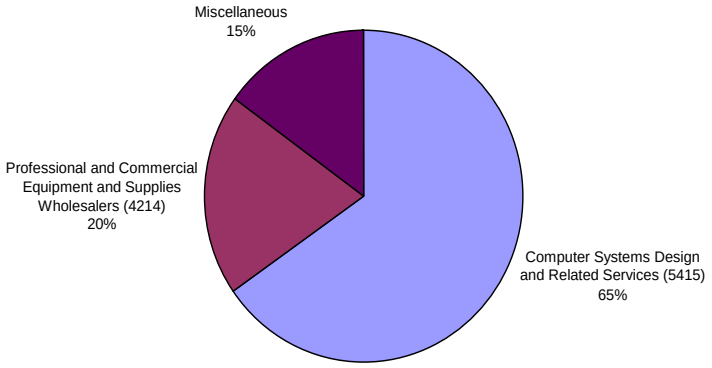
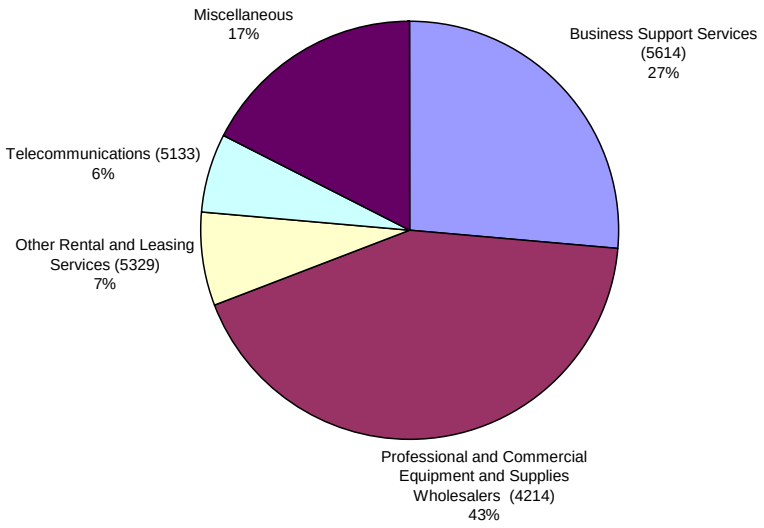


Chart 6-13
NAICS Classifications for Foreign Affiliates with MNC Parents in Business Support Services [5614] (2003)



Source for Charts 6-10 to 6-13: Bureau of Economic Analysis.

Key Findings:

- Chart 6-10 for foreign affiliates of group I MNC parents concentrated in the pharmaceutical and medicine manufacturing industry [3254] shows that only 33 percent of these affiliates had the majority of their sales in the parent industry in 2003. The remaining were classified in drugs and druggists' sundries wholesalers (31 percent), other miscellaneous manufacturing (9 percent), holding companies, except bank holding companies (7 percent) and 20 percent were into the miscellaneous category.

- Chart 6-11 for foreign affiliates of group I MNC parents concentrated in architectural, engineering and related services [5413] shows that only 47 percent of these affiliates were concentrated in their parent's industry in 2003. The majority were distributed among , building, developing, and general contracting (15 percent), heavy construction (12 percent), other professional, scientific, and technical services (14 percent), and 12 percent fell into the miscellaneous category.

- Chart 6-12 for foreign affiliates of group I MNC parents concentrated in computer system design and related services [5415] shows that the vast majority of these affiliates—65 percent—were concentrated in the parent industry in 2003. Of the remainder, 20 percent

were in professional and commercial equipment and supplies wholesalers, and 15 percent were in the miscellaneous category.

- Chart 6-13 for foreign affiliates of group I MNC parents concentrated in business support services [5614] shows that only 27 percent of these affiliates were in business support services [5614]. The majority are classified in professional and commercial equipment and supplies wholesalers (47 percent), other rental and leasing services (7 percent), telecommunications (6 percent), and miscellaneous (17 percent).

Conclusion:

Although each group of foreign affiliates in 2003 had a portion of foreign affiliates in the same industry as their parents, each group also had a large portion of foreign affiliates with the preponderance of sales in a variety of other industries. The only group with the majority of affiliates in the same industry as the parents was computer system design and related services [5415].

Growth of Foreign Affiliates vs. Growth of MNC Parents

Chart 6-14 shows the number of MNC parents and their foreign affiliates concentrated in the four selected industries from 1999 to 2003. Charts 6-15 to 6-21 compare the growth rates of MNC parents to their foreign affiliates for seven economic indicators. While the number of MNC parents declined over this period in each industry (except in business support services [5614]) the number of foreign affiliates for these MNC parents increased (except in computer systems design and related services [5415]). Charts 6-15 to 6-21 however indicate a more erratic pattern in MNC parent and foreign affiliate growth rates for the seven economic indicators.

Chart 6-14
Growth in the Number of MNC Parents and Their Foreign Affiliates (1999 to 2003)

Number of MNC Parents	3254	5413	5415	5614
1999	46	48	104	11
2000	44	45	100	10
2001	43	44	98	10
2002	43	43	98	10
2003	42	44	91	11
Percent Change from 1999 to 2003*	**-8.7 %**	**-8.3 %**	**-12.5 %**	**0.0 % t**
Number of Their Foreign Affiliates	**3254**	**5413**	**5415**	**5614**
1999	1285	387	954	55
2000	1328	380	953	160
2001	1352	378	932	159
2002	1333	415	951	160
2003	1362	426	841	166
Percent Change from 1999 to 2003*	**6.0 %**	**10.1 %**	**-11.8 %**	**201.8 %**

* Percent Change from 1999 to 2003 is calculated as: (total variable value for 2003-total variable value for 1999)/total variable value for 1999.

Chart 6-15
Percentage Change of MNC Parent and Foreign Affiliate Sales (1999 to 2003)

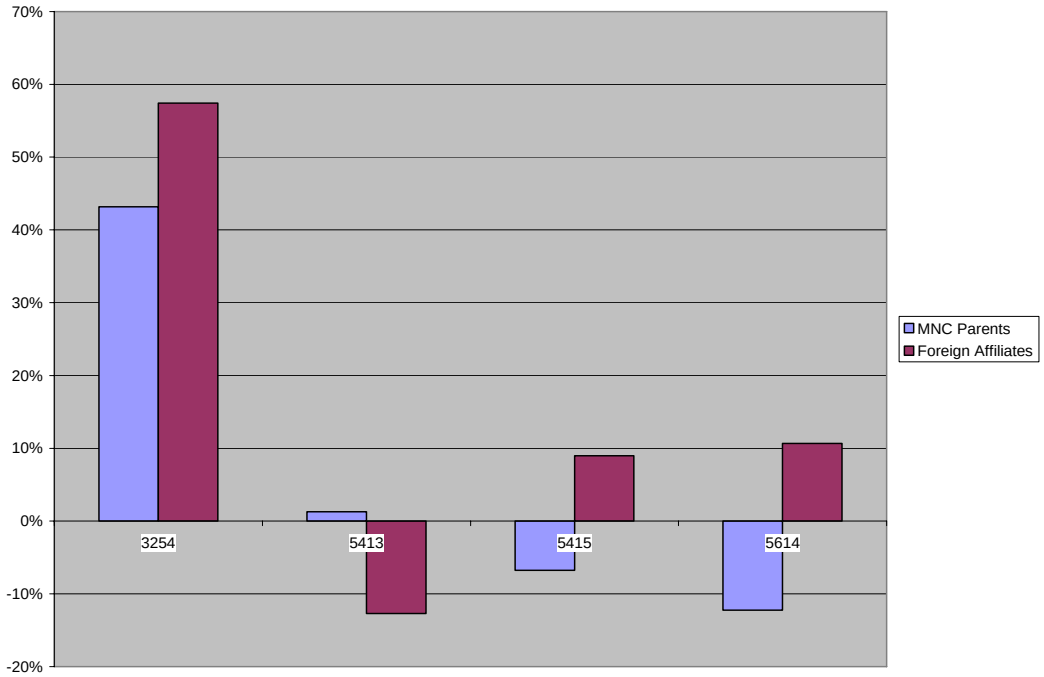


Chart 6-16
Percentage Change of Average Sales per Employee for MNC Parents and Their Foreign Affiliates (1999 to 2003)

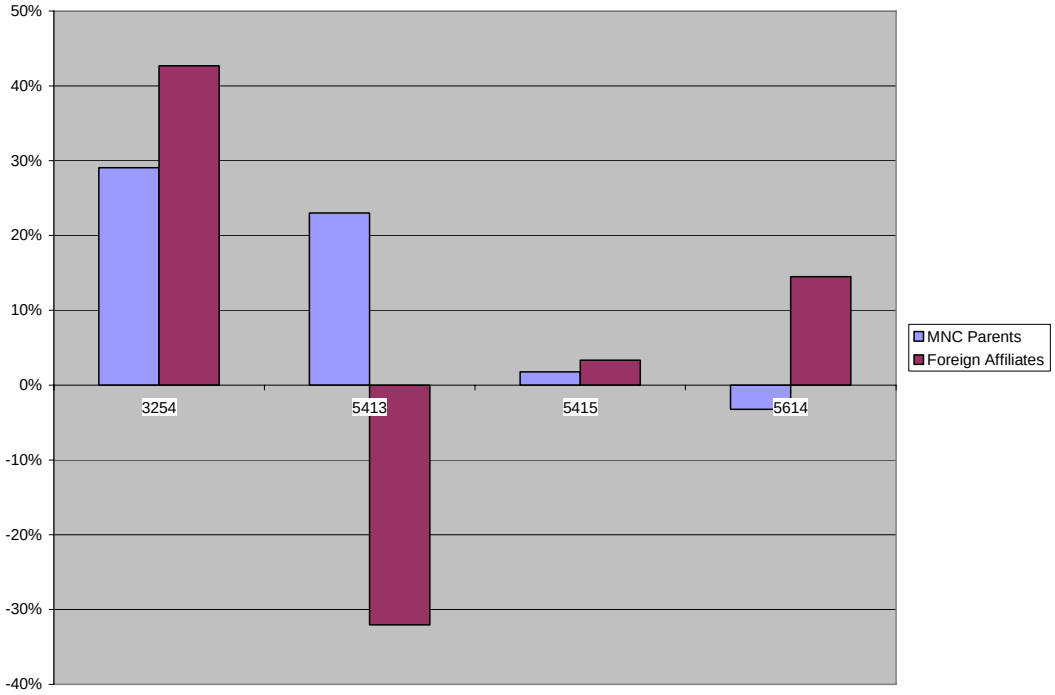


Chart 6-17
Percentage Change of Value added for MNC Parents and Their Foreign Affiliates (1999 to 2003)

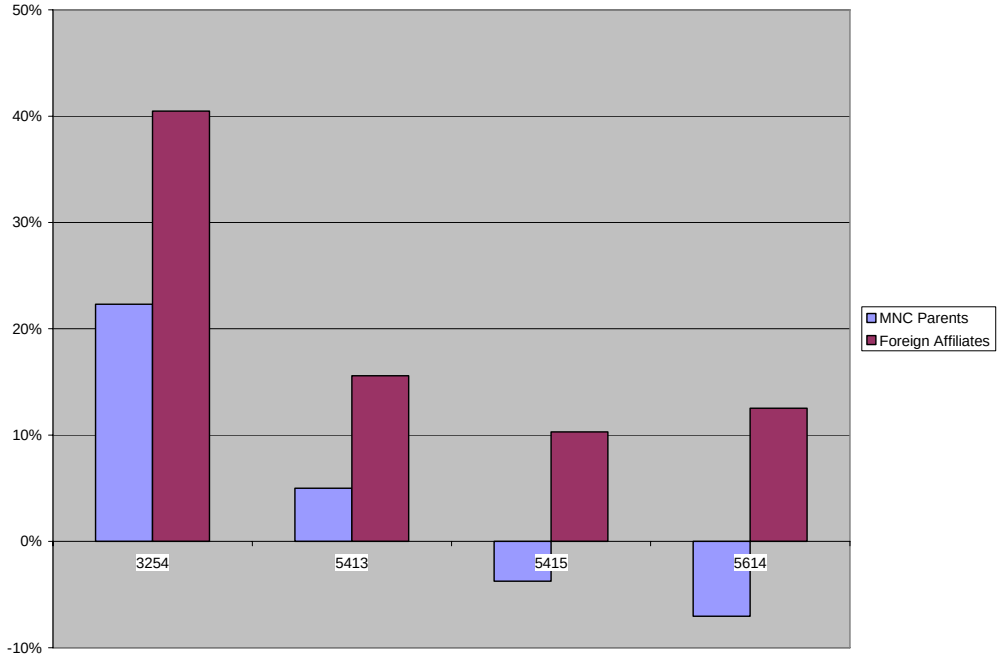


Chart 6-18
Percentage Change of MNC Parent and Foreign Affiliate Employment (1999 to 2003)

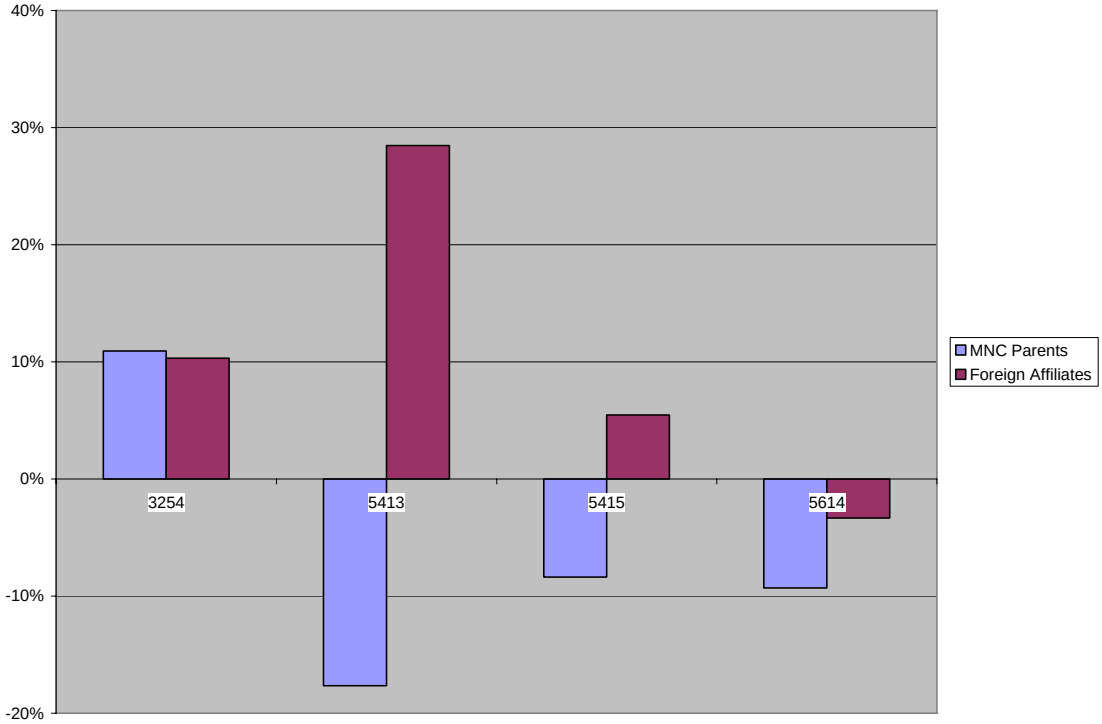


Chart 6-19
Percentage Change of Employee Compensation for MNC Parents and Their Foreign Affiliates (1999 to 2003)

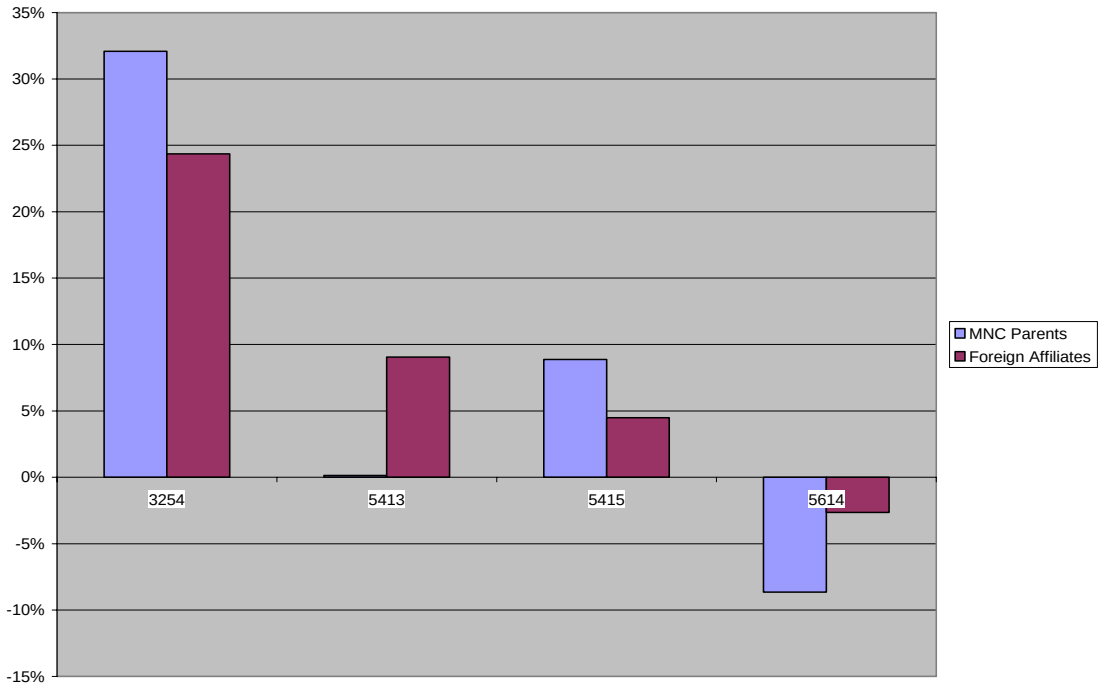


Chart 6-20
Percentage Change of Average Employee compensation for MNC Parents and Their Foreign Affiliates (1999 to 2003)

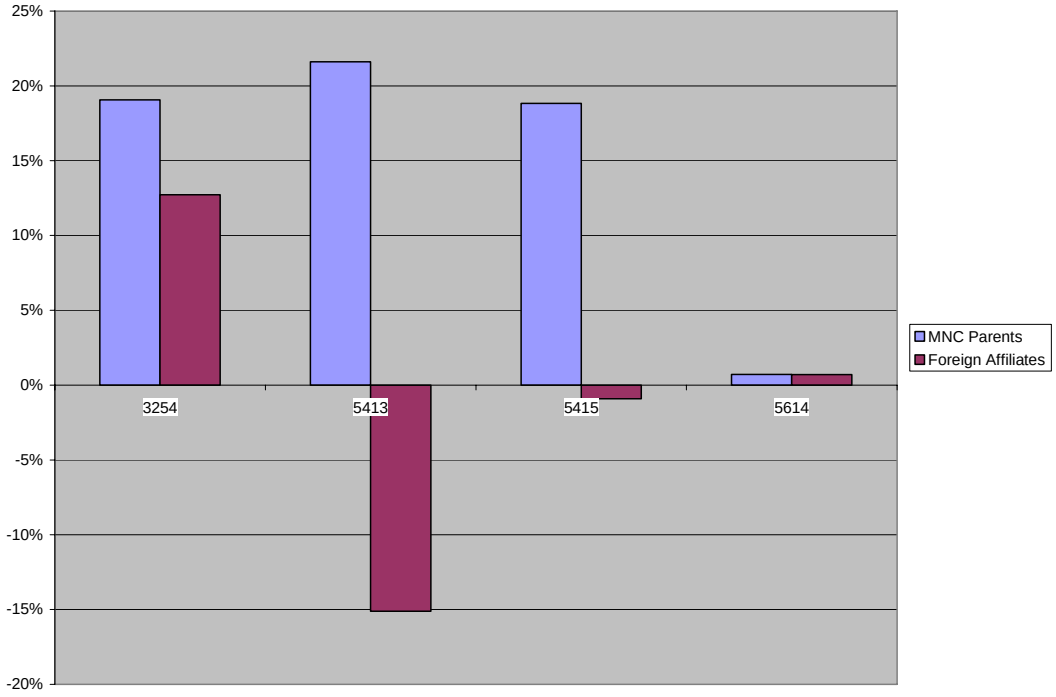
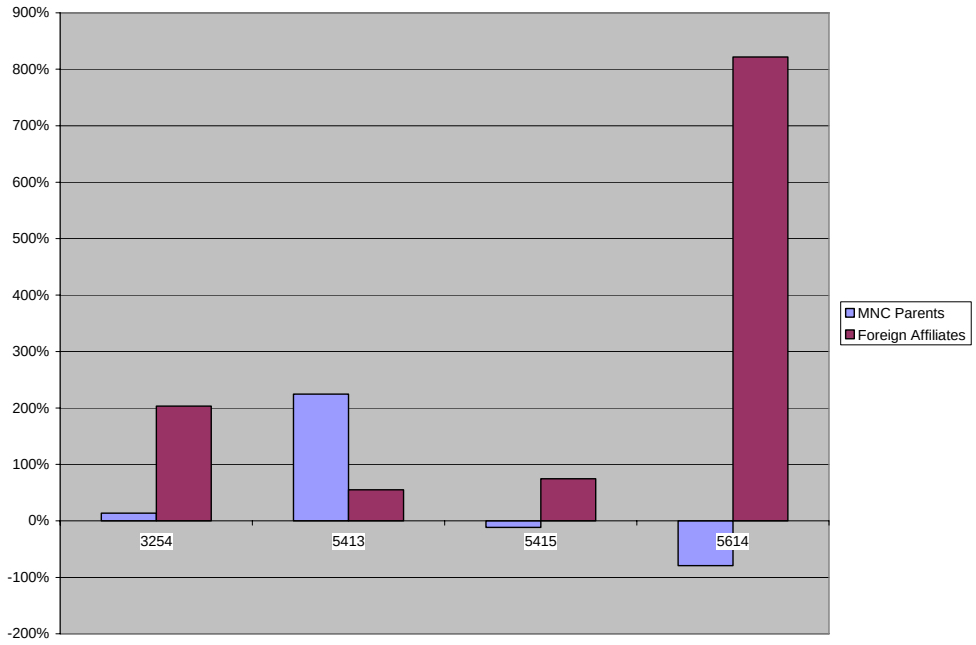


Chart 6-21
Percentage Change of Net Income for MNC Parents and Their Foreign Affiliates (1999 to 2003)



Source for Charts 6-15 to 6-21: Bureau of Economic Analysis.

Key Findings:

- Foreign affiliate sales (Chart 6-15) increased from 1999 to 2003 except in architectural, engineering and related services [5413] where sales declined almost 13 percent over the period.[89] In contrast, MNC parent sales increased only for those concentrated in pharmaceutical and medicine manufacturing [3254] and architectural, engineering and related services [5413]. Sales for MNC parents concentrated in computer system design and related services [5415], and business support services [5614] declined 6.8 percent and 12.2 percent, respectively. The growth in parent sales over this period exceeded that for their foreign affiliates only for architectural, engineering, and other services [5413]. For the other three industries, sales growth for foreign affiliates exceeded the growth for their parents.

- Average sales per employee (Chart 6-16) increased for foreign affiliates with parents concentrated in the four industries with the exception of those in architectural, engineering and related services [5413], and increased for MNC parents with the exception of those concentrated in business support services [5614]. Comparative growth rates between parents and foreign affiliates were the same as for total sales. For pharmaceutical and medicine manufacturing [3254] and architectural, engineering and related services [5413] industries, parent growth exceeded foreign affiliate growth; for the other two industries, foreign affiliate growth exceeded parent growth.

- Value added (Chart 6-17) for foreign affiliates grew faster than their parents in the four industries examined over this period. Value added decreased for MNC parents in computer system design and related services [5415] and business support services [5614].

- Employment (Chart 6-18) increased for foreign affiliates, except for business support services [5614] between 1999 and 2003. For MNC parents, however, employment increased only for pharmaceutical and medicine manufacturing [3254]. Parent employment growth exceeded foreign affiliate growth in this industry as well.

- Employee compensation (Chart 6-19) increased for MNC parents and foreign affiliates during the period except in business support services [5614]. MNC parents average employee compensation (Chart 6-20) increased in the four industries, but declined for foreign affiliates in architectural, engineering and related services [5413] and computer system design and related services [5415]. Over the period average employee compensation increased faster for MNC parents than for their foreign affiliates, although the difference was negligible for business support services [5614].

- Net income (Chart 6-21) increased from 1999 to 2003 for foreign affiliates with parents in the four industries and for MNC parents in pharmaceutical and medicine manufacturing [3254] and architectural, engineering and related services [5413]. For MNC parents in computer system design and related services [5415], and business support services [5614] net

[89] The number of foreign affiliates for these architectural, engineering and other related services [5413] industry parents also declined 12 percent over the period.

income decreased. Only 5413 parents had higher growth in net income than their foreign affiliates.

Conclusion:

As explained in Chapter 2, higher growth rates in foreign affiliate sales relative to their parents would be consistent with off-shoring due to global expansion. For MNC parents and their foreign affiliates in the four industries reviewed, the evidence using changes in total sales for parents and their affiliates in the four industries examined is mixed. While foreign affiliate sales increased faster than parent sales in three of the industries, sales for parents concentrated in architectural, engineering and related services [5413] grew faster than foreign affiliate sales over the 1999 to 2003 period. Since we are interested in services off-shoring, not just total off-shoring, we need more detailed sales data. In the next section, we will look at the distribution of these sales by market destination and type of customer in grater detail. In a later section, we will examine numbers of individual MNC parents with foreign affiliate sales growth grater than parent sales growth over the period.

Total Sales of Foreign Affiliates- Disaggregated by Destination and Customer Type

Charts 6-22 to 6-25 show the percentage distribution of foreign affiliate sales by destination--sales to local market of foreign affiliates, sales to U.S. market, or sales to other foreign markets— and by type of customer—sales to MNC parents, other foreign affiliates of MNC parents or to unaffiliated customers--for each of the four industries. Tables 6A-8 and 6A-9 in Appendix E contain the detailed numbers and show percentage change from 1999 to 2003. The foreign affiliate sales in this analysis include both goods and services.

Chart 6-22
Market Destinations of Pharmaceutical and Medicine Manufacturing [3254] Foreign Affiliate Sales (1999 to 2003)

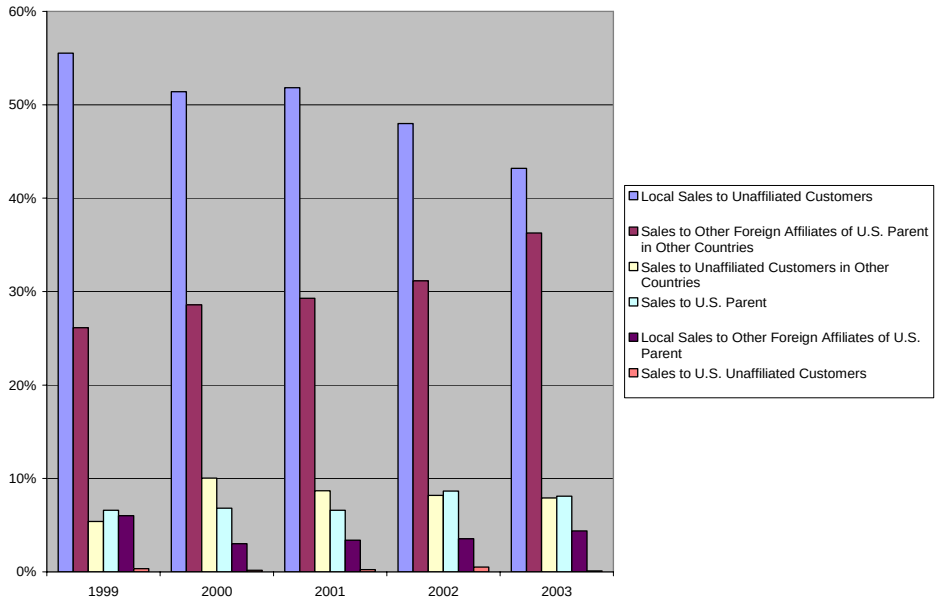


Chart 6-23
Market Destinations of Architectural, Engineering and Related Services [5413] Foreign Affiliate Sales (1999 to 2003)

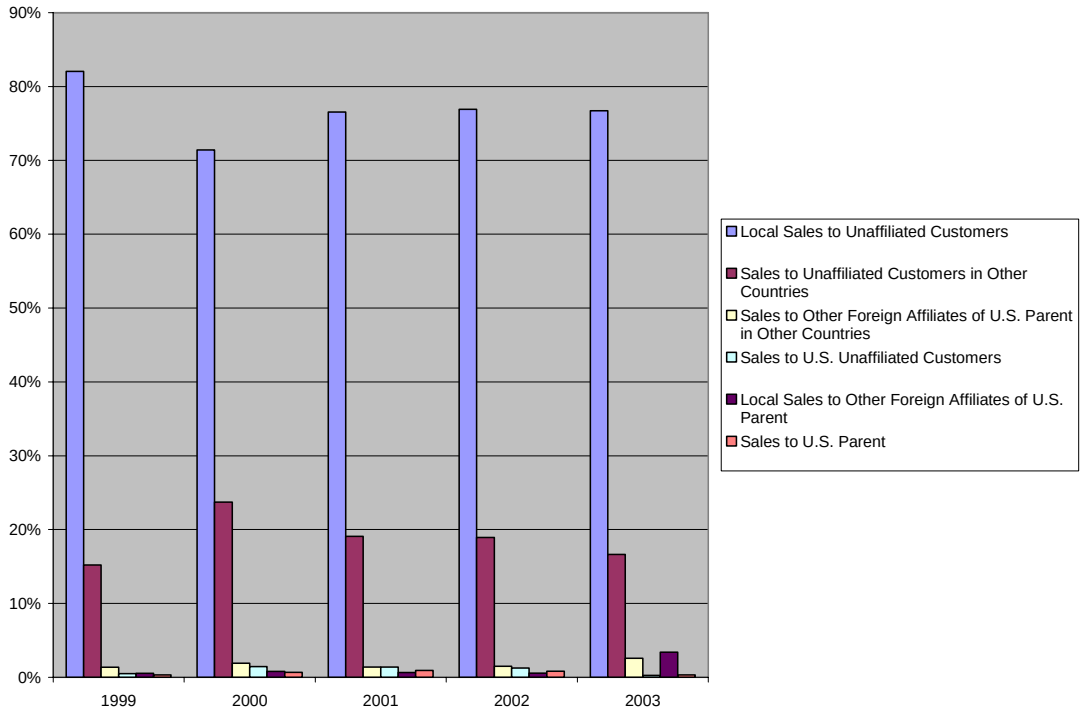


Chart 6-24
Market Destinations of Computer Systems Design and Related Services [5415] Foreign Affiliate Sales (1999 to 2003)

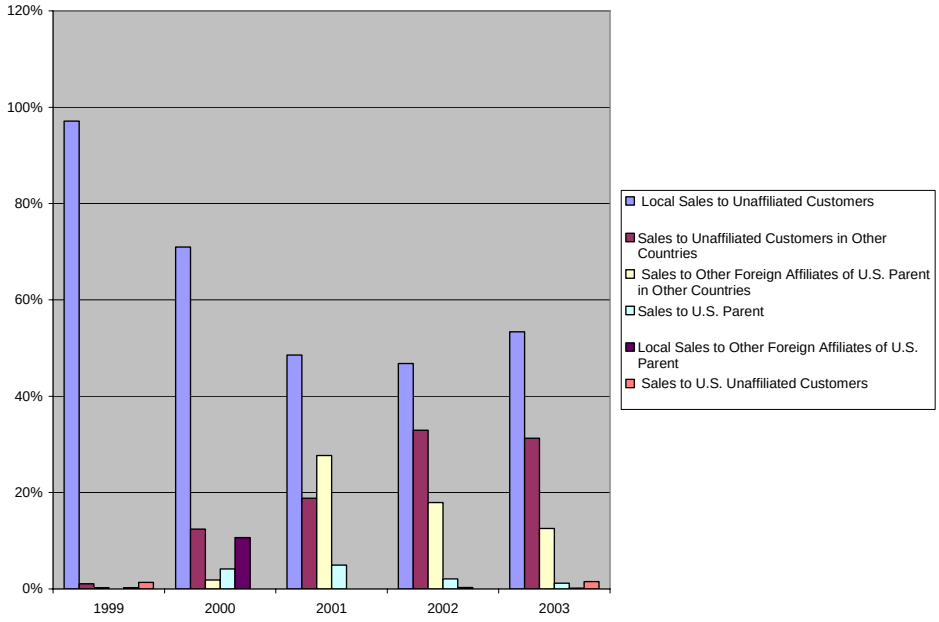
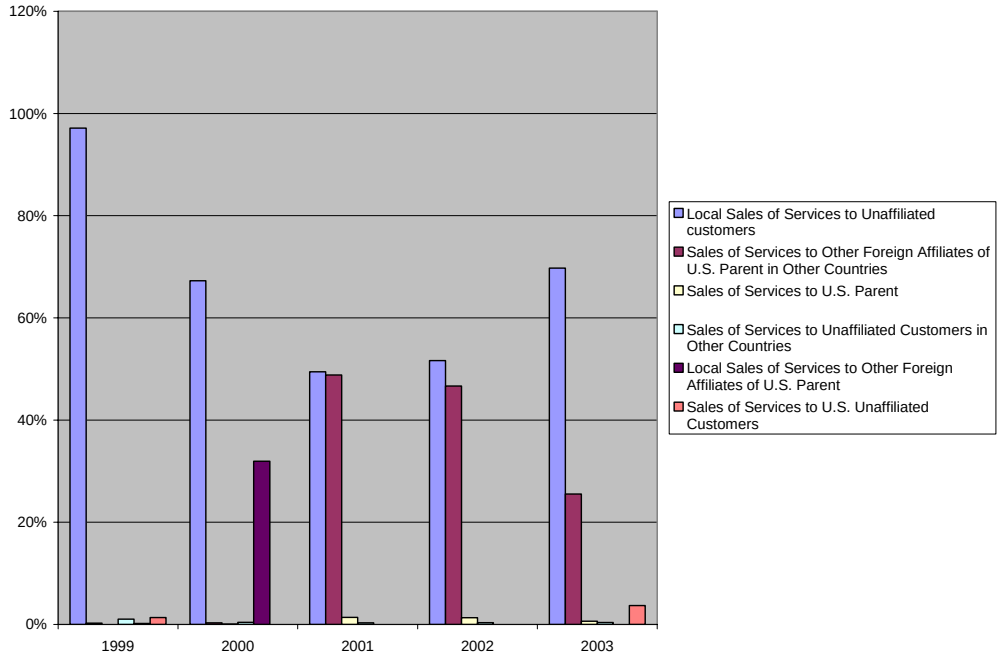


Chart 6-25
Market Destinations of Business Support Services [5614] Foreign Affiliate Sales
(1999 to 2003)



Source for Charts 6-22 to 6-25: Bureau of Economic Analysis.

Key Findings:

- Total foreign affiliates sales increased from 1999 to 2003 except for architectural, engineering and related services [5413] (See Table 6A-9 in Appendix E).

- For all four industries, the majority of foreign affiliate sales were local sales to unaffiliated customers. This was generally consistent throughout the period except for one or two years for foreign affiliates of MNC parents in pharmaceutical and medicine manufacturing [3254] (Chart 6-22) and business support services [5614] (Chart 6-25).

- During this five-year period, the second most popular destination for foreign affiliate sales was to other MNC affiliates in other countries, except for architectural, engineering and related services [5413] (Chart 6-23). For pharmaceutical and medicine manufacturing [3254] (Chart 6-22) and computer system design and related services [5415] (Chart 6-24), the share of these sales increased from 1999 to 2003.

- For foreign affiliates with parents in architectural, engineering and related services [5413] (Chart 6-23) sales to unaffiliated customers in other countries was the second most popular sales destination for the five-year period.

- Most other sales destinations accounted for small percentages of total sales from these foreign affiliates during the five-year period. In particular, foreign affiliate sales to U.S.

MNC parents or unaffiliated persons were only a very small part of total affiliate sales for all industries over the period (Charts 6-16 to 6- 19).

Conclusion:

Foreign affiliates with MNC parents in the four industries were, for the most part, primarily engaged in local sales to unaffiliated customers. These data show that total local and other foreign sales make up most of the sales of the foreign affiliates from 1999 to 2003. A very limited amount of these sales went to U.S. customers. It appears that the foreign affiliates' primary function was to serve local and foreign markets rather than produce goods and services for import back to the U.S.

Total Sales of Services of Foreign Affiliates- Disaggregated by Destination and Customer Type

Chart 6-26 compares foreign affiliate sales of services to total sales for the four industries and Charts 6-27 to 6-30 show the percentage distribution of foreign affiliate sales of services by destination—sales of services to local market of foreign affiliates, sales to U.S. market, or sales to other foreign markets—and by type of customer—sales of services to the MNC parent, other foreign affiliates of U.S. MNC parent or to an unaffiliated customer. Tables 6A-10 and 6A-11 in Appendix E contain the detailed numbers and show percentage change from 1999 to 2003.

Chart 6-26
Foreign Affiliate Sales of Services to Total Sales (1999 to 2003)

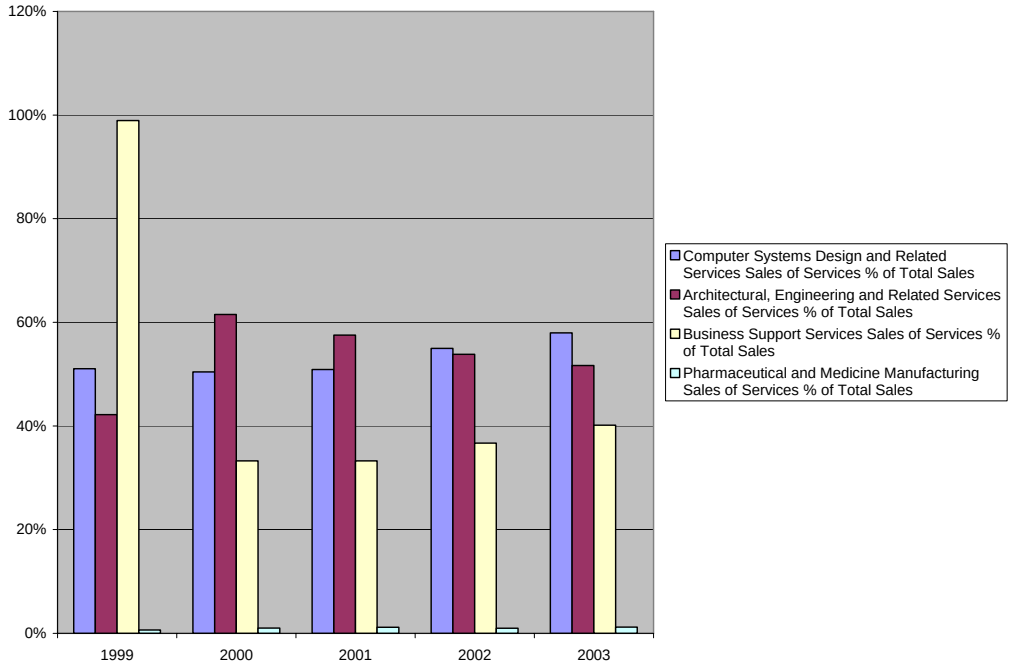


Chart 6-27
The Market Destinations of Pharmaceutical and Medicine Manufacturing [3254] Foreign Affiliate Sales of Services (1999 to 2003)

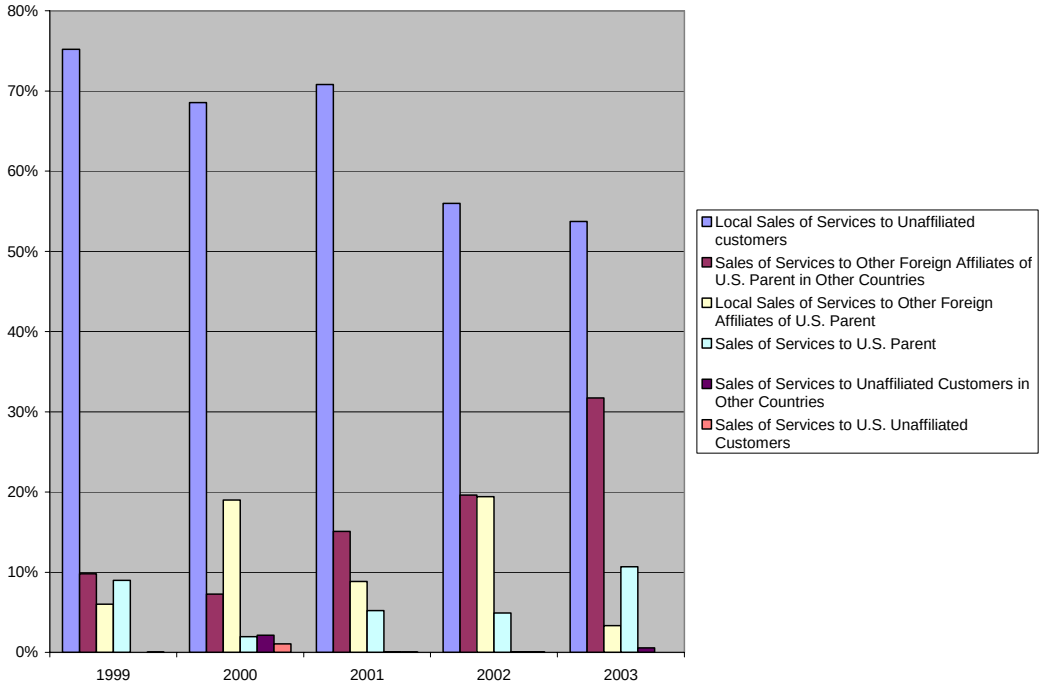


Chart 6-28
The Market Destinations of Architectural, Engineering and Related Services [5413] Foreign Affiliate Sales of Services (1999 to 2003)

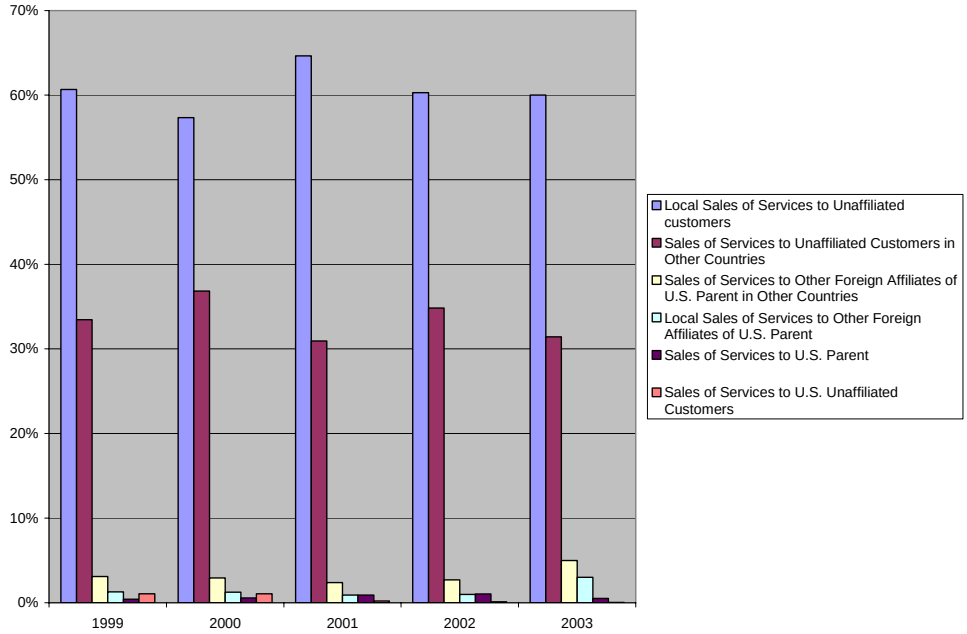


Chart 6-29
The Market Destinations of Computer Systems Design and Related Services [5415] Foreign Affiliate Sales of Services (1999 to 2003)

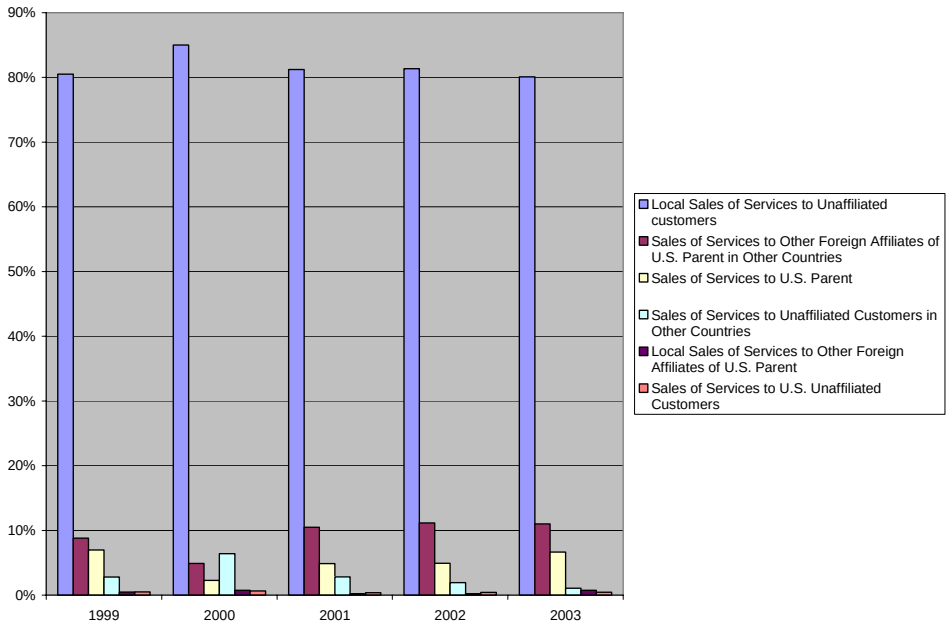
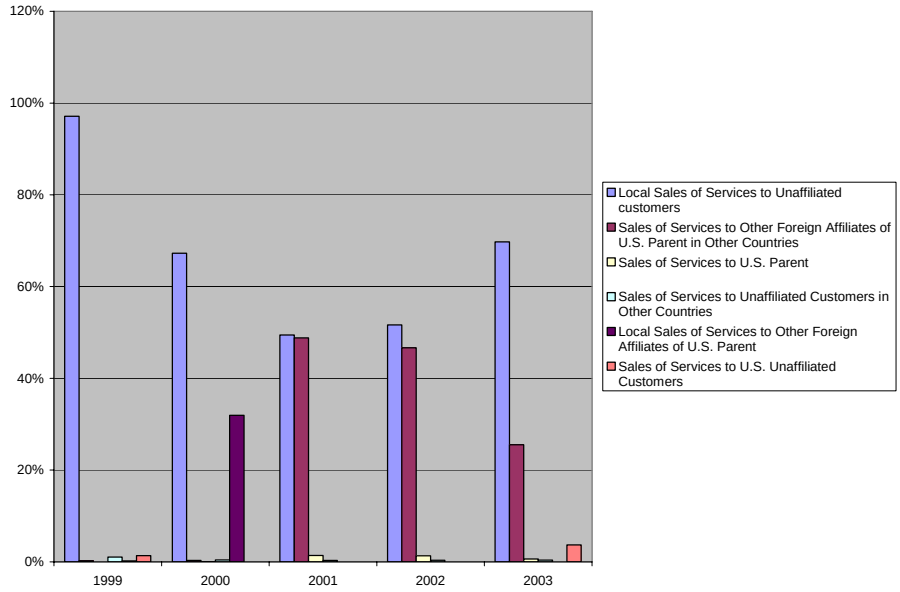


Chart 6-30
The Market Destinations of Business Support Services [5614] Foreign Affiliate Sales of Services (1999 to 2003)[90]



Source for Charts 6-20 to 6-24: Bureau of Economic Analysis.

[90] Chart 6-25 appears to be identical to Chart 6-30, however they are not the same chart. The distribution of market destinations for business support services [5614] sales and sales of services are very similar. Refer to Tables 6A-8 and 6A-10 in Appendix E for the detailed percentages.

Key Findings:

- Chart 6-26 shows that, in general, sales of services were the majority of foreign affiliate sales for those with parents in architectural, engineering and related services [5413] and computer systems design and related services [5415] from 1999 to 2003. Sales made by foreign affiliates with parents in business support services [5614] and pharmaceutical and medicine manufacturing [3254] were predominantly goods sales.

- Foreign affiliate services sales as a percent of their total sales increased from 1999 to 2003 for those foreign affiliates with parents concentrated in all four industries[91] (see Chart 6-26 and Table 6A-11 in Appendix E). Foreign affiliates with parents in architectural, engineering and related services [5413], and computer system design and related services [5415] had more sales in services than goods (except for those with parents in architectural, engineering and related services [5413] in 1999). In contrast, from 2000 to 2003, foreign affiliates with parents in business support services [5614] sold a larger percentage of goods than services, except for 1999. Foreign affiliates with parents in pharmaceutical and medicine manufacturing [3254] (Chart 6-26) had very low percentages of services sales during the five-year period.

- From 1999 to 2003, the majority of foreign affiliate services sales were local sales to unaffiliated customers for all four industries. Sales to other foreign markets, whether to other MNC affiliates or unaffiliated customers, tended to be the second most prominent destination for foreign affiliates services sales (Charts 6-27 to 6-30).

- The other destinations for services sales accounted for only small percentages of total services sales for the foreign affiliates during the five-year period.[92] As with total sales, foreign affiliate services sales to its MNC parent or unaffiliated U.S. customers accounted for a very small part of total foreign affiliate services sales.

Conclusion:

As with total sales, foreign affiliate services sales primarily went to unaffiliated customers in the local markets during this five-year period. Foreign affiliate services sales as a percent of total foreign affiliate sales also increased over the period. These data show that most foreign affiliate sales of services were meeting foreign demands, primarily in their local markets. Few foreign affiliated service sales appear to have been imported to meet U.S needs.

MNC Parent Affiliated and Unaffiliated Services Exports

Charts 6-31 to 6-34 show the percentage distribution of MNC parent exports to their foreign affiliates and to unaffiliated foreign persons. Tables 6A-12 and 6A-13 in Appendix E contain the detailed percentages and show the percentage change from 2001 to 2003.

[91] This holds for foreign affiliates with business support services [5614] parents after the anomalous results for 1999.
[92] The only exception is the 32 percent of local services sales to other MNC foreign affiliates made by affiliates with parents in business support services [5614] in the year 2000.

Chart 6-31
Pharmaceutical and Medicine Manufacturing [3254] MNC Parent Services Exports
(2001 to 2003)

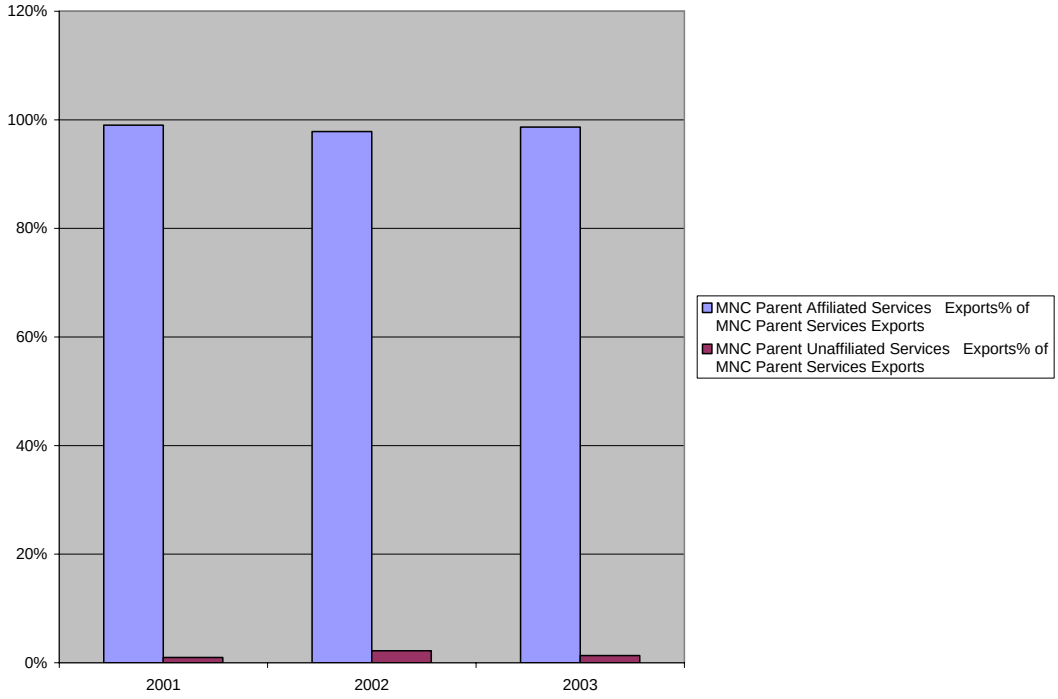


Chart 6-32
Architectural, Engineering, and Related Services [5413] MNC Parent Services Exports
(2001 to 2003)

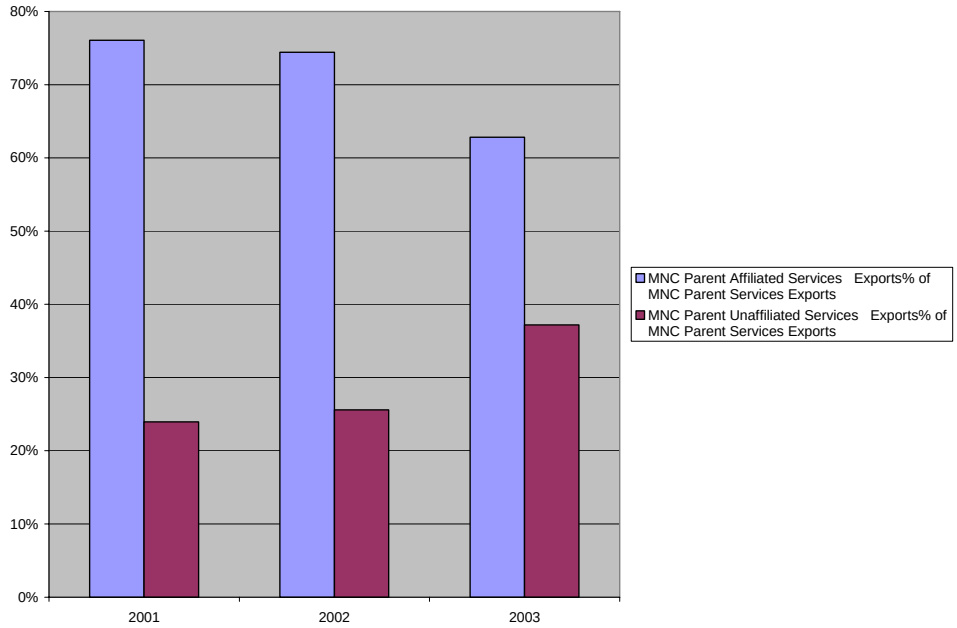


Chart 6-33
Computer Systems Design and Related Services [5415] MNC Parent Services Exports (2001 to 2003)

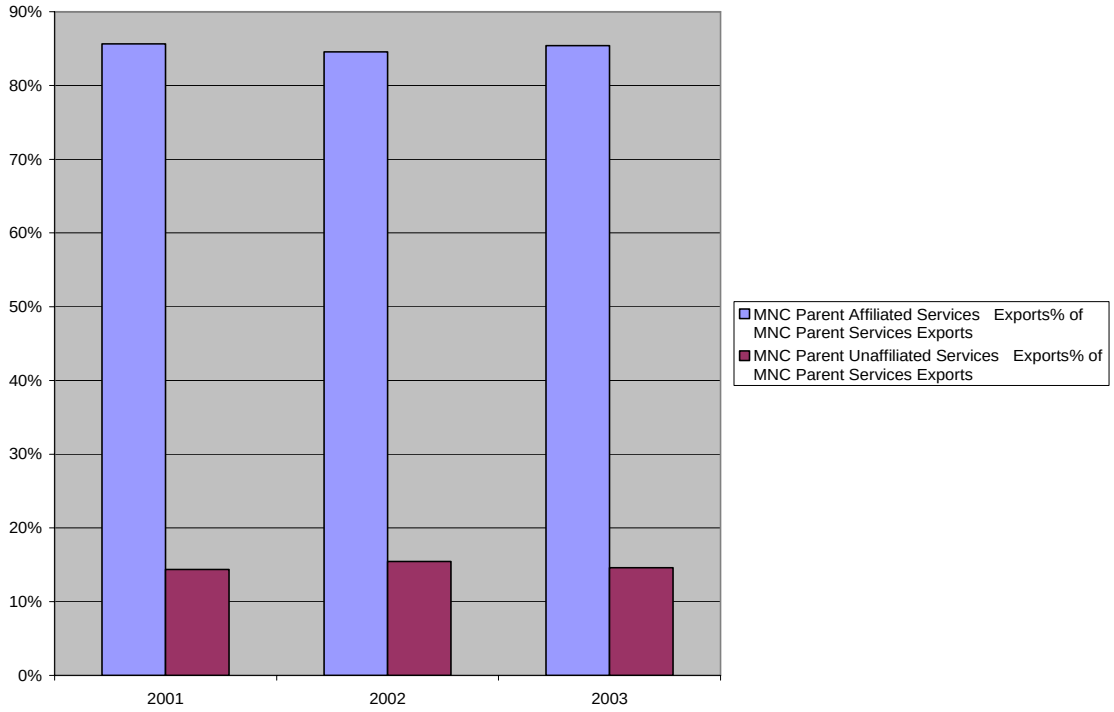
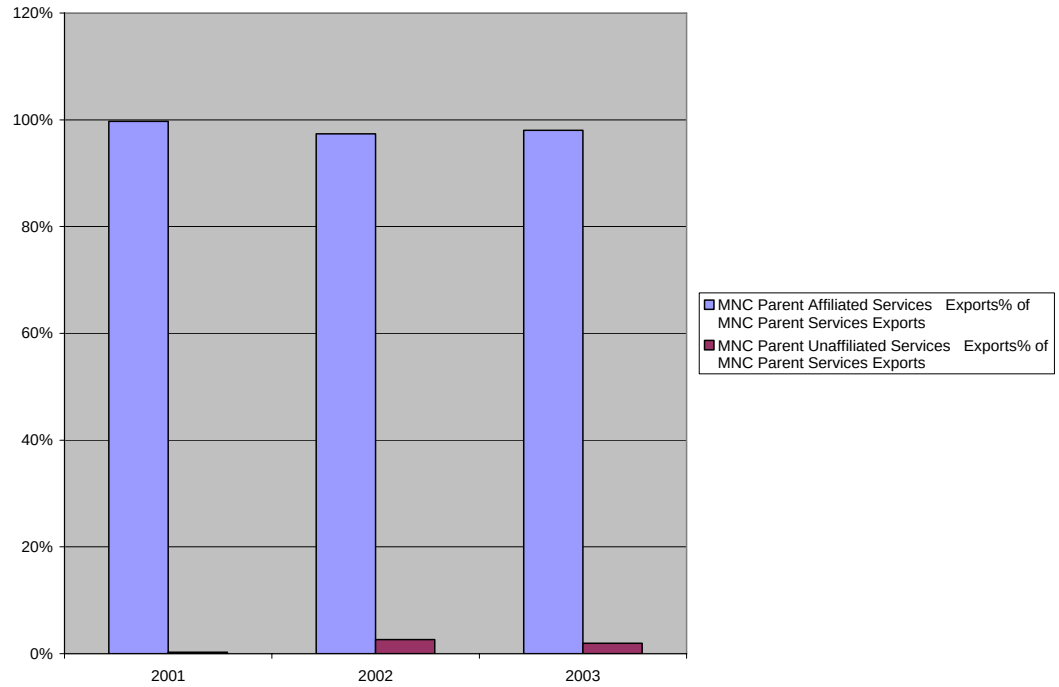


Chart 6-34
Business Support Services [5614] MNC Parent Services Exports (2001 to 2003)



Source for Charts 6-31 to 6-34: Bureau of Economic Analysis.

Key Findings:

- Total MNC parent exports increased from 2001 to 2003 except for business support services [5614]. Total MNC parent services exports increased for pharmaceutical and medicine manufacturing [3254] and computer systems design and related services [5415] but decreased for architectural, engineering and related services [5413] and business support services [5614] (see Table 6A-13 in Appendix E).

- For all four industries, the majority of MNC parent services exports went to their foreign affiliates (Charts 6-31 to 6-34) from 2001 to 2003**.** MNC parent affiliated exports however decreased from 2001 to 2003 except in computer systems design and related services [5415] which increased 32.1 percent between the two years (see Table 6A-13 in Appendix E).

- MNC parent unaffiliated services exports increased from 2001 to 2003 for all four industries, and the composition of MNC parent unaffiliated services exports to total MNC parent services exports also increased for all four industries between the two years (see Table 6A-13 in Appendix E).

Conclusion:

Over the 2001 to 2003 time period, MNC parents primarily exported to their foreign affiliates rather than to unaffiliated foreign persons. MNC parent affiliated exports however, decreased from 2001 to 2003, except in computer systems design and related services [5415]. For all four industries, MNC parent unaffiliated services exports increased over this period.

Sales Growth for MNC Parents Relative to Their Foreign Affiliates

Although Chart 6-15 compared the growth in total sales for parents relative to their affiliates for all MNC parents in the four industries examined, that comparison did not account for changes in the number of MNC parents over the period. Moreover, given the small sample size for several of the industries examined, changes in total industry sales are susceptible to small sample effects. Specifically, large changes in sales for a few large MNC parents during the period could substantially affect total group sales. To address these concerns, we examined the number of MNC parents concentrated in the four industries with foreign affiliate sales that grew faster than their own between 1999 and 2003. Chart 6-29 shows the percent of MNC parents in each of the four industries that had faster growth in their foreign affiliates' sales than parent sales between 1999 and 2003 The chart also shows the percent of those MNC parents with faster foreign affiliate sales growth that had positive growth in total parent sales over the period. While these data do control for changes in the number of parents over the period, it does not control for changes in the number of foreign affiliates. However, global services off-shoring can occur if affiliate sales are greater than parent sales from either faster growth among current affiliates or an increase in the number of affiliates, or both. Consequently, there appeared to be less need to control for changes in numbers of affiliates than changes in the number of parents.

Chart 6-29
Sales Growth for MNC Parents Relative to Their Foreign Affiliates (1999 to 2003)

Industry	Total MNC Parents in Both 1999 and 2003	Number of MNC Parents with Total Sales Growth Less Than Their Foreign Affiliates	Percent of MNC Parents with Total Sales Growth Less Than Their Foreign Affiliates	Number of MNC Parents with Positive Total Sales Growth	Number of MNC Parents with Positive Total Sales Growth, and Total Sales Growth Less Than Their Foreign Affiliates	Percent of MNC Parents with Positive Total Sales Growth, and Total Sales Growth Less Than Their Foreign Affiliates
3254	43	22	51.2%	39	18	81.8%
5413	39	33	84.6%	33	25	75.8%
5415	73	61	83.6%	62	54	88.5%
5614	9	8	88.9%	8	7	87.5%

Key findings:

- In all four industries the majority of MNC parents experienced faster growth in foreign affiliate sales than parent sales between 1999 and 2003.

- For those MNC parents in the three services industries—architectural, engineering and related services [5413], business support services [5614] and computer systems design and related services [5415]—the vast majority had faster affiliate sales growth, ranging between 84 and 89 percent.

- The percent of MNC parents in pharmaceutical and medicine manufacturing [3254] with faster foreign affiliate sales growth between 1999 and 2003 was 51.2 percent.

- For those MNC parents in the four industries examined with faster affiliate sales growth than their parents between 1999 and 2003, a substantial majority also had growth in parent sales over the period. The percentages were significantly high for all four groups, with pharmaceutical and medicine manufacturing [3254] at 81.8 percent, architectural, engineering and related services [5413] at 75.8 percent, business support services [5614] at 87.5 percent, and computer systems design and related services [5415] at 88.5 percent.

Conclusion:

As Chart 6-29 indicates, the majority of MNCs in each of these industries had faster growth in total sales for their foreign affiliates than their parent between 1999 and 2003. For the three services industries, over 80 % of the parents had faster affiliate sales growth. This contrasts with the limited percent of MNC parents importing services over the same period and thus off-shoring services due to business restructuring. This helps to confirm that the incidence of global expansion off-shoring among the MNC parents in the four industries examined appears to be

more widespread than off-shoring due to business restructuring during the 1999 to 2003 period. In addition, this greater incidence of global expansion off-shoring during the period was accompanied by growth in parent sales for the vast majority of parents. From 76 % to over 88 % of those parents with faster affiliate sales had increased parent sales during the period.

The Panel finds that services off-shoring due to global expansion was more prevalent among MNC parents in the four industries studied than services off-shoring due to business restructuring during the 1999 and 2003.

CHAPTER 7

DATA CHALLENGES AND RECOMMENDED IMPROVEMENTS

A number of previous studies[93] had indicated that attempts to estimate the extent of services off-shoring were hindered by gaps and other limitations in currently available data. These studies recognized that the prohibitive costs of collecting detailed data on services off-shoring and its key economic effects directly from individual firms required use of alternative indirect measures to estimate the extent and impacts of services off-shoring. Access and confidentiality issues also restricted most of the U.S. studies to an analysis of publicly available industry-level data. Previous chapters of this report also identified limitations in available micro-level as well as industry-level data that impeded efforts to estimate the extent of services off-shoring and its impacts over the 1998 to 2004 period.

In this chapter, those data limitations will be examined in greater detail. Specifically, we will identify the specific data limitations, describe how they affect either the estimate of the extent of off-shoring or its economic effects, evaluate the significance of each impediment, and examine possible alternatives for improving current data. The chapter will conclude with a number of Panel recommendations to improve currently available data. These recommendations will reflect the significance of the limitation, the feasibility of the proposed improvement, and the implications of the proposed change for other elements of both the federal and international statistical systems.

The Panel is particularly sensitive to the need to balance the demands for improved statistics to respond to a dynamic and changing global economy with essential consistency and compatibility among the various federal statistical agencies within the decentralized US system and between the US and other international systems. This sensitivity does not imply an aversion to changes to improve current data; it does suggest, however, the need for well documented and carefully planned changes that can improve not only our understanding of services off-shoring but also other economic forces driving the dynamic changes we continue to encounter.

The Panel also recognizes that any proposed change will require resources to implement and can impose additional costs and reporting burdens on respondents to various federal data collection efforts. These costs and burdens must be weighed relative to the benefits obtained from a more complete assessment of the extent of services off-shoring and its economic effects that improved data could provide.

[93] Prime examples include U.S. Government Accountability Office, *International Trade: Current Government Data Provide Limited Insight into Off-shoring of Services*, GAO-04-932, Washington DC September 2004, and Lieberman, Joseph I., *Data Dearth in Off-shore Outsourcing: Policymaking Requires Facts*. December 2004.

TYPES OF DATA ISSUES

There were two types of data issues encountered in developing estimates of the extent of services off-shoring– basic data gaps and data quality concerns. The data gaps reflected the absence of key data elements in currently available data. An obvious example is the lack of separate measures of services imports used for intermediate purposes relative to final demand. While in some cases, assumptions were made to attempt to overcome this data gap, the validity of those assumptions was sometimes uncertain, at best. Data quality issues involved not only questions about discrepancies in reported data, but also the timeliness and availability of data. The alternatives for addressing these two different types of data issues also vary.

Gaps in BEA Data

Affiliated and Unaffiliated Services Imports Differences

The BEA collects services import data through a number of different surveys. The Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons (BE-22 or the benchmark year BE-20) provides detailed data on unaffiliated services imports by the types of services listed in attachment A. The quarterly surveys of MNC parents and their direct transactions with foreign affiliates (BE-577) provide data on affiliated services imports.[94] However, unlike the detailed data from the unaffiliated surveys, the BE-577 survey seeks information on only the following types of services transactions between the MNC parent and its foreign affiliate:

- Insurance services
- Financial services
- Transportation
- Computer and information services
- Management and consulting services
- Research, development and testing services
- Other services

Because of these differences in types of services data, the micro-level analysis of services off-shoring could use only total services imports to develop estimates of services off-shoring among MNCs. While this did not prevent developing some initial total services off-shoring estimates, it did preclude any detailed analysis of the types of services being off-shored by the MNC parent. Moreover, these inconsistent categories of services imports—particularly the greater detail available for unaffiliated imports—may help explain the different treatment of affiliated and unaffiliated imports in BEA I-O tables. The review of "non comparable imports" in the data quality section will examine the implications of this in greater detail.

More detailed and consistent data on the types of services imports from both affiliated and unaffiliated sources could provide greater insight on the economic impacts of services off-

[94] BEA'S quarterly survey of transactions of U.S. affiliates with their foreign parents (BE-605) also collects data on affiliated services imports.

shoring. In particular, it might improve estimates of specific occupational impacts from services off-shoring by affording a more direct linkage with specific, detailed services industries and the occupations associated with the provision of those types of services.

BEA has continued to explore efforts to improve its information on services transactions between MNC parents and their foreign affiliates. In a 2000 paper, Obie Whichard noted that BEA has tested collecting different types of services transactions in several benchmark surveys. However, he concluded that "BEA's experience in collecting these data had indicated that respondents cannot break down all such transactions by type of service. Some transactions between parents and affiliates simply represent allocated charges to affiliates for a variety of overhead-type expenses incurred by the parent, and information on the specific types of services involved may not be maintained in company accounting systems."[95]

BEA also has a proposal under consideration to establish comprehensive and uniform coverage between its collection of affiliated and unaffiliated services by using the same survey to collect both types of services imports. This will involve some simplification and consolidation of minor categories of unaffiliated services imports and then consistent collection of the remaining detailed services categories for both types of imports. BEA has initiated discussions with its major survey respondents to obtain comments on the proposal, including a suggestion that an "all other" category be established allowing respondents to self-identify types of imports beyond those already enumerated in the survey.

As the recent report of the Services Off-shoring Working Group at MIT's Industrial Performance Center has noted, "modern services industries are extremely dynamic and innovative. They create value, job growth, and influence the competitive position of the United States economy on the global stage….The statistical system of the United States has not adequately adapted to the increased importance of services by developing systems that collect and disseminate highly detailed economic statistics, as they do in the goods sector."[96] In 2004, services industries accounted for over 79 percent of GDP and over 82 percent of U.S. employment. This sector has been, and will continue to be, a dominant component of the U.S. economy. Developing more detailed data for services activities and implementing those changes throughout the U.S. statistical system will necessarily take substantial time and care. The current detailed data available for the goods sector evolved over decades. The U.S. Census Bureau, in conjunction with other federal statistical agencies, has begun that work, concentrating extensively on services products in the new North American Product Code System (NAPCS). As NAPCS, or some of its components, are fully implemented, BEA will also have to increase the type of detail it collects on its unified services imports survey.

MNC Value Added for Services

In its survey of MNC financial operations, the BEA collects information on a number of MNC financial variables, including total sales and other economic components that sum to value

[95] Obie Whichard, United States Statistics on Trade in Services. Paper presented to APEC Seminar on Statistical Reporting on Service Trade, Aug 2000. p. 11.
[96] Industrial Performance Center at MIT, *Services Off-shoring Working Group Final Report*, September 2006, p 14.

added. While the survey reports the largest eight categories of sales, the components of value added are not separately reported for goods and services.

The micro-level MNC analysis for this report followed BEA staff practice of estimating MNC purchased inputs as the difference between total sales and value added.[97] Estimated purchased inputs are critical components of the indicators to identify services outsourcing and off-shoring intensity among MNC parents, as described in Chapter 6. The proposed services outsourcing indicator was the ratio of purchased services inputs relative to total sales; the proposed services off-shoring indicator was the ratio of imported intermediate services relative to purchased services inputs.

This data gap precluded any estimate of services outsourcing at a micro level, since an estimates of purchased services inputs could not be made. It also required a modification in the services off-shoring indicator, using the ratio of services imports relative to total purchased inputs rather than only purchased services inputs. This modification was likely to underestimate the extent of services off-shoring for any MNC—possibly by a large amount—since total purchased goods inputs can be quite large and total purchased inputs (goods and services) most likely exceed purchased services inputs alone.[98] The impact of this modification on any trends in the services off-shoring intensity among MNCs was uncertain, since it would depend upon the growth in purchased services inputs relative to total purchased inputs over the period.

The most direct approach for overcoming this gap would be to modify the current BEA survey to obtain data on the services content of the various components of value added. However, BEA staff have indicated that previous efforts to collect such detailed data were thwarted because most firms' accounting systems did not provide information on value added by types of services produced. Another alternative might be to estimate the allocation of value added between services and goods using industry productivity averages developed from I-O data.

Developing better data for estimating the extent of services outsourcing can provide some additional insight into the potential for future growth in services off-shoring due to business restructuring. While there are different costs and risks associated with off-shoring relative to outsourcing,[99] an outsourced service is more vulnerable to off-shoring than those services that are still provided internally. Better measures of services outsourcing for MNCs can also improve understanding of MNC operating efficiency relative to domestic firms, given some recent work examining the links between productivity and outsourcing.[100]

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[97] Although this study followed the standard BEA convention in deriving MNC purchased inputs, the procedure produced occasional estimates of negative purchased inputs (see Chapter 6). This anomalous result occurred because of another data gap discussed below—the lack of data on inventories for MNC in the annual surveys. BEA collects MNC inventory data only every five years in the benchmark surveys.

[98] This expected underestimate of the services off-shoring indicator will be mitigated by the inability to separate intermediate services imports from those for final demand as described later in the data gap section of this chapter.

[99] See the discussion on outsourcing versus off-shoring in the first Panel report, *Off-shoring: An Elusive Phenomenon*, National Academy of Public Administration, January 2006, pp. 8-10.

[100] See Dey, Housemen and Polivka, *Contracting Out to Employment Services: Analysis Using the OES, CES, and CPS*, a paper presented to the BLS LMI Conference May 2006, and Houseman, *Outsourcing, Off-shoring, and Productivity Measurement in Manufacturing.* Unpublished working paper, June 2006.

Services Imports for Intermediate Use

U.S. data on services imports do not distinguish between uses of those imports.[101] Importers do not indicate whether they will use those imports internally within their own business operations or sell them to some other individual or enterprise. One reason for this is that the distinction between intermediate use and final demand is complex and difficult to monitor within a diverse economy. In the previous example, if the initial importer had sold the imported service to another firm that subsequently used it internally, this subsequent intermediate use would not have been reflected in the initial importer response.[102]

The lack of data on services imported for intermediate use has a direct effect on the ability to estimate the extent of services off-shoring due to business restructuring. As noted in previous chapters, the preferred conceptual measure of this type of services off-shoring is the ratio of imported intermediate services relative to either total inputs, or total services inputs. To overcome this data gap required different assumptions about the available services imports data, depending upon the type of data being analyzed.

For the industry-level analyses, the working assumption was that imported services were used the same as domestically produced services of the same type among the industries in the I-O table. However, as a recent National Academy of Sciences (NAS) study notes, the validity of this import similarity assumption depends upon the level of aggregation for the service categories in the I-O table and the effect of the terms of trade between the U.S. and the countries supplying the imported service.[103] For the industry-level analyses, the impact of this data gap is confounded by the treatment of all affiliated services imports as "non comparable imports" in BEA I-O tables. This issue is examined separately in the data quality section.

For the micro-level data, the working assumption was that all services imports were used internally by the importer. This assumption overstates the extent of services off-shoring to the extent any of the services imports were for final demand. The impact of this data gap on the trend in services off-shoring is unclear, since it will depend upon whether the services imported for final demand have been increasing or decreasing over the period relative to total services imports.

One alternative for addressing this data gap is to modify the current BEA surveys to include a question on the use of particular imported services. Although the current BEA surveys do ask for this type of information from MNCs regarding imports of goods, it has not been extended to services because of substantial conceptual and measurement issues. A second alternative might be to link the current services imports data with other surveys indicating the use of selected

[101] BEA surveys do ask respondents to distinguish goods imported for internal use from those imported for resale to others. BEA staff indicate that services imports raise conceptual as well as collection issues that have not yet been successfully surmounted BEA staff also maintain that most business, professional and technical (BPT) services imports—the types of services that have been the focus of much off-shoring concerns—are either used by the importing business or combined with other services and products before being sold to final customers..

[102] At an industry level, input-output tables can account for the multiple transactions through the use of specific industry multipliers.

[103] National Research Council of the National Academies, *Analyzing the U.S. Content of Imports and the Foreign Content of Exports*. 2006, p 33.

services by other businesses. Data from the economic census, for example, might provide information to benchmark such uses by individual companies or by NAICS industry every five years. A third alternative is to collect data on the types of services imports at a level of detail that is compatible with the industry aggregates included in the BEA I-O table. This would allow application of the industry-level intermediate to final use ratio to each individual firm's services imports to allocate them between intermediate and finals uses. This approximation still assumes a degree of homogeneity among firms within an industry that may not be accurate. In addition, it assumes that import similarity is more likely at lower levels of aggregation. However, the NAS study indicates why a more disaggregated categorization of services within an I-O table may enhance, but not assure, the validity of the import similarity assumption.[104]

MNC Inventory Estimates

Although the BEA does collect data on MNC inventories in their benchmark surveys every five years, these data are not collected in the annual surveys. The lack of data on the annual change in inventories for MNCs affects the accuracy of the derived estimates of purchased inputs used by BEA staff and in this study. As noted above, purchased inputs were estimated as the difference between total sales and value added. This calculation was based on the identity that for each MNC parent, the value of total output in each year must equal the value of total inputs. Total inputs equal the MNC parent's value added—the value of labor and capital inputs (including net profits) provided by the parent—plus any intermediate inputs supplied by another entity (purchased inputs). If total sales adequately accounted for total output, estimating purchased inputs as the difference between total sales and value added would be reasonable.

However, a MNC parent's total output in any year includes not only its total sales but also any change in its inventory. This data gap will distort the estimates of purchased inputs used to develop our outsourcing and off-shoring intensity measures. The direction of the inaccuracy for an individual MNC parent in any particular year is unclear, since inventory changes can be either positive (inventories are increasing) or negative (inventories are decreasing). The significance of the inaccuracy depends upon the size of the change in inventories relative to sales. BEA staff believe that inventories for services are most likely insignificant, since services usually cannot be stored, unlike goods and manufactured items.

Gaps in BLS Data

Price and Quantity Data for Services Imports

BLS develops and maintains price data for a range of domestic consumer, producer and international goods and services. The International Price Program (IPP) within BLS, established in 1971, collects prices on about 10,000 individual export items and 12,000 import items to develop export and import price indices. The vast majority of these individual export and import items are goods. The relatively few service transactions included involve primarily transportation and travel services. There are currently no export or import prices for business, professional, and technical (BPT) services. However, these BPT services imports are the focus of most of the current concerns about services off-shoring.

[104] ibid. p. 35.

This data gap does not directly affect our indicators of the extent of services off-shoring or even services outsourcing among firms and MNCs because they rely on the value of services imports and the value of purchased services inputs.[105] Similarly, trends in these indicators will not be directly affected by this data gap. However, forecasts or projections of future trends will depend on changes in relative prices. Moreover, prices are a critical element for assessing the economic effects of services off-shoring and this may explain why numerous trade economists, most notably Catherine Mann,[106] have urged that a greater emphasis be placed on overcoming this gap. The recent NAS study perhaps put the argument most succinctly: "To determine the effects of international trade on wages and working conditions, it is not enough to know the value of imports and exports. One also needs to know the prices and quantities. Prices and costs are the economic signals that drive business and consumer decisions to buy or produce in one or another location."[107]

Developing market based prices for distinct, internationally traded, services is an exceedingly challenging task. Developing prices for domestically traded services poses some daunting measurement issues because many services involve intangible transactions unlike most specific goods transactions. Qualitative differences in similar types of services supplied can be difficult to differentiate from the price of the service. For internationally traded services, these measurement difficulties are compounded by the lack of consistent categories of traded services. As described above, even BEA data on services imports provide substantially greater detail on the types of unaffiliated relative to affiliated services imports. Again, the NAS study reached an appropriately succinct conclusion: "To analyze the relative competitiveness of domestic and foreign producers of services, U.S. international price data need to be comparable to domestic price data for similar classifications of services transactions. It is difficult to achieve these objectives."[108] To have comparable international and domestic services prices, one must first have comparable categories of services for developing price measures. The current differences in the types of services reported for unaffiliated relative to affiliated imports indicate that this consistent set of services imports comparable to domestically traded services does not yet exist.

BLS Mass Lay-Off Survey (MLS) Limitations for Services Off-Shoring

The MLS program at BLS is the only federal statistical survey that directly asks employers whether a major lay-off event at one of their establishments involved movement of work activity overseas and further, whether that work movement occurred within the firm's legal structure or involved use of an independent outside party. Although the program began in 1995, the movement of work question was only added to the survey in 2004. The program's current design focuses on major mass lay-off events that are likely to impose significant adjustment problems on the workers and communities affected. It uses administrative information available from the comprehensive set of establishments within the QCEW to identify mass lay-off events

[105] Many economists might prefer a more precise measure—the quantity of services imported—to separate price changes, including changes in exchange rates, from changes in the amounts of imported services actually substituting for domestic inputs.
[106] See for example, *Prices for International Services Transactions: Issues and a Framework for Development*, September 2004, a paper prepared for the BLS.
[107] NAS, op. cit., p. 13.
[108] Ibid., p. 14.

for individual establishments that last more than 30 days, have at least 50 initial unemployment insurance claims and involve establishments with 50 or more employees. BLS then contacts these selected establishments to obtain the additional information sought by the MLS program. The survey not only identifies the immediate employment effects from these major events but tracks some of the adjustment problems displaced employees encounter.

This original program design has worked effectively to identify and help assess the employment and other impacts from large, concentrated lay-off events. But its current targeting criteria were not intended to identify structural reorganizations within a firm that may be spread among several establishments, phased-in over an extended period of time and include personnel options and severance packages to minimize lay-offs such as early retirement inducements, reassignments to different positions, relocations to other establishments within the firm, or retraining programs. As the first Panel report noted, the estimates of job losses from services off-shoring obtained from the MLS data in 2004 were substantially smaller than other estimates.[109] But this clearly reflected the current program design focusing on major lay-off events. Given that design, it is not surprising that MLS survey results appear highly sensitive to general US labor market conditions. As the labor market improved in 2005, the number of MLS events and the number of employees affected by them declined, including those events associated with movement of work and movement of work overseas.

The data in Table 7-1 show that the number of employees affected by MLS events involving movement of work overseas fell to 12,030 in 2005—a decline of more than 25 percent. Most other studies of services off-shoring suggest that this phenomenon, whether due to business restructuring or global expansion decisions, is determined by more fundamental and structural economic, financial and competitive market conditions than by temporary, cyclical U.S. labor market changes.[110] While none of the other studies of off-shoring reviewed in the first report contained information as current as the MLS 2005 data, none indicate a decline in off-shoring or its employment effects. While limited to 2003 or 2004 data, the empirical results presented in chapters three through six do not indicate a decline in the extent of services off-shoring.

[109] Op. cit., the Academy, See Table 4-3, p. 58.
[110] Ibid., see discussion in Chapters 2 and 4.

Table 7-1
Recent Mass Lay-Off Events Including Movement of Work Overseas
(Numbers in Units)

	Total MLS Events		Movement of Work Events			Work Movement Overseas Events		
	Number	Separated Employees	Number	Separated Employees	Percent Total Employees	Number	Separated Employees	Percent Total Employees
2004	5010	993909	366	73217	7.4%	103	16197	1.6%
2005	4881	884661	277	53628	6.1%	91	12030	1.4%
Change	-129	-109248	-89	-19589		-12	-4167	
(in Percent)	-2.6%	-11.0%	-24.3%	-26.8%		-11.7%	-25.7%	

Source: BOS data

This data gap did not affect the development of services off-shoring measures or the estimates of the extent of services off-shoring using those measures in this study. BLS staff indicate that in 2007 the program will develop from unemployment insurance initial claims filings monthly data on all lay-offs regardless of size. This more detailed universe of lay-off events will provide an opportunity to survey smaller lay-off events selectively using other criteria. Linking these data with OES data indicating firms that are undergoing significant occupational structural changes, or with shared BEA MNC data identifying firms that are increasing their services imports, could provide targeting criteria more focused on services off-shoring activities. If the current MLS survey provided greater coverage of establishments that appear to be off-shoring services through either business restructuring or global expansion, these MLS results could be compared with those developed for the particular industries included in the micro-level analyses of this report.[111]

BEA Data Quality Issues

Comprehensiveness and Accuracy of Survey Data

Well publicized differences in the value of certain IT related services imports from India to the U.S. reported by BEA and The National Association of Software and Service Companies (NASSCOM)[112] have raised concerns about the comprehensiveness and accuracy of BEA's

[111] The BEA MNCs that were identified as off-shoring services through business restructuring and experienced net job flow losses or specific occupational losses when matched with other BLS data could be compared to MLS establishments to determine the consistency of any matches if there were sufficient time and resources to accomplish these tasks. One difficulty is that these BEA MNC data were only available through 2003, before the new survey language on movement of work was implemented in the MLS.

[112] The National Association of Software and Service Companies (NASSCOM) is India's primary information technology association and collects trade data on IT, software and other related services from its members and other sources. These data are shared with the Reserve Bank of India (RBI); RBI in turn uses these NASSCOM data in its official reports on Indian exports and imports.

estimates of services imports. The differences are striking—for 2003, NASSCOM estimated Indian IT related services imports to the US were $8.7 billion, while BEA reported unaffiliated BPT services imports from India were only $420 million—a difference of almost $8.3 billion.[113] A recent GAO report, *U.S and India Data on Off-shoring Show Significant Differences***,** reviewed the procedures and information used to develop these different estimates and found five principal reasons for this discrepancy. These were:

1. Earnings of temporary Indian workers residing in US—India's estimates included all workers; BEA's estimates included only those in the US for less than a year and not on the payroll of a firm in the US.

2. Definition of services—India defined them more broadly to include software embedded in computers.

3. Definition of U.S. imports—India included sales to all U.S firms located outside the U.S. but consistent with international standards BEA does not.

4. Unaffiliated versus affiliated services—BEA's estimates included only unaffiliated services, since estimates of affiliated IT-related services imports are not available by country of origin; India's estimates included both affiliated and unaffiliated services**.**

5. Other differences, including identifying specific firms participating in trade flows between India and the U.S.[114]

The GAO report noted that Indian data did not conform to international standards for the first three reasons. GAO did not indicate how much each of these key factors contributed to the discrepancy, but cited Indian experts who suggested that as much as 65 percent ($5.4 billion) of the discrepancy was due to the first two reasons. BEA data also indicate that total affiliated imports of BPT services in 2003—$26.1 billion—were more than twice the amount of unaffiliated BPT services imports ($11.4 billion). If this same relationship applies to Indian BPT imports, BEA's estimates of total BPT imports would have been almost 230 percent larger. This would have accounted for another 12 percent of the discrepancy, but that still leaves over 20 percent of the discrepancy to be accounted for by the other factors.

This discrepancy in estimated services imports is apparently not unique to this Indian case. BEA staff noted that BEA has relied on Statistics Canada data on exports of unaffiliated computer and information services to the US rather than the results from their surveys to report unaffiliated computer and information services imports from Canada. Since 1970 Canada and the US have reconciled their current accounts and these results are reported in a Survey of Current Business article (most recently the November 2005 issue). This annual reconciliation process identified a substantial discrepancy between Canadian estimated exports and BEA estimated imports for these unaffiliated computer and information services. As the annual reconciliation article notes, "as part of the reconciliation process, Canada and the United States have evaluated the accuracy of each other's estimates, and as a result, each country now includes in its published estimates

[113] The corresponding difference for 2002 was over $6.2 billion.
[114] GAO, *U.S and India Data on Off-shoring Show Significant Differences*, GAO-06-116, October 2005 p .3.

some data that are provided by the other country."[115] Although the major sources of the discrepancy are not identified, BEA staff acknowledge that since they believe they are better able to identify exporting firms than importing firms, they felt that Statistics Canada was also better able to identify exporters of computer services to the U.S. than BEA could identify importers of those services.

Table 7-2
Differences in Valuation of Canadian Imports of Computer and Data Processing Services
(Millions of Dollars)

Year	BEA Survey Database	Published Canadian Estimates	Difference
1999	79.4	933	853.6
2000	528.2	1277	748.8
2001	282	1114	832
2002	72	1036	964
2003	98.5	1396	1297.5

Source: BEA data

The differences between the published (Canadian) data on these unaffiliated computer and information services imports and the data reported on the BEA survey forms are substantial, amounting to about $1 billion in each year 1999-2003. BEA said that it plans to explore this discrepancy with Canada, and noted that differences between the Canadian and BEA survey estimates for these services are not representative of differences for other services. This is borne out by data published from the annual United States-Canadian current account reconciliation, which has not uncovered such large differences for other types of services imports For example, Canadian estimates for unaffiliated insurances services imports to the U.S. in 2003 ($ 201 million) and 2004 ($ 171 million) were $300 million and $ 473 million less than the BEA survey amounts. While Canadian estimates for unaffiliated financial services imports to the U.S. were larger than BEA's survey results for 2003 and 2004, the differences were only $161 million for 2003 and $195 million for 2004.

However, these results, in conjunction with the findings in the GAO report, suggest a need for improved methods of identifying service importers—whether MNCs or domestic firms. BEA has acknowledged this need, noting in their response to the GAO report, "we do agree, though, that BEA's mailing lists should be improved."[116]

Incomplete or inaccurate data on the amount and type of services imported into the U.S. by MNCs or other firms will directly affect the services off-shoring indicators and estimates of services off-shoring derived from them presented in this report. Improving coverage of importing firms with BEA surveys is a critical first step and BEA has indicated it has been

[115] Sauers, Abaroa, Dozier and Caron, *Reconciliation of the U.S.-Canadian Current Account, 2003 and 2004*. Survey of Current Business, November 2005 p. 37.
[116] Op. cit., GAO p. 29.

negotiating with the Census Bureau and the Internal Revenue Service (IRS) to obtain access to Census' database of U.S. businesses.[117] On July 6, 2006, the IRS issued a temporary rule[118] providing BEA access to certain tax information that should help identify various components within a consolidated business entity, industry classification of those components, and their addresses. This rule should help resolve some of the issues restricting BEA's access to these Census data and may provide useful information directly to BEA to help improve its survey mailing lists.

In addition, BEA has obtained agreement from Census to include a question on whether a firm is importing services on the annual Company Organization Survey (COS). This survey obtains information from larger, multi-establishment firms using the Census business register to identify these firms. About 40,000 large firms are currently surveyed. Under the BEA/Census agreement, BEA would fund a sample expansion of another 15,000 firms. This additional information from Census' COS should improve BEA's survey coverage for these larger firms importing services.

Timeliness of MNC Financial and Operating Data

Although the industry-level analyses covered the period from 1998 to 2004, the micro-level analyses using MNC data examined a more limited 1999-2003 period. The conversion to the NAICS for identifying principal manufacturing and service sector concentrations for MNC operations limits any consistent, historical analysis of these micro-level MNC data to 1999 forward.[119] Although BEA has been working to improve the timeliness of its international trade data, and currently provides some summary data on affiliated and unaffiliated exports and imports, as well as key MNC operating data, within 16 months of the end of the year,[120] complete micro-level MNC data for 2004 were still unavailable as of September 2006. These lags reflect the current BEA process for conducting these surveys, the continued reliance on paper processing by many MNCs, and the need to correct and verify data from primarily paper submissions. In addition, these 2004 data are benchmark year data and contain greater detail than other years. Because this greater detail requires more review and preparation of the data, benchmark year data are typically released later than other, less detailed, annual year data.

BEA distributes its survey forms in the spring following the end of each year; responses are not due until May 31 for most surveys. A reliable and reasonably complete response is normally not available until the following spring. BEA has emphasized electronic collection processes and, starting in 1998, began work on its Automated Survey Transmission and Retrieval (ASTAR) system. ASTAR was implemented for individual surveys beginning in 2001 with the survey on MNC transactions with their affiliates (BE-577 Direct Transactions of U.S. Reporters with Foreign Affiliates). ASTAR now covers almost all the surveys conducted by the International

[117] Ibid. p. 29.
[118] See 26 CFR Part 301, Federal Register volume 71 Number 129 p. 38262.
[119] Developing a detailed crosswalk between the NAICS and its predecessor system—the Standard Industrial Classifications (SIC)—was outside the scope of this study.
[120] This year, BEA provided advanced summary estimates of key items for the 2004 data on MNC financial operations, including affiliated trade, in an April 20, 2006 press release.

Investment Division within BEA and several smaller surveys for the Balance of Payments Division.[121]

BEA fully recognizes the potential advantages from electronic collections in timeliness, accuracy, costs, and lower respondent burdens. While there have been improvements in the responses to BEA surveys and some increased use of the ASTAR system, a substantial portion of the major surveys filed with BEA continue to be paper documents.

While these timeliness issues did not affect the development of the services outsourcing and off-shoring measures used in this report, they did preclude extending these measures to the most recent period. The truncated time period available for analyzing these micro-level data may have affected attempts to discern any significant trends in services off-shoring and outsourcing.

"Non-Comparable" Imports in BEA I-O Tables

As discussed in Chapter 3, BEA staff account for unaffiliated and affiliated services imports differently in the I-O tables. Unaffiliated services imports are distributed by major commodity type and appear as an element in the estimate of total commodity output or production. Affiliated services imports are included with other "non-comparable" imports as a separate commodity in the I-O tables. The principal reason for creating a separate "non-comparable" imports category is the recognition that some types of imports have no domestic counterpart.[122] However, many of the affiliated services imports included in the "non-comparable" category, "such as business, professional, and technical (BPT) services and royalties and license fees, have components that may be comparable to domestically produced services and that could be included in the domestic supply of those services."[123]

This different treatment of similar types of affiliated and unaffiliated services imports—e.g. BPT services—in the I-O table will not only understate total production of BPT services shown in the table, but can cause analysts to underestimate the imports of particular services to be distributed between intermediate and other uses. A number of previous studies, including the recent NAS study, have used BEA I-O tables to estimate the share of imported services used as intermediate inputs, by applying the import similarity assumption to the imports by commodity type. It is not clear that these estimates were augmented by including the affiliated services import component within the "non-comparable" commodity line. One difficulty in doing this, of course, is that the BEA provides much greater detail on the types of unaffiliated services than affiliated services imports.

Failure to account for these affiliated "non comparable" services imports could yield a substantial underestimate of imported intermediate services for certain types of services. As noted earlier in this chapter, affiliated imports for BPT services in 2004 were more than twice as

[121] Walker, Patrica, Survey Data Collection Over the Internet at the U.S. BEA, paper presented at the Statistical Data Editing work session of the UN Economic Commission for Europe, October 2003, pp. 2-3.
[122] Examples include overseas port operations by US air and water carriers and US government purchases for overseas operations. See Yuskavage, Strassner and Medeiros, *Outsourcing and Imported Services in BEA's Industry Accounts*. Paper for the NBER's Conference on Research in Income and Wealth, April 2006.
[123] Ibid., p 20.

large as unaffiliated BPT services imports. Since BPT services have been considered by some to be potentially vulnerable to off-shoring activity, this failure could understate intermediate BPT services imports and consequently underestimate the extent of off-shoring of these services. The estimates of services off-shoring at an industry level, presented in Chapter 3, did account for these affiliated services embedded in "non-comparable" imports. That chapter describes the methodology and assumptions used to distribute these affiliated services. The Yuskavage et al paper also accounted for these affiliated services imports by relying on unpublished data developed by other BEA staff. But these data are not available to outside analysts. Consequently, as Yuskavage et al note, "BEA will investigate options for reducing the size of imports classified as "non-comparable," while retaining the distributional advantages of the current procedures."[124]

BLS Data Quality Issues

Multi-Establishment Firms in OES Sample

The OES program surveys over a three year collection cycle the roughly 1.2 million establishments within the QCEW universe to produce estimates on employment and wages for over 800 occupations. The survey is conducted semi-annually and includes approximately 200,000 establishments—roughly $1/6^{th}$ of the QCEW universe. The sample is designed to produce reliable estimates by geographical area (national, state and metropolitan area) and by industry at the 3- and 4-digit NAICS levels.[125] This design is intended to collect data on any specific establishment only once every three years to minimize respondent burden. One parameter that is not explicitly discussed in this sampling design is the firm, particularly those larger firms with multiple establishments.

Within the QCEW database, it is theoretically possible to construct firm-level information by aggregating all establishments with an EIN common to the firm. This works for the QCEW database because those administrative records constitute the entire universe of firms and establishments with paid employees in the U.S. The same process can be followed in the OES sample, but since not all establishments for multi-establishment firms will be captured in a particular sample, it is not clear how representative those captured establishments are of the entire firm.

Services off-shoring decisions typically are made at a firm, not an establishment, level. Therefore, the effect of those decisions on employment and occupational structure need to be assessed for all establishments within the firm. While the economic effects of services off-shoring, particularly the employment impacts, will occur at the establishment level within the firm, not all establishments within the firm may experience the same impact from the firm's decision. From the firm's perspective, the success of its off-shoring decision depends upon the net economic, financial, and employment effects for the firm, not specific effects within individual establishments.

[124] Ibid., p. 21.
[125] The current sample also provides estimates for selected industries at the 5-digit NAICS level.

While this issue about the representation of multi-establishment firms within the OES sample does not affect the measures used to identify the extent of services off-shoring, it can affect the assessment of several key employment effects of off-shoring—occupational structure and wage changes within the off-shoring firm. Since MNC parents are generally large, multi-establishment firms and MNC parents that have off-shored services were larger than other parents within the same industry,[126] this issues is especially critical to the assessment of changes in the occupational structures of those MNC parents that appear to have off-shored services over the period.

Changes in the sample design for the OES could allow BLS to develop representative panels for multi-establishment firms within the current OES sample size at a national level, given the likely dispersion of individual establishments for these multi-establishment firms. The sampling design could explore whether these representative samples could be developed at the 4-digit NAICS level.

Longitudinal Occupation Analysis and OES Data

BLS has issued very clear caveats about using the current OES data for longitudinal analysis of occupational changes at a national and/or aggregate industry level.[127] The current OES sample was certainly not designed to support longitudinal analysis of occupational changes for specific establishments or firms. BLS staff have attempted to overcome this by creating data sets for matched establishments over a three to five year period and have made them available for this project.[128]

The industry-level analyses of these occupational data in chapters 4 and 5 have demonstrated the potential value the OES data can add to assessing both the extent and distributional employment effects of services off-shoring. However, these industry-level analyses still encounter aggregation issues, since not all firms within an industry are likely to engage in services off-shoring. Indeed, the micro-level analysis of MNCs in Chapter 6 indicated that only a limited proportion of MNC parents off-shored services due to business restructuring even among those in the same industry and that these proportions also varied by industry. While the lack of longitudinal OES data at the firm and establishment level did not impede the ability to develop initial estimates of the extent of services off-shoring among MNC parents, their availability might have provided an opportunity to extend that analysis to non-MNC firms. In addition, it would greatly improve an understanding of the distributional employment effects from services off-shoring due to business restructuring.

Joint Agency Data Quality Issues

Different NAICS Classifications for Specific Firms

Although both BEA and BLS use NAICS codes to determine the industry sectors for the firms or establishments providing them economic data, they assign these codes to different entities. BEA classifies their MNC parents and other importing firms according to the industry group

[126] See discussion in Chapter 6.
[127] See http://www.bls.gov/oes/oes_ques.htm#Ques27
[128] These OES data sets will be described and analyzed in the final report.

accounting for the preponderance of firm sales, using the detailed sales data from their surveys. BLS asks establishments reporting employment data to classify themselves based on the industry group accounting for the largest share of their sales.[129] To link BEA MNC data with the BLS establishment data, the BLS data must be aggregated into firms, where necessary. Academy staff assigned NAICS categories to these derived BLS firms based on the industry group accounting for the largest share of total firm employment. While there should be some correlation between these two classification methodologies, there is no reason to expect 100 percent correspondence.

Different NAICS categories for the same firm can impose problems in linking firm-level data between the two agencies. Consistent industry classifications would provide another means for verifying the validity of initial matches.[130] While the two different methodologies can provide some interesting insights on the complex internal structures of multi-establishment firms, it is still important to be confident that the matched firm is in fact the same entity.

One approach to overcoming this is to have BEA and BLS reach agreement on a common NAICS identifier for the firms jointly reporting to each. Alternatively, establishing a consistent set of identifiers for components within complex U.S. business entities would help each agency understand how the business components providing them statistical data fit within a consolidated national or international business entity.

RECOMMENDATIONS AND CONCLUSIONS

The previous assessment of the significance of the various data gaps and data quality issues encountered and their impact on the ability to identify the extent of services off-shoring and its major economic effects suggested several critical observations.

- Not all data issues were equally important to improving the understanding of the extent and impact of services off-shoring.
- Addressing some data issues could help to resolve other data problems, as well.
- Any proposed change would require resources to implement and could impose additional costs and reporting burdens on survey respondents.
- Some proposed changes appeared easier or less costly to implement than others.
- It is likely that some changes could be implemented more quickly than others.
- Addressing some data gaps and quality issues would have significant implications for a broader set of economic, financial or statistical policy issues.

[129] BLS has no way to verify this self-determination since it collects only employment data from these establishments.
[130] These matching issues will be described in detail in the final report.

- Several alternatives for improvement are being considered or actively pursued by the agencies themselves.

The Panel's recommended improvements and changes to the current data collection system and specific elements within it attempt to achieve a balance among these observations. The Panel has distinguished three key recommendations among its recommended data improvements. These recommendations address the following critical needs:

- improving the consistency, completeness and coverage of BEA's data on services imports;

- providing longitudinal occupational data through a revised or restructured BLS survey; and

- developing consistent business identifiers to link information from several statistical agencies with different business organizational levels.

These key recommendations are similar to several of the recommendations contained in the September 2006 report of the Services Off-shoring Working Group at MIT's Industrial Performance Center. The additional Panel recommended data improvements are organized by the principal responsible statistical agency.

Key Data Improvements for BEA

Collect Consistent Levels of Detail for Affiliated and Unaffiliated Services Imports

The Panel findings on the extent of services off-shoring in chapters three through six suggest that the phenomenon is small, has the potential to grow, and varies significantly among individual industries. These findings support the need to develop more detailed and consistent data on the types of services involved now, while the phenomenon is relatively small. Given the current dominance of affiliated imports for BPT and other services that appear particularly vulnerable to off-shoring, it is difficult to understand why there is less detail available for these imports than for unaffiliated imports. Collecting similar detail on affiliated and unaffiliated services imports will help address a number of data gap or data quality issues. Therefore,

> **The Panel recommends that BEA should implement its proposal to collect consistent levels of detail for affiliated and unaffiliated services imports and periodically review the collection to ensure that it is comprehensive and compatible with details on services contained in other economic data.**

The current differences in the level of detail between affiliated and unaffiliated service imports include both type of service and country of origin—the current BEA proposal will address both differences. BEA acknowledges that their published data on services by type and country of origin may have to suppress more individual data to preserve respondent confidentiality. This change will improve our understanding of the types of services being off-shored, and the implications for particular occupations. It will facilitate efforts to remove these affiliated

services imports from the "non-comparable" import category in the BEA I-O tables and account for them the same as unaffiliated services imports of the same type. By assuring compatibly with other economic data on services, this change to collect uniform detailed services imports maintains opportunities for linking these data with other data on services (e.g. domestic supplies of services) to address future questions that cannot be fully answered using only the BEA trade data. Finally, this change provides the essential foundation for future efforts to develop price information for specific types of imported services that are compatible, or consistent with, similar domestically traded services.

The Panel also recognizes that BEA will have to extend the level of detail on services imports as more detailed data on services are developed for the U.S. economy. An example of this is the current effort led by the U.S. Census Bureau to develop a hierarchical product code system for domestic services through the North American Product Code System (NAPCS).

Implementing this recommendation will increase the reporting burden for U.S. MNC parents or U.S. affiliates of foreign MNC parents now responding to BE-577 and BE-605, respectively. This burden should be no greater than the current burden for MNC parents and other firms importing unaffiliated services imports. Moreover, the BEA proposal to eliminate some of the minor detailed categories for unaffiliated services imports should reduce the collection burden for those unaffiliated survey respondents.

Improve Sampling Coverage of U.S Services Importers

The Panel agrees with BEA that improving current mailing lists will require more than access to a consistent set of business identifiers with common current addresses, as the Panel has recommended below. BEA needs additional help in identifying businesses importing services. BEA's agreement with Census to add a question to the annual Company Organization Survey (COS) to identify firms that are importing services is another useful step. While this should result in improved BEA survey coverage of services importers among large multi-establishment firms, BEA could consider other efforts to improve its mailing list.

The Panel recommends that BEA should assess the effectiveness and impact of the additional COS question and continue to seek ways to improve its survey of services importers.

This COS check-off question should help BEA identify new or additional larger firms on the common business register that were not currently on its survey mailing lists. But BEA may also want to consider working with other federal agencies surveying particular service activities to determine whether information on imports of those specific services would useful to that agency. An alternative source of specific service imports would help BEA assess the adequacy of its survey coverage in this area. In addition, BEA should continue to work with its major trading partners to identify major differences in particular types of services imports where improved survey efforts may be needed. Additional resources will be needed to add check-off questions to other surveys, complete major trading partner reconciliations of services imports, and extend surveys to additional businesses found from new survey efforts.

Key Data Improvements for the U.S. Statistical System

Develop Consistent Business Identifiers

The enactment of the Confidential Information Protection and Statistical Efficiency Act (CIPSEA) in 2002 was intended to establish consistent protection for confidential information collected by individual statistical agencies within the currently decentralized federal statistical system and provide increased opportunities to share data for statistical purposes among the agencies under specific written agreements. While this might have raised expectations about linking micro-level data across agencies to use currently available data more effectively in addressing cross-cutting issues, those expectations have yet to be fully realized. One reason for that is the difficulty in linking micro-level business data when the three major statistical agencies, BEA, BLS and Census, maintain different systems for identifying business firms or establishments within their own jurisdictions. This lack of a common, consistent central business register has contributed to a number of data gaps and data quality issues affecting the ability to estimate the extent and major economic impacts of services off-shoring. The business register maintained by the Census bureau contains basic organizational information, industry classification and operating data for each establishment, firm or company, and major intra-company organizational unit. Unfortunately, these operating data also contain information derived from tax records, and this creates additional issues concerning access to tax data that were not fully addressed or resolved in CIPSEA and may require additional legislation to resolve.

Currently an MOU between Census and BLS provides BLS access to the Census business register on a confidential basis for research purposes only. This limited access does not allow BLS to use information from the business register to improve its sampling designs for any of its surveys or for any administrative purposes. BLS has been supplying Census with quarterly updates on employment and other information at the establishment level since BLS establishment data are the most current among the major federal statistical agencies. BEA has not yet been able to execute a similar MOU with Census, although BEA staff indicated that a July 6, 2006 temporary federal register notice issued by IRS providing BEA restricted access to certain tax data should facilitate the issuance of an MOU.

The Panel recognizes that each of these three agencies need and collect data from business entities at different organizational levels to meet their specific information needs at varying time intervals. As this report has noted, BLS collects various types of employment data at the establishment level at monthly as well as quarterly intervals. BEA's trade and foreign investment needs require quarterly collections from MNCs that may be firms with single or multiple EINs or conglomerate holding companies with multiple firms and multiple EINs. This report has also indicated several instances where sharing data between agencies can enhance an agency's understanding of its own data and can address issues that cross-cut individual agencies, most especially. the extent and impact of services off-shoring.

A consistent set of identifiers for components within complex U.S. business entities would help each agency understand how the business components it surveys fit within a consolidated

national or international business entity. This would also retain the most advantageous features of each agency's current business identification system. Most importantly, consistency would facilitate data sharing that could enhance the usefulness of separately collected data in understanding major cross-cutting issues, especially services off-shoring. Therefore,

> **The Panel recommends that BEA, BLS, and Census should work together to develop and maintain a consistent set of identifiers for each level of organization within every consolidated business entity in the United States. This would include shared location data for various entities and consistent methodology for assigning industrial classifications to them.**

Developing a consistent set of business identifiers with common current addresses is the first step in helping BEA improve its mailing lists for services imports surveys. This change would eliminate the use of different firm identifiers for MNCs importing both affiliated and unaffiliated services, which also would be accomplished through BEA's proposal to adopt a common survey. The key advantage, however, is the impact on future data sharing and linking micro-level data across agencies. For example, this change would improve the ability to match BEA's MNC data with BLS establishment data and business establishments in the economic census, thus improving understanding of the extent and impact of services off-shoring and other cross-cutting issues.

Key Data Improvements for BLS

Redesign OES Sample for Multi-Establishment Firms and Longitudinal Analysis

The analyses of changes in occupational employment shares and their relation to services outsourcing and off-shoring presented in chapters four and five demonstrate the importance of understanding these distributional effects for firms or industries that have off-shored services. These analyses also indicated that changes in occupational structures reflect the impact of a number of economic factors. Services off-shoring is one of those, but appears to be a relatively minor one for the industries reviewed, at least at the moment.

These analyses also indicated the value of examining individual firm behavior using micro-level data. The current sampling design for the OES program produces reliable estimates of occupational employment by industry and geographic area within the U.S. to meet not only BLS requirements but also specific state needs as funding comes from state trust funds under the Wagner-Peyser Act. Yet the design limits analysis of occupational shifts and wage changes over time for specific firms, particularly MNCs with multiple establishments. Specifically, it is difficult to know whether the few establishments matched for MNCs in the OES data were representative of all the MNC's establishments,

> **The Panel recommends that BLS should develop additional sampling panels for its OES program to provide representation for multi-establishment firms at a national level and to support longitudinal analysis for single and multi-establishment firms**

This change would require additional resources, even if some of the additional sampling panels could be accommodated within the overall sample without sacrificing the quality and reliability of geographic and industry-level estimates. Developing the capability of longitudinal analysis at a national level can demonstrate the value of monitoring occupational shifts for particular firms over time for potential future application to specific geographical areas. For example, this change would not only enhance future research on the impact of services off-shoring on employment, wages and occupational changes but could also provide greater understanding of the role of large complex firms, e.g. MNCs, in the economy and particular local labor markets including their impact on the demand for specific occupations and wages in those markets. Longitudinal analysis of occupational changes among firms, particularly large, complex firms, may also improve understanding of outsourcing among U.S. businesses. Some recent research has suggested that a better understanding of outsourcing activities may improve our assessment of estimated productivity changes in the U.S. economy.[131]

Additional Data Recommendations for BEA

Develop Estimates of MNC Value Added for Services

The value of BEA MNC data for estimating the extent of services off-shoring and its major impacts is currently diminished by the inability to distinguish purchased services inputs from all purchased inputs. Purchased services inputs are needed to develop indicators for the extent of a MNC's services outsourcing and off-shoring.

While the extent of services outsourcing is important due to its own economic and employment effects on the individual firm, it also has potentially significant implications for services off-shoring. Since services off-shoring due to business restructuring can be a subset of services outsourcing, current levels of services outsourcing reflect potential future growth opportunities for services off-shoring. The extent to which that potential is realized will depend upon future changes in the net returns from outsourcing relative to off-shoring.

The Panel recognizes that the feasibility of modifying BEA surveys to collect such data depends directly upon the ability of business accounting systems to supply that level of detail. Previous BEA efforts to collect similar data have demonstrated that business accounting systems are not able to supply such detail, other estimation approaches will be needed.

One alternative might be to link BEA MNC parent data to economic census data. This would allow identification of manufacturing establishments within the MNC parent and these could be used to develop estimates of value added for that parent's goods-producing activities. In theory, subtracting these goods-producing value added estimates from total parent value added would yield the value added generated by the parent's service producing establishments.

Another alternative might be to use the more detailed benchmark I-O industry analyses to estimate the services component of total MNC purchased inputs and value added. This would

[131] Op.cit., Dey, Houseman and Polivka, *Contracting Out to Employment Services: Analysis Using the OES, CES and CPS,* and Houseman, *Outsourcing, Off-shoring, and Productivity Measurement in Manufacturing*.

involve applying the industry distribution of services purchased inputs relative to all purchased inputs to all MNCs within the same industry. Therefore,

> **The Panel recommends that BEA should explore other available data, such as the economic census or benchmark I-O industry estimates, and estimation techniques to help it allocate MNC value added between services and other activities.**

This change would require assessing whether benchmark data from the economic census or industry level data from BEA I-O tables could be used to estimate the proportion of a MNC parent's value added used to produce services outputs. If these techniques can provide a reasonable estimate of the services component of a MNC parent's value added, then total purchased services inputs can still be estimated as the difference between services sales and services value added.

Develop Consistent Accounting for Affiliated and Unaffiliated Services Imports in BEA I-O Tables

Currently, affiliated services imports are shown separately from unaffiliated services imports and are accounted for differently in BEA I-O tables as "non-comparable" imports. The differences in the detailed services collected for unaffiliated imports precluded providing more consistent treatment. With similar details for both types of services imports, BEA staff would be able to separate affiliated services imports from the "non-comparable" import category in the BEA I-O tables and develop accounting linkages between them and unaffiliated services imports of the same type.

> **The Panel recommends that BEA staff should work to remove affiliated imports from the 'non-comparable" imports component within its I-O tables and link them more closely with the same type of unaffiliated services.**

This will require coordination between BEA industry and international staffs to ensure that affiliated and unaffiliated services imports in these I-O tables can be linked without losing information and insight currently available from each type of import. It may also be true that some affiliated service imports may have no domestic counterpart and are therefore truly "non-comparable." The additional detail to be obtained should help resolve this potential problem.

This change will also ensure that total commodity outputs in the I-O tables include both unaffiliated and affiliated imports and that imported services for specific commodities displayed in these tables are also complete. This should prevent future potential underestimates of the intermediate use of specific services, since total services imports, and not simply unaffiliated services imports, will be allocated between intermediate and other uses.

Accelerate Availability of MNC Financial and Operating Data

BEA staff have made numerous efforts to improve the timeliness of the services import data. BEA continues to explore ways to encourage its respondents to submit their data electronically

using the ASTAR system, but many of their larger MNCs remain unwilling or unable to use that system. This is particularly unfortunate because, as Chapter 6 has indicated, only a limited percentage of MNCs import services and these tended to be disproportionately large, at least for the sectors reviewed in detail for this report.

Since BEA can identify from its current data those MNCs that import services, BEA could use this ability to focus on these particular MNCs. If this group continues to represent a relatively small percentage of all MNCs, BEA could consider focusing additional resources or assigning higher priority to processing these MNC data.

> **The Panel recommends that BEA should reallocate priorities and, if necessary resources, to accelerate the processing of MNC data for those MNCs importing services.**

Since this would involve some additional resources, BEA may want to test this for a sample of large MNC services importers to determine the resources need to accelerate the availability of services import data. Accelerating the availability of preliminary estimates based on this sample of larger MNCs by a quarter would have permitted analysis of (at least preliminary) 2004 data for this report.

Collect Data on Imports for Intermediate Use

While this data gap has the potential to improve most directly the measures used to assess the extent of services off-shoring, it also appears to be the one with the fewest effects on other broad economic issues. For example, improving the quality of BEA's survey mailing lists for services imports will not only improve our estimates of the extent of off-shoring, but will improve other trade estimates, such as quarterly balance of payments estimates.

The costs and effectiveness of obtaining these intermediate use estimates is also somewhat uncertain. The Panel acknowledges the conceptual difficulties facing this type of collection effort, given the multiple and complex transactions that occur within the large, dynamic U.S. economy. This is particularly acute for the services sector relative to the manufacturing sector. As BEA has acknowledged, their MNC surveys currently ask respondents to distinguish intermediate use from final demand use for goods imports. But BEA officials stated that they have not been successful in overcoming the conceptual and measurement hurdles present by service type imports.

> **The Panel recommends that BEA should consider limited sampling of MNC service importers to test their ability to distinguish the use of particular types of services imports for their own use rather than for sale to others.**

BEA industry account staff have developed an algorithm for allocating affiliated services imports to intermediate use by commodity type within their I-O tables. Once common service type categories for both affiliated and unaffiliated services have been adopted and BEA staff have been able to link their accounting treatment of these two types of services imports in the I-O

tables, BEA should assess the accuracy of that algorithm and determine its applicability to allocating unaffiliated services imports between intermediate and other uses.

BEA staff have also maintained that most BPT services imports appear to be used by the importing firm either internally, or combined with other services and products before sale to final consumers. While that may be true given the limited types of services currently identified for U.S economic activity, as more detailed services categories are developed over time, this distinction between services imported for intermediate use and for final demand may become increasingly important. It may be easier to test the ability to distinguish between these different usages while the detailed types of services and the use for final demand are relatively small.

Additional Data Recommendations for BLS

Apply Additional Sampling Criteria for the MLS Program

BLS' MLS program identifies major lay-off events at individual establishments and surveys those establishments to obtain more detailed information on the nature of the event. It does so by using administrative data available from the comprehensive set of establishments within the QCEW. MLS is the only direct survey that asks U.S. employers whether a major lay-off at an establishment involved movement of work activity overseas. It focuses on major lay-off events that are highly disruptive to surrounding communities and involve often substantial adjustment issues for displaced employees. As a result, its targeting criteria are not aimed at detecting services off-shoring activities that are either less immediate or more dispersed throughout the firm.

Starting in 2007, BLS will obtain monthly data from states on all lay-offs, regardless of size. This more detailed universe of events provides an opportunity to use additional selection criteria for surveying firms with specific lay-offs. The Panel believes this opportunity could be used to address future services off-shoring issues by using different criteria for some of the follow-up surveys. These criteria could include BEA surveyed MNCs that have increased services off-shoring or BLS surveyed establishments that have experienced major occupational changes consistent with services outsourcing or off-shoring.

To better address future services off-shoring issues, the Panel recommends that BLS should develop additional survey criteria to target firms or establishments likely to be off-shoring or outsourcing services in a supplement to its MLS program in 2007 and future years.

This recommendation would require additional resources, but it will utilize an already planned expansion of a program that effectively combines administrative data with targeted sampling information.

Publish 3-digit Level Data on Standard Occupation Codes

The industry-level analyses in Chapters 4 and 5 also showed the value of examining these occupational changes at disaggregated levels—more specifically at the 3-digit and 6-digit SOC

levels. While the BLS has provided the aggregate 2-digit and the detailed 6-digit SOC data for the OES program on its website, it has not yet done so for the intermediate 3-digit level. Unfortunately, attempts to aggregate the detailed 6-digit data to develop 3-digit data for this report encountered confidentiality and other data issues described in those chapters. Specifically, the 3-digit data developed for this report by aggregating the 6-digit data undercounted actual 3-digit data because certain 6-digit data elements in the publicly available data had been suppressed for confidentiality reasons. Consequently, the analyses of occupational changes at the 3-digit level in this report used a truncated data set. BLS staff can avoid these data issues by creating 3-digit SOC data sets for their OES data and making them available to the public.

The Panel recommends that BLS should provide OES data at a 3-digit level on its website, in addition to the 2- and 6-digit SOC levels already provided.

While the creation of publicly available 3-digit data provide detailed estimates that may require additional data suppression of current 6-digit data elements, the extent of this effect on the quality and scope of currently available data is not clear. BLS should determine the extent of any addition data suppression that would result from this recommendation and assess the significance of any reduction in current data quality relative to the additional information provided by releasing data at this intermediate, 3-digit level.

CONCLUSION

Current levels of services off-shoring may be small, but there exists the potential for future growth in this phenomenon, given the extent of services outsourcing and continuing technological changes. The Panel believes it is prudent to improve existing data systems now to increase the ability to detect and monitor future services off-shoring activities and their economic impacts

The Annual Survey of Selected Service Transactions with Unaffiliated Foreign Persons [BE-22]

The BE-22 survey collects data on the following types of services imports:

- advertising services;
- auxiliary insurance services;
- miscellaneous disbursements or outlays to fund news-gathering costs of broadcasters, news-gathering costs of print media, production costs of motion picture MNCs, production costs of broadcast program material other than news, to maintain government tourism and business promotions offices, and maintain sales promotion and representative offices;
- education and training services;
- computer and data processing services;
- database and other information services;
- telecommunications services;
- research, development, and testing services;
- management, consulting, and public relations services;
- legal services;
- industrial engineering services;
- industrial-type maintenance;
- installation, alterations and training services;
- construction services;
- engineering, architectural and surveying services;
- merchanting services;
- operating leasing;
- mining services;
- other private services (language translations services, security services, collection services, salvage services, satellite photography and remote sensing/satellite imaging services, space transport, and transcription services);
- other trade-related services;
- performing arts, sports, and other live performances, presentations, and events
- purchase of rights to natural resources, and lease bonus payments;
- use or lease of rights to natural resources, excluding lease bonus payments; waste treatment and depollution services; and
- purchases of financial services transactions not reported on the BE-82 survey.

SECTION III

APPENDICES

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TECHNICAL APPENDIX FOR INDUSTRY-LEVEL ANALYSES

CREATING A LINKED DATABASE WITH OES OCCUPATION DATA AND BEA ANNUAL I-O USE TABLES AND INDUSTRY CODES

The Bureau of Labor Statistics provides publicly available Occupational Employment Statistics (OES) data at a national 4 digit North American Industrial Classification System (NAICS) industry level. The data contain detailed employment and earnings data at the Standard Occupational Classification (SOC) 6 digit level for each industry. BLS also provides 2 digit SOC major occupation data for each industry and industry totals. The data are released about a year after each semi-annual survey is conducted.

The consistency of the data makes it quite feasible to combine the separate spreadsheets into a single database. This provides a great deal more flexibility regarding the types of analysis that can be performed. For example, the estimates in Chapter 5 require (1) calculating for each occupation for each industry employment as a percent of industry total employment, (2) applying the shares calculated for the 2002 survey to industry totals in 2005, and (3) subtracting the calculated employment from actual employment levels for each occupation for each industry in the 2005 survey. While it might be possible to do this using the original Excel spreadsheets, the work is greatly facilitated by having all of the data together in a common structure. Similarly, the estimates of employment for core occupations of selected industries in other industries in Chapter 4 is a calculation done easily within a database, but one that might require a great deal more effort working within the spreadsheet format.

The other, huge, advantage to working with a database is the ability to incorporate data from the BEA use tables and aggregate the OES data to BEA sector levels in order to perform the analyses of Chapter 5. While it has been possible to do so in Excel, it would have required substantially more effort.

Creating the database required a good deal of preparation, despite the ready availability of the national OES data and BEA use tables. To do so we followed the steps below:

1. Download all BLS OES 4 digit spreadsheets, currently including one for November, 2002, May and November for 2003 and 2004, and May, 2005.[132]

2. In Excel, add two columns at the beginning, "Year" and "Month," to identify the surveys to which the data belong.

3. In Microsoft ACCESS, import all of the files, each into its own table. Numeric values in some of the surveys are treated as alphameric. Convert all fields to numeric so that they can be combined using the "Make Table" and "Append" queries.

[132] See the BLS web site http://www.bls.gov/oes/home.htm

4. Make a table from the 2002 data and append the 2003, 2004 and 2005 tables in order, using "Make Table" and "Append" queries.

5. Add an auto numbered primary key ID field to the table "Combined OES Data".

6. There are 21,696 records with ** in the employment field, indicating that the data is not available and 249 additional records with missing wage data. Delete these records, using a make table query to create "Combined OES No Missing Data" (252,295 records).

7. Import BEA Annual Industry Accounts Input-Output Use Table data to an Excel spreadsheet.[133] The BEA data contain Use tables for the years 1998-2004 on separate spreadsheets within a single Excel workbook.

8. BEA's Excel Use Table workbook also contains a spreadsheet, "NAICS Codes," that contains the specific 2, 3, and 4 digit NAICS industries that are included in each I-O industry sector. Using Microsoft ACCESS, list the 4 digit NAICS codes in the OES data (set the property of the query to "Unique Values" to eliminate duplicates.) Export it to Excel, and create a table that bridges BEA I-O industry codes and titles to the 4-digit NAICS industry codes in the OES. Each line contains a single NAICS code and the matching BEA I-O code and title. Import this table to the database. A summarized version of this file, which groups the NAICS codes for appearance, is attached.

9. Use a select query to join the Combined OES Data and the BEA bridge table. Create a new OES Data table, "OES with BEA Industry Codes," that contains BEA industry codes and titles for each record.

10. The data contain useful records that need to be deleted from the main database but retained as separate tables.

    A. Each industry begins with a record with an occupation code "00-0000". This record contains total employment and average annual compensation. There are 1766 records in the database. Put these into a separate Industry Totals table.

    B. Within each industry are records coded XX-0000 where XX is an occupation class, and 0000 signifies that it is a major occupation grouping. There are 27,643 records of major occupation by industry and survey in the database. Collect major occupation records into a separate table.

11. The data need 3-digit SOC identifiers, but the BLS OES does not contain data summarized by 3-digit SOC code. Obtain the 3-digit SOC codes and titles from the BLS web site (http://www.bls.gov/soc/soc_majo.htm), and manually create a 3-digit to 6-digit occupation code bridge table in Microsoft Excel. Import that table into the Microsoft Access database, and merge the 3-digit occupation code into each record.

[133] See the BEA site http://www.bea.gov/bea/dn2/i-o_annual.htm

12. In the database, create a list of occupation and industry pairs that existed both in 2002 and 2005. Select only these records for all surveys into a new table. This enforces consistency in the calculation of the components of employment change in Chapter 5. This reduces the database from 222,947 records to 168,583 records. Most of the reductions are in low employment occupations or industries, and the reduced data set accounts for 96.9 % of total employment in November2002 and 93.5% in May, 2005.

13. Delete all "-0000" records from this table to prevent double-counting.

14. Calculate total employment for each BEA I-O industry group. Calculate total employment within each occupation within each BEA I-O industry group. Calculate the occupation share of total employment within each BEA I-O category.

All of the OES data as modified by Academy staff to incorporate BEA industry classifications can be found on the Academy's web site
http://www.napawash.org/pc_management_studies/offshoring/index.html

Table
BEA Industry Account and Equivalent OES 4-digit NAICS Codes
Annual Industry Accounts Classification Codes

BEA Code	BEA Industry Group	NAICS Equivalent Codes
111CA	Farms	115100, 115200
113FF	Forestry, fishing, and related activities	113300
211	Oil and gas extraction	211100
212	Mining, except oil and gas	212100, 212200, 212300
213	Support activities for mining	213100
22	Utilities	221100, 221200, 221300
23	Construction	236100, 236200, 237100, 237200, 237300, 237900, 238100, 238200, 238300, 238900
311FT	Food and beverage and tobacco products	311100, 311200, 311300, 311400, 311500, 311600, 311700, 311800, 311900, 312100, 312200
313TT	Textile mills and textile product mills	313100, 313200, 313300, 314100, 314900
315AL	Apparel and leather and allied products	315100, 315200, 315900, 316100, 316200, 316900
321	Wood products	321100, 321200, 321900
322	Paper products	322100, 322200
323	Printing and related support activities	323100
324	Petroleum and coal products	324100
325	Chemical products	325100, 325200, 325300, 325400, 325500, 325600, 325900
326	Plastics and rubber products	326100, 326200
327	Nonmetallic mineral products	327100, 327200, 327300, 327400, 327900
331	Primary metals	331100, 331200, 331300, 331400, 331500,
332	Fabricated metal products	332100, 332200, 332300, 332400, 332500, 332600, 332700, 332800, 332900
333	Machinery	333100, 333200, 333300, 333400, 333500, 333600, 333900
334	Computer and electronic products	334100, 334200, 334300, 334400, 334500, 334600
335	Electrical equipment, appliances, and components	335100, 335200, 335300, 335900
3361MV	Motor vehicles, bodies and trailers, and parts	336100, 336200, 336300
3364OT	Other transportation equipment	336400, 336500, 336600, 336900
337	Furniture and related products	337100, 337200, 337900
339	Miscellaneous manufacturing	339100, 339900
42	Wholesale trade	423100, 423200, 423300, 423400, 423500, 423600, 423700, 423800, 423900, 424100, 424200, 424300, 424400, 424500, 424600, 424700, 424800, 424900, 425100
44RT	Retail trade	441100, 441200, 441300, 442100, 442200, 443100, 444100, 444200, 445100, 445200, 445300, 446100, 447100, 448100, 448200, 448300, 451100, 451200, 452100, 452900, 453100, 453200, 453300, 453900, 454100, 454200, 454300
481	Air transportation	481100, 481200
482	Rail transportation	482100
483	Water transportation	483100, 483200
484	Truck transportation	484100, 484200
485	Transit and ground passenger transportation	485100, 485200, 485300, 485400, 485500, 485900

BEA Code	BEA Industry Group	NAICS Equivalent Codes
486	Pipeline transportation	486100, 486200, 486900
487OS	Other transportation and support activities	487100, 487200, 487900, 488100, 488200, 488300, 488400, 488500, 48890, 491100, 492100, 492200
493	Warehousing and storage	493100
511	Publishing industries (includes software)	511100. 511200
512	Motion picture and sound recording industries	512100, 512200
513	Broadcasting and telecommunications	515100, 515200, 516100, 517100, 517200, 517300, 517400, 517500, 517900
514	Information and data processing services	518100, 518200, 519100
521CI	Federal Reserve banks, credit intermediation, and related activities	521100, 522100, 52220, 522300
523	Securities, commodity contracts, and investments	523100, 523200, 523900
524	Insurance carriers and related activities	524100, 524200
525	Funds, trusts, and other financial vehicles	525100, 525900
531	Real estate	531100, 531200, 531300
532RL	Rental and leasing services and lessors of intangible assets	532100, 532200, 532300, 532400, 533100
5411	Legal services	541100
5412OP	Miscellaneous professional, scientific and technical services	541200, 541300, 541400, 541600, 541700, 541800, 541900
5415	Computer systems design and related services	541500
55	Management of companies and enterprises	551100
561	Administrative and support services	561100, 561200, 561300, 561400, 561500, 561600, 561700, 561900
562	Waste management and remediation services	562100, 562200, 562900
61	Educational services	611100, 611200, 611300, 611400, 611500, 611600, 611700
621	Ambulatory health care services	621100, 621200, 621300, 621400, 621500, 621600, 621900
622HO	Hospitals and nursing and residential care facilities	622100, 622200, 622300, 623100, 623200, 623300, 623900
624	Social assistance	624100, 624200, 624300, 624400
711AS	Performing arts, spectator sports, museums, and related activities	711100, 711200, 711300, 711400, 711500, 712100,
713	Amusements, gambling, and recreation industries	713100, 713200, 713900
721	Accommodation	721100, 721200, 721300
722	Food services and drinking places	722100, 722200, 722300, 722400
81	Other services, except government	811100, 811200, 811300, 811400, 812100, 812200, 812300, 812900, 813100, 813200, 813300, 813400, 813900
GFE	Federal government enterprises	None
GFG	Federal general government	999100
GSLE	State and local government enterprises	None
GSLG	State and local general government	999200, 999300

Source: Bureau of Economic Analysis

TECHNICAL APPENDIX ON BEA MICRO-DATA ANALYSIS

METHODOLOGY AND DATA

The data used in this analysis come from two datasets collected by the Bureau of Economic Analysis (BEA): "financial and operating" data of multinational corporations (MNCs), and "international transactions." The majority of the economic indicators we used come from BEA financial and operating data, with the exception of MNC parent unaffiliated services imports and exports which were extracted from the international transactions dataset. This analysis focused primarily on U.S. MNC parents and their majority-owned foreign affiliates (MOFAs) in four industries at the four-digit North American Industry Classification System (NAICS) level, primarily in the services sector: pharmaceutical and medicine manufacturing [3254], architectural, engineering and related services [5413], computer system design and related services [5415], and business support services [5614]. The time series used is the longest possible given the availability of BEA data using NAICS codes to define MNC industry assignments. Generally, the data examined cover the 1999 to 2003 period; however, in some instances, shorter periods were used – for example unaffiliated services imports and exports data were available only from 2001 to 2003 because BEA used Standard Industrial Classification (SIC) codes, rather than NAICS codes, in 1999 and 2000.

BEA defines a U.S. MNC, a U.S. MNC parent, and a U.S. foreign affiliate as:

U.S. multinational company: "the U.S. parent and its foreign affiliates;"

U.S. MNC parent: "a person, resident in the United States that owns or controls 10 percent or more of the voting securities, or the equivalent, of a foreign business enterprise. "Person" is broadly defined to include any individual, branch, partnership, associated group, association, estate, trust, corporation, or other organization (whether or not organized under the laws of any state), or any government entity. If incorporated, the U.S. parent is the fully consolidated U.S. enterprise consisting of (1) the U.S. corporation whose voting securities are not owned more than 50 percent by another U.S. corporation and (2) proceeding down each ownership chain form that U.S. corporation, any U.S. corporation whose voting securities are more than 50 percent owned by the U.S. corporation above it. A U.S. parent comprises the domestic operations of U.S. MNC, covering operations in the 50 states, the District of Columbia, the Commonwealth of Puerto Rico, and all other U.S. areas;" and

U.S. foreign affiliate: "a foreign business enterprise in which there is U.S. direct investment, that is, in which a U.S. person owns or controls (directly or indirectly) 10 percent of more of the voting securities or the equivalent. Foreign affiliates comprise the foreign the foreign operations of a U.S. MNC over which the parent is presumed to have a degree of managerial influence."[134]

BEA collects data for all U.S. foreign affiliates but collects more data for majority owned foreign affiliates (MOFAs). Our analysis focused on MOFAs to use a more comprehensive set of

[134] Raymond J. Mataloni Jr., "U.S. Multinational Companies Operations in 2003," (Washington: Bureau of Economic Analysis, July 2005), p. 12.

economic indicators. BEA defines a *MOFA* as a foreign affiliate with a combined ownership of all U.S. parents exceeding 50 percent.[135]

MNC PARENTS

Identifying Number of U.S. MNC parents in 3254, 5413, 5415, 5614 for Groups I and II

The number of U.S. MNC parents in the four industries was identified by extracting two sub-groups of MNC parents for each industry from BEA financial and operating data, for a total of eight sub-groups.

- Group I consists of those MNC parents classified by BEA as being in one of the four selected industries—according to the preponderance of their sales.

- Group II is made up of those MNC parents classified by BEA in another industry, but having some sales in one of these four industries.

For example, the pharmaceutical and medicine manufacturing industry [3254] group I includes those MNC parents with the preponderance of their sales in the 3254 NAICS industry, while group II includes those MNC parents that have some, but not the preponderance, of their sales in the 3254 NAICS industry.

Total employment for the MNC parents in each of the eight sub-groups were extracted for the years 1999 to 2003 from BEA financial and operating data. The MNC parents were divided into three categories: small, mid-size, and large firms (see Table E-1). The ranges for these three categories are 0-500 employees for a small firm, 500-1,000 employees for a mid-size firm, and 1000 or more employees for a large firm. For most sub-groups, the majority of MNC parents were large firms. The two exceptions were MNC parents concentrated (group I) in architectural, engineering and related services [5413], and in computer system design and related services [5415]. For these two sub-groups the majority of parents were small firms, although the percent of large firms for 5415 parents increased from 38 percent to 42 percent over the period.

[135] Mataloni., "U.S. Multinational Companies Operations in 2003," (Washington: Bureau of Economic Analysis, July 2005), p. 12.

Table E-1
MNC Distribution by Size of Firm and Year—Group I and Group II*

Group I					
Industry Group	**1999**	**2000**	**2001**	**2002**	**2003**
3254					
Total	49	47	46	47	46
Small	19	16	16	16	15
Mid-size	3	6	6	6	7
Large	27	25	24	25	24
5413					
Total	51	49	48	47	47
Small	28	28	27	26	26
Mid-size	5	5	5	4	5
Large	18	16	16	17	16
5415					
Total	118	114	112	113	103
Small	63	60	57	57	50
Mid-size	10	8	11	12	10
Large	45	46	44	44	43
5614					
Total	10	10	10	10	11
Small	1	1	1	1	1
Mid-size	0	0	0	0	0
Large	9	9	9	9	10
Group II					
Industry group	**1999**	**2000**	**2001**	**2002**	**2003**
3254					
Total	33	35	36	34	33
Small	5	5	5	5	5
Mid-size	2	2	3	4	4
Large	26	28	28	25	24
5413					
Total	64	55	54	55	56
Small	15	15	14	17	15
Mid-size	9	11	10	8	7
Large	40	29	30	30	34
5415					
Total	105	106	100	94	90
Small	29	31	32	31	30
Mid-size	11	14	12	12	11
Large	65	61	56	51	49
5614					
Total	20	18	17	13	16
Small	1	0	0	0	0
Mid-size	0	0	1	0	0
Large	19	18	16	13	16

* Note: MNC count reflects the original sample including outliers.

Extracting and Calculating Total Purchased Inputs, Outsourcing Intensity, Off-shoring Intensity, and Services Off-shoring Intensity

Total Purchased Inputs

The total purchased inputs variable is not directly obtained by BEA through its MNC surveys but is derived from other survey data. BEA and Academy staff used the same approximation to estimate total purchased inputs, i.e. the difference between each MNC parent's annually reported total sales and the estimated value added.

Total sales are reported directly, but value added is estimated by summing the individual components (employee compensation, profit-type return, net interest, indirect business taxes, and capital consumption allowances) that are reported in BEA surveys. The total sales and value added estimates developed from BEA financial and operating data for MNC parents in groups I and II for each of the four industries include both goods and services. The BEA surveys of the operations of MNC parents do distinguish sales of services from total sales, but they do not collect separate information to distinguish between goods and services for the individual components of value added. This limitation precluded any separate analysis of potential outsourcing of services relative to goods among these MNC parents. It also required using a more aggregate indicator for examining services off-shoring as described below.

Another data gap is the absence of inventory data in the annual surveys. Inventory data are collected only for the benchmark years—1999 being the latest available. In theory, purchased inputs should equal the difference between a MNC parent's total output and its value added. Total output includes both total sales and changes in inventory. The derived total purchased inputs measure (total sales less value added) does not include a MNC parent's change in inventory because annual inventory data are not available. The significance of this limitation is somewhat unclear and BEA staff indicate that the inventory issue for services is likely to be small relative to goods.

However, Academy staff encountered a few cases where individual MNC parents have a negative value for purchased inputs because their derived value for value added exceeded their sales for that year. Since purchased inputs is used in the numerator in calculating outsourcing intensity, and in the denominator in calculating off-shoring and services off-shoring intensity, this anomaly also creates a negative value for MNC parents' calculated outsourcing, off-shoring and services off-shoring intensity indicators. Our methodology for dealing with such outliers is explained in detail in the "Average Outsourcing, Off-shoring and Services Off-shoring Intensity" section.

Outsourcing Intensity

To assess the extent of outsourcing and any changes in outsourcing activity over the 1999 to 2003 period, Academy staff developed an indirect indicator of outsourcing—the ratio of total purchased inputs to total sales. An increase in this ratio—our "outsourcing intensity" indicator—should occur when a MNC parent increases its use of purchased inputs relative to its total sales (our proxy for total output) and thus outsources more of its internal production processes. MNC

parents with higher outsourcing intensity ratios utilize purchased inputs more extensively in their production processes than those with lower outsourcing intensity ratios. A MNC with an increasing outsourcing intensity indicator has presumably substituted purchased inputs for its own employees or capital in its production processes over this period. Since this study focused primarily on the outsourcing and off-shoring of services rather than manufactured goods, we wanted to distinguish between services and goods outsourcing to assess the extent of services outsourcing relative to goods outsourcing. But data limitations precluded this, because BEA's financial and operating data of MNCs currently do not allow separate estimates of purchased services inputs.

Off-shoring Intensity and Services Off-shoring Intensity

Academy staff derived two indirect indicators of off-shoring: "off-shoring intensity," calculated as the ratio of total imports to total purchased inputs; and "services off-shoring intensity," calculated as the ratio of total service imports to total purchased inputs. A significant number of MNC parents in groups I and II for each of the four industries do not have any goods and/or services imports. Thus, the off-shoring and/or services off-shoring intensity is zero for these MNC parents.

The values for the total affiliated and unaffiliated goods imports and total affiliated services imports variables were extracted from the financial and operating dataset, and the values for the total unaffiliated service imports variables were extracted from the international transactions dataset. The unaffiliated services imports data list each value of the service categories imported by each company. Academy staff aggregated these data to create a total unaffiliated services imports variable for each company. These services categories come from the survey of Selected Service Transactions with Unaffiliated Foreign Persons and include:

- education and training services;
- computer and data processing services;
- database and other information services;
- telecommunications services;
- research, development, and testing services;
- management, consulting, and public relations services;
- legal services;
- industrial engineering services;
- industrial-type maintenance;
- installation, alterations and training services;
- construction services;
- engineering, architectural and surveying services;
- merchanting services;
- operating leasing;
- mining services;
- other private services (language translations services, security services, collection services, salvage services, satellite photography and remote sensing/satellite imaging services, space transport, and transcription services);

- other trade-related services;
- performing arts, sports, and other live performances, presentations, and events
- purchase of rights to natural resources, and lease bonus payments;
- use or lease of rights to natural resources, excluding lease bonus payments; waste treatment and de-pollution services; and
- purchases of financial services transactions not reported on the financial services transactions with unaffiliated foreign persons survey.

The importers in the international transactions data are U.S. companies, both MNC parents and non-MNCs. Academy staff linked the MNC parent importers of unaffiliated services imports to the MNC parent companies extracted from financial and operating survey data, and did not utilize unaffiliated services import data for non-MNCs.

The "total imports" component in the "off-shoring intensity" indicator included total affiliated and unaffiliated goods imports, and affiliated service imports for parents in groups I and II for all years. Unaffiliated services imports were included for group I MNC parents for years 2001 to 2003. SIC codes rather than NAICS codes were used for unaffiliated services importers prior to 2001. The "total services imports" component of the "services off-shoring intensity" indicator was constructed in the same way as the "total imports" component. Another important caveat is that neither the goods nor services import data distinguish between imports for intermediate use and those for final demand.

Average Outsourcing, Off-shoring and Services Off-shoring Intensity

Working with confidential micro-data presents some unusual challenges, not the least of which is determining how to present meaningful results without violating confidentiality requirements. Initially, we did not know whether MNC parents were equally likely to be outsourcing and off-shoring services. Consequently, we decided to calculate group averages for each of the four industries for groups I and II, and identify the number of MNC parents in each group that were above or below that average.

In calculating the average outsourcing and services off-shoring intensities for each group, we adjusted the simple arithmetic means for some sub-groups to account for occasional outliers. Outliers for these intensity indicators had either negative values or values above 1. MNC parents with outsourcing or services off-shoring intensity outliers in all years they were represented in one of the eight industry sub-groups were omitted (e.g. a MNC parent with an outsourcing intensity outlier for three out of the three years the firm was in one of the eight industry sub-groups was omitted for all three years). MNC parents with outsourcing or services off-shoring intensity outliers for four out of the five, three out of five, three out of four, two out of four, two out of three, one out of three or one out of two years they were represented in the industry sub-groups were also omitted. In cases where there were outliers for one out of five, two out of five or one out of four years a MNC parent was represented in one of the industry sub-groups, we interpolated the outlier value.

There were a total of 119 MNC observations omitted from the analysis due to outlier issues covering all five years for the 8 industry sub-groups. This amounted to only 5.7 percent of the

total number of MNC observations (2088)[136] for the eight sub-groups examined. In none of the sub-groups did the number of omitted MNCs account for more than 10 percent of the group. The vast majority of outliers involved the outsourcing intensity indicator; there were no outliers for the services off-shoring intensity indicator.

In addition to identifying those MNC parents above and below the average each year, we also identified the number of MNC parents consistently above the average intensity for five out of five years, and four out of five years. An above average outsourcing intensity, off-shoring intensity or services off-shoring intensity implies that the MNC parents in this category are the top outsourcers, off-shorers or services off-shorers in their industry grouping respectively. Those MNC parents with above average outsourcing, off-shoring or services off-shoring intensity for five out of the five years or four out of the five years are *consistently* the top outsourcers, off-shorers or services off-shorers in their industry grouping, respectively. These more detailed analyses of the MNC parents in each of our eight sub-groups created a number of confidentiality issues given the small numbers of parents being identified in some of these sub-sub-groups. Since a number of these averages had to be suppressed given the limited number of parents in the sub-groupings developed, this analysis was not included in this report.

Comparison of Services Off-shoring MNCs to Total MNCs

To overcome these confidentiality issues due to small sample problems, Academy staff distinguished between "services off-shorers," those MNC parents with service imports, and all other MNC parents ("non-services off-shorers") in the four industries and two sub-groups (concentrated and non- concentrated) previously described. However, even in this case, some confidentiality issues were encountered. For example, in Table 6A-4, the data for business support services [5614] had to be omitted due to confidentiality issues concerning the limited number of parents in the industry group.

The analysis identified nine economic indicators to compare MNC parents engaged in services off-shoring to those MNC parents that were not. These nine variables were total sales, value added, employment, employee compensation, average employee compensation, sales per employee, total imports, net income and capital expenditure. All variables were taken directly from BEA financial and operating data, except for value added, average employee compensation, sales per employee and total imports. We derived average employee compensation as: employee compensation/employment; and sales per employee as: total sales/employment. The total imports variable includes total affiliated and unaffiliated goods imports, and affiliated service imports for groups I and II for all years. Unaffiliated services imports are included only for group I MNC parents for years 2001 to 2003. Those MNC parents considered to be outliers that were omitted from the average outsourcing and service-offshoring intensity analysis were omitted from this analysis as well.

The MNC parents with service imports were extracted from the total group of MNC parents for each of the eight industry sub-groups for 1999 to 2003. The ratio of parent MNCs with service

[136] A MNC observation is the number of times the MNC appears during the time period. Thus, a MNC that appeared in all five years between 1999 and 2003 had five observations. There were 2888 total MNC observations for all eight sub-groups examined over this period.

imports to total MNCs in each of the eight industry sub-groups was used to compare the values of each of the nine variables for services off-shorers relative to other MNC parents in each group. We also identified the number of services off-shorers and large services off-shorers (those MNC parents with service imports with 1,000 or more employees) and compared them to the number of total MNCs and total large MNCs respectively. Percentage changes between the years 1999 and 2003 were estimated for the nine variables and the number of services off-shorers and large services off-shorers.

Linear Regressions and Means Tests

To estimate annual growth rates for these small samples of MNC parents over a limited time period, Academy staff ran linear regressions using SPSS on the natural logs of total sales, employment, average employee compensation, sales per employee, net income and outsourcing intensity for "services off-shorers" and "non-services off-shorers." Separate regressions were run for each of the eight MNC parent sub-groups over the five year period. Linear regressions were also run for the natural logs of services off-shoring intensity for MNC parents with service imports using the 1999 to 2003 five-year time series. Only one or two of the coefficients for these pooled cross-section/time series regressions were statistically significant (see Table 6A-5).

Academy staff estimated the means for the outsourcing and services off-shoring indicators for each MNC parent group among the four industries under review. The differences in these means were then compared on a pair-wise basis. To determine the statistical significance of these pair-wise mean differences in outsourcing and services off-shoring indicators intensities, Academy staff used the independent t-tests from these differences of means tests. We used a similar analytical technique to compare difference in selected financial benchmarks in the four industries and two sub-groups for the 1999 to 2003 period.

U.S. FOREIGN AFFILIATES

Industry Classifications of U.S. Foreign Affiliates

BEA classifies MNC parents and U.S. foreign affiliates according to the industry of the entity's preponderance of sales for that year. U.S. foreign affiliates may have a different industry classification from their parents if the preponderance of their sales are in different industries. For the year 2003, Academy staff analyzed the industry classifications of the U.S. foreign affiliates with parents whose sales were concentrated in one of the four industries examined (group I) to determine whether those affiliates were classified in different industries. Pie charts show the primary industry distribution in percentage terms of the U.S. foreign affiliates for 2003.

Growth of U.S. Foreign Affiliates vs. Growth of MNC Parents

Utilizing BEA financial and operating data for U.S. foreign affiliates and MNC parents, Academy staff compared the growth of seven economic variables for U.S. foreign affiliates and MNC parents with concentrated sales (group I) in one of the four industries reviewed. The seven economic variables used in this analysis are total sales, value added, employment, employee

compensation, average employee compensation (employee compensation/employment), sales per employee (total sales/employment), and net income. In addition to the seven variables, changes in the number of U.S. foreign affiliates and MNC parents were also analyzed. Percentage changes between the years 1999 and 2003 were estimated for the seven variables and the number of U.S. foreign affiliates and MNC parents.

For business support services [5614], however, the percentage change was calculated between 2000 and 2003 rather than for 1999 and 2003. The number of foreign affiliates for business support services [5614] increased from 55 in 1999 to 160 in 2000. Changes in the primary industry of even a single large U.S. MNC parent can cause pronounced changes in the number of foreign affiliates classified by the industry of their parent because a given parent might have dozens of foreign affiliates. Because MNC parents tend to be large diversified business enterprises, changes in the industrial mix of their activities can cause their primary industry to change and this appeared to be the case with 5614 between 1999 and 2000.

Total Sales and Total Sales of Services of U.S. Foreign Affiliates

To assess the destination of U.S. foreign affiliate sales—sales to foreign affiliates' local market, sales to U.S. market, or sales to other foreign markets—Academy staff examined total foreign affiliate sales to six different sales destinations. The six destinations of sales, disaggregated into affiliated (MNC parent or other foreign affiliates of U.S. MNC parent) and unaffiliated customers, were: total local sales to other foreign affiliates of U.S. parent, total local sales to unaffiliated customers, total sales to U.S. parent, total sales to U.S. unaffiliated customers, total sales to other foreign affiliates of U.S. parent in other countries, and total sales to unaffiliated customers in other countries. The sales in this analysis included both goods and services.

We calculated the values of total sales for each of the six sales destinations, and then estimated the percentage of total sales for each of the six sales destinations over the five-year time period for the four industry groups (group I). We also calculated the percentage change between the years 1999 and 2003 for total sales and each of the six total sales destinations. Again, for business support services [5614], we used the percentage change between 2000 and 2003 rather than for 1999 and 2003.

Academy staff used the same methodology to analyze the destination of foreign affiliates' sales of services. Total services sales were compared to total sales for foreign affiliates, and their distribution among the six sales destinations were estimated and compared to the distribution of total sales among these six destinations.

MNC Parent Affiliated and Unaffiliated Exports

To assess the composition and growth of MNC parent exports, Academy staff analyzed MNC parent total exports, total services exports, total affiliated and unaffiliated services exports. Total MNC parent exports were the sum of affiliated and unaffiliated goods and services exports. MNC parent services exports were the total of affiliated and unaffiliated services exports. The data for this analysis came from BEA financial and operating data, except for unaffiliated services exports which were extracted from the international transactions dataset. The time

series used was from 2001 to 2003 because SIC codes, rather than NAICS codes, were used in 1999 and 2000 for unaffiliated services exports data (except for MNC parent total affiliated exports that were available on a NAICS basis from 1999 to 2003).

To analyze the composition of MNC parent exports, we compared the ratios of total MNC parent services exports to total MNC parent exports, MNC parent affiliated services exports to total MNC parent services exports, and MNC parent unaffiliated services exports to total MNC parent services exports. Due to suppression issues, BEA was unable to allow us to show the percentages of total MNC parent services exports to total MNC parent exports for architectural, engineering and related services [5413], computer system design and related services [5415], and business support services [5614].

To analyze the growth of MNC parent exports, we calculated the percentage change between the years 2001 and 2003 for total MNC parent exports, total MNC parent services exports, MNC parent unaffiliated services exports and the ratios of MNC parent affiliated services exports to total MNC parent services exports and MNC parent unaffiliated services exports to total MNC parent services exports. Due to suppression issues, BEA was unable to allow us to show the percentage changes for the ratio of MNC parent services exports to total MNC parent exports for the four examined industry groups.

For MNC parent affiliated services exports, the percentage change was calculated between the years 1999 and 2003 because NAICS codes were used from 1999 to 2003. The percentage change for business support services [5614] was calculated between the years 2000 and 2003.

Sales Growth for MNC Parents Relative to Their Foreign Affiliates

Academy staff compared the growth in total sales of each MNC parent to the combined total sales of their foreign affiliates for the four group I industry groups used in the MNC parent analyses— those MNC parents with preponderance of sales in pharmaceutical and medicine manufacturing [3254], architectural, engineering and related services [5413], business support services [5614] and computer systems design and related services [5415]. The average percentage change in total sales between the years 1999 and 2003 for MNC parents and their foreign affiliates was used to determine whether MNC parents' or their combined foreign affiliates' total sales were growing faster.

We collapsed the foreign affiliate total sales data into one combined total for the foreign affiliates of each of the group I MNC parents in each of the four industries examined for 1999 and 2003. Next we hand matched each MNC parent with the combined total of their foreign affiliates for 1999 and 2003. Academy staff then calculated the average percentage change in total sales for the MNC parents between 1999 and 2003, did the same for their foreign affiliates, and then compared these two growth rates. We also tabulated combined total MNC parents in both 1999 and 2003; MNC parents with total sales growth less than their foreign affiliates; MNC parents with positive sales growth; and MNC parents with positive sales growth and sales growth less than their foreign affiliates.

The number of total MNC parents in this analysis is smaller than other MNC parent numbers throughout Chapter 6 because: (1) we included only those MNC parents in each group I industry group that existed for both 1999 and 2003, thus MNC parents that either entered or exited in one of the two years were not included in the tabulation; and (2) there were some MNC parents in 1999 that did not have foreign affiliates included in the data since these affiliates were exempt from reporting on the 1999 benchmark survey.

LISTING OF BACK-UP TABLES FOR CHAPTER 6

Table 6A-1 contains data from 1999 to 2003 showing the average value of the outsourcing, off-shoring and services off-shoring intensity indicators for the MNC parents in each industry and sub-group (groups I and II) as well as the number of parents in each year.

Table 6A-1
Comparison of Outsourcing, Total Off-shoring and Services Off-shoring Intensity Indicators by Industry (1999 to 2003)

	Industry	1999				2000				2001			
		Average Outsourcing	Average Offshoring	Average Services Offshoring	MNC Count	Average Outsourcing	Average Offshoring	Average Services Offshoring	MNC Count	Average Outsourcing	Average Offshoring	Average Services Offshoring	MNC Count
Group I	**3254**	0.585	0.190	0.027	46	0.562	0.162	0.028	44	0.562	0.176	0.041	43
	5413	0.532	0.025	0.023	48	0.507	0.031	0.028	45	0.520	0.032	0.032	44
	5415	0.490	0.024	0.017	104	0.478	0.031	0.024	100	0.466	0.033	0.021	98
	5614	0.432	0.016	0.002	10	0.356	0.018	0.001	10	0.390	0.027	0.004	10
Group II	**3254**	0.628	0.194	0.015	33	0.593	0.101	0.011	35	0.664	0.116	0.012	36
	5413	0.603	0.163	0.020	62	0.644	0.111	0.005	51	0.622	0.085	0.100	50
	5415	0.618	0.070	0.023	98	0.605	0.080	0.009	99	0.601	0.118	0.007	93
	5614	0.526	0.095	0.005	20	0.575	0.065	0.008	18	0.634	0.050	0.004	17

	Industry	2002				2003			
		Average Outsourcing	Average Offshoring	Average Services Offshoring	MNC Count	Average Outsourcing	Average Offshoring	Average Services Offshoring	MNC Count
Group I	**3254**	0.548	0.184	0.026	43	0.573	0.189	0.037	42
	5413	0.504	0.043	0.041	43	0.506	0.052	0.052	43
	5415	0.480	0.022	0.014	98	0.453	0.025	0.022	91
	5614	0.349	0.049	0.008	10	0.427	0.042	0.012	11
Group II	**3254**	0.639	0.109	0.012	34	0.657	0.116	0.015	33
	5413	0.647	0.076	0.014	51	0.645	0.115	0.014	53
	5415	0.603	0.052	0.007	89	0.588	0.060	0.010	85
	5614	0.556	0.067	0.005	13	0.616	0.062	0.005	16

Table 6A-2 shows the number and percentage of MNCs with imports (including goods and/or services) compared to the number and percentage of MNCs with services imports only for groups I and II in the four industries examined.

Table 6A-2
MNC Summary

Group I MNCs with Goods and Services Imports					
	1999	**2000**	**2001**	**2002**	**2003**
All MNCs					
Total MNCs	3872	3771	3717	3684	3587
Total w/Imports	1856	1781	1776	1778	1749
% Total	47.934	47.229	47.780	48.263	48.759
Total w/ Service Imports	653	578	583	583	571
% Total	16.865	15.327	15.685	15.825	15.919
3254					
Group I					
Total MNCs	46	44	43	43	42
Total w/Imports	32	31	32	32	31
% Total	69.57	70.45	74.42	74.42	73.81
Total w/ Service Imports	19	15	19	19	19
% Total	41.30	34.09	44.19	44.19	45.24
5413					
Group I					
Total MNCs	48	45	44	43	43
Total w/Imports	9	8	9	9	7
% Total	18.75	17.78	20.45	20.93	16.28
Total w/ Service Imports	7	7	8	7	7
% Total	14.58	15.56	18.18	16.28	16.28
5415					
Group I					
Total MNCs	104	100	98	98	91
Total w/Imports	17	21	23	25	23
% Total	16.35	21.00	23.47	25.51	25.27
Total w/ Service Imports	17	19	19	24	21
% Total	16.35	19.00	19.39	24.49	23.08
5614					
Group I					
Total MNCs	11	10	10	10	11
Total w/Imports	2	2	3	4	3
% Total	18.18	20.00	30.00	40.00	27.27
Total w/ Service Imports	2	2	2	3	3
% Total	18.18	20.00	20.00	30.00	27.27

Table 6A-2 continued

Group II MNCs with Goods and Services Imports					
	1999	**2000**	**2001**	**2002**	**2003**
All MNCs					
Total MNCs	3872	3771	3717	3684	3587
Total w/Imports	1856	1781	1776	1778	1749
% Total	47.934	47.229	47.780	48.263	48.759
Total w/ Service Imports	653	578	583	583	571
% Total	16.865	15.327	15.685	15.825	15.919
3254					
Group II					
Total MNCs	33	35	36	34	33
Total w/Imports	21	24	24	24	23
% Total	63.64	68.57	66.67	70.59	69.70
Total w/ Service Imports	9	9	8	9	14
% Total	27.27	25.71	22.22	26.47	42.42
5413					
Group II					
Total MNCs	62	51	50	51	53
Total w/Imports	34	28	26	29	32
% Total	54.84	54.90	52.00	56.86	60.38
Total w/ Service Imports	17	10	12	14	14
% Total	27.42	19.61	24.00	27.45	26.42
5415					
Group II					
Total MNCs	98	99	93	89	85
Total w/Imports	44	45	39	38	35
% Total	44.90	45.45	41.94	42.70	41.18
Total w/ Service Imports	37	24	21	25	24
% Total	37.76	24.24	22.58	28.09	28.24
5614					
Group II					
Total MNCs	20	18	17	13	16
Total w/Imports	8	8	6	5	8
% Total	40.00	44.44	35.29	38.46	50.00
Total w/ Service Imports	8	8	5	5	8
% Total	40.00	44.44	29.41	38.46	50.00

APPENDIX E

Table 6A-3 shows the regression coefficients for semi-log regressions for pooled time series data for two different sub-groups of MNC parents in each industry comparing services off-shoring MNC parents with non-services off-shoring MNC parents. The coefficients may be interpreted as average annual changes in the variable for the MNC parents in each industry and sub-group.

Table 6A-3
Average Annual Changes in Intensity Measures and Key Financial Performance Indicators
1999 to 2003

Group I	lnouts	lnoffsvc	lnemp	lnsalesemp	lnavecmp	lnnetinc	lnsales
3254: Group I - Services Off-Shorers	0.163	0.222 **	-0.042	0.188	0.074	-0.064	0.02
3254: Group I - Non-Services Off-Shorers	-0.136	-	-0.02	0.037	0.058	-0.197 **	-0.002
5413: Group I - Services Off-Shorers	-0.265	0.101	0.014	0.089	0.451 **	0.016	0.049
5413: Group I - Non-Services Off-Shorers	-0.027	-	0.004	-0.115	-0.112	0.005	-0.005
5415: Group I - Services Off-Shorers	-0.063	-0.036	0.063	0.049	-0.054	-0.13	0.081
5415: Group I - Non-Services Off-Shorers	-0.017	-	-0.013	0.014	0.021	-0.13 **	-0.009
5614: Group I - Services Off-Shorers	0.08	0.205	-0.078	0.45	0.348	0.4	0.156
5614: Group I - Non-Services Off-Shorers	0.031	-	-0.007	-0.136	-0.273	-0.212	-0.036

** Statistically significant at the 5% significance level.

Note: Measures are regression coefficients reflecting growth rates for 1999 to 2003 generated by SPSS' least squares regression. The regression method gives consideration to all data points in the series, thus it is least likely to be biased by a randomly high or low beginning or ending year.

Variables are defined as follows: ln = logarithm; outs = outsourcing intensity measure; off = total offshoring intensity; offsvc = services offshoring; intensity; emp = employment; salesemp = sales per employee; avecmp = average compensation; svcimp = service imports; netinc = net income; sales = total sales

Group II	lnouts	lnoffsvc	lnemp	lnsalesemp	lnavecmp	lnnetinc	lnsales
3254: Group II - Services Off-Shorers	0.139	-0.033	0.04	0.125	0.026	-0.034	0.076
3254: Group II - Non-Services Off-Shorers	0.043	-	-0.036	0.051	0.11	-0.097	-0.006
5413: Group II - Services Off-Shorers	0.141	0.19	0.15	0.068	0.154	0.127	0.175
5413: Group II - Non-Services Off-Shorers	0.004	-	0.013	0.005	0.038	-0.085	0.013
5415: Group II - Services Off-Shorers	0.019	-0.14	0.037	-0.008	0.034	-0.134	0.032
5415: Group II - Non-Services Off-Shorers	-0.047	-	0.012	-0.026	0.046	-0.028	0.004
5614: Group II - Services Off-Shorers	0.164	-0.037	-0.136	0.09	-0.052	-0.166	-0.081
5614: Group II - Non-Services Off-Shorers	0.1	-	0.122	0.066	0.184	-0.043	0.148

Note: Measures are regression coefficients reflecting growth rates for 1999 to 2003 generated by SPSS' least squares regression. The regression method gives consideration to all data points in the series, thus it is least likely to be biased by a randomly high or low beginning or ending year.

Variables are defined as follows: ln = logarithm; outs = outsourcing intensity measure; off = total offshoring intensity; offsvc = services offshoring intensity; emp = employment; salesemp = sales per employee; avecmp = average compensation; svcimp = service imports; netinc = net income; sales = total sales

Table 6A-4 contains detailed data on the percentage shares of various descriptive and financial measures accounted for by services off-shoring MNCs relative to the rest of the MNCs in their sub-group and industry.

Table 6A-4: Services Off-Shoring MNC Share of Total

	NUMBER MNCs			LARGE MNCs			TOTAL SALES	VALUE ADDED	EMPLOYMENT	EMPLOYMENT COMPENSATION
	Total MNCS	Service Off-Shorers	% of Total	Total MNCS	Service Off-Shorers	% of Total	% of Total	% of Total	% of Total	% of Total
3254										
Group I										
1999	46	19	**41.3%**	26	18	69.2%	84.0%	86.5%	83.6%	85.7%
2000	44	15	**34.1%**	24	14	58.3%	66.9%	66.8%	65.6%	70.2%
2001	43	17	**39.5%**	23	16	69.6%	85.3%	87.2%	83.2%	86.1%
2002	43	19	**44.2%**	24	18	75.0%	87.0%	89.6%	84.3%	85.8%
2003	42	19	**45.2%**	23	17	73.9%	87.4%	87.6%	84.9%	85.7%
Percent Change	-8.7%	0.0%	**9.5%**	-11.5%	-5.6%	6.8%	4.1%	1.3%	1.6%	0.0%
Group II										
1999	33	9	**27.3%**	26	9	34.6%	73.9%	76.1%	65.3%	71.4%
2000	35	9	**25.7%**	28	9	32.1%	71.4%	72.2%	59.8%	63.8%
2001	36	8	**22.2%**	28	8	28.6%	74.3%	75.1%	68.7%	69.8%
2002	34	9	**26.5%**	25	8	32.0%	74.5%	74.2%	68.5%	70.1%
2003	33	14	**42.4%**	24	7	29.2%	72.5%	74.3%	66.3%	68.4%
Percent Change	0.0%	55.6%	**55.6%**	-7.7%	-22.2%	-15.7%	-1.9%	-2.4%	1.5%	-4.1%
5413										
Group I										
1999	48	7	**14.6%**	18	6	33.3%	52.0%	32.2%	37.3%	35.2%
2000	45	6	**13.3%**	16	5	31.3%	50.7%	38.0%	32.2%	35.5%
2001	44	7	**15.9%**	16	6	37.5%	56.9%	41.4%	37.4%	39.6%
2002	43	7	**16.3%**	17	7	41.2%	57.0%	30.9%	34.0%	37.1%
2003	44	7	**15.9%**	16	7	43.8%	57.2%	33.1%	32.3%	36.7%
Percent Change	-8.3%	0.0%	**9.1%**	-11.1%	16.7%	31.3%	10.1%	3.1%	-13.3%	4.3%
Group II										
1999	60	16	**26.7%**	39	14	35.9%	41.5%	44.9%	48.3%	47.1%
2000	52	10	**19.2%**	29	9	31.0%	56.7%	49.7%	46.8%	41.5%
2001	51	12	**23.5%**	29	10	34.5%	58.0%	5.9%	38.2%	45.3%
2002	52	13	**25.0%**	30	11	36.7%	57.8%	54.2%	45.6%	53.0%
2003	54	13	**24.1%**	34	12	35.3%	61.0%	59.8%	46.6%	55.8%
Percent Change	-10.0%	-18.8%	**-9.7%**	-12.8%	-14.3%	-1.7%	46.8%	33.2%	-3.6%	18.5%
5415										
Group I										
1999	104	17	**16.3%**	42	10	23.8%	64.5%	57.5%	49.8%	68.0%
2000	100	19	**19.0%**	41	14	34.1%	76.0%	70.5%	64.8%	65.6%
2001	98	19	**19.4%**	41	15	36.6%	69.4%	67.2%	56.5%	62.3%
2002	98	24	**24.5%**	42	17	40.5%	70.1%	64.1%	59.0%	64.1%
2003	91	21	**23.1%**	41	16	39.0%	68.6%	65.0%	58.6%	67.0%
Percent Change	-12.5%	23.5%	**41.2%**	-2.4%	60.0%	63.9%	6.5%	13.1%	17.6%	-1.4%
Group II										
1999	98	37	**37.8%**	63	34	54.0%	77.6%	75.6%	71.0%	74.0%
2000	99	24	**24.2%**	61	21	34.4%	46.9%	55.2%	51.1%	49.9%
2001	93	22	**23.7%**	56	18	32.1%	55.9%	54.2%	54.9%	59.0%
2002	89	25	**28.1%**	51	21	41.2%	54.4%	57.2%	57.1%	59.2%
2003	85	24	**28.2%**	49	21	42.9%	56.7%	55.5%	55.4%	58.8%
Percent Change	-13.3%	-35.1%	**-25.2%**	-22.2%	-38.2%	-20.6%	-26.8%	-26.6%	-22.0%	-20.4%
5614										
Group I										
1999	11	2	**18.2%**	10	2	20.0%	D	D	D	D
2000	10	2	**20.0%**	9	2	22.2%	D	D	D	D
2001	10	2	**20.0%**	9	2	22.2%	D	D	D	D
2002	10	3	**30.0%**	9	3	33.3%	D	D	D	D
2003	11	3	**27.3%**	10	3	30.0%	D	D	D	D
Percent Change	0.0%	50.0%	**50.0%**	0.0%	50.0%	50.0%	D	D	D	D
Group II										
1999	20	8	**40.0%**	19	7	36.8%	49.1%	55.8%	48.2%	50.0%
2000	18	8	**44.4%**	19	8	42.1%	57.8%	56.6%	47.6%	53.5%
2001	17	5	**29.4%**	16	5	31.3%	56.7%	53.5%	69.5%	42.4%
2002	13	5	**38.5%**	13	5	38.5%	71.0%	58.8%	49.1%	49.5%
2003	16	8	**50.0%**	16	7	43.8%	70.3%	60.1%	52.3%	53.2%
Percent Change	-20.0%	0.0%	**25.0%**	-15.8%	0.0%	18.8%	43.3%	7.7%	8.6%	6.4%

	AVERAGE EMPLOYMENT COMPENSATION		TOTAL SALES/ EMPLOYMENT	TOTAL IMPORTS	NET INCOME	CAPITAL EXPENDITURE
	Service Off-Shorers (%)	% of Total	% of Total	% of Total	% of Total	% of Total
3254						
Group I						
1999	**41.3%**	102.6%	100.5%	74.0%	95.4%	83.2%
2000	**34.1%**	107.0%	102.0%	67.8%	64.7%	41.3%
2001	**39.5%**	103.4%	102.4%	79.0%	97.6%	87.7%
2002	**44.2%**	101.8%	103.2%	87.5%	99.6%	87.5%
2003	**45.2%**	101.0%	102.9%	87.4%	101.2%	83.0%
Percent Change	**9.5%**	-1.6%	2.5%	18.2%	6.1%	-0.2%
Group II						
1999	**27.3%**	109.3%	113.1%	63.9%	93.6%	74.5%
2000	**25.7%**	106.6%	119.4%	55.8%	95.4%	73.3%
2001	**22.2%**	101.6%	108.1%	60.0%	92.3%	79.9%
2002	**26.5%**	102.4%	108.8%	70.4%	77.4%	72.7%
2003	**42.4%**	103.2%	109.4%	68.4%	94.5%	69.7%
Percent Change	**55.6%**	-5.5%	-3.3%	7.0%	0.9%	-6.5%
5413						
Group I						
1999	**14.6%**	94.4%	139.4%	96.7%	-25.6%	17.6%
2000	**13.3%**	110.2%	157.3%	100.0%	123.7%	24.5%
2001	**15.9%**	105.7%	151.9%	93.6%	67.3%	37.5%
2002	**16.3%**	109.2%	167.8%	93.4%	236.1%	24.3%
2003	**15.9%**	113.6%	177.0%	100.0%	-6.8%	28.3%
Percent Change	**9.1%**	20.3%	27.0%	3.4%	-73.5%	60.6%
Group II						
1999	**26.7%**	97.4%	85.9%	30.9%	33.1%	29.3%
2000	**19.2%**	88.6%	121.1%	70.3%	37.7%	40.3%
2001	**23.5%**	118.7%	152.1%	59.0%	74.1%	59.8%
2002	**25.0%**	116.1%	126.7%	60.2%	104.6%	51.9%
2003	**24.1%**	119.7%	130.9%	77.4%	108.8%	48.4%
Percent Change	**-9.7%**	22.9%	52.3%	150.3%	229.0%	65.1%
5415						
Group I						
1999	**16.3%**	136.6%	129.4%	100.0%	80.2%	72.7%
2000	**19.0%**	101.4%	117.4%	97.1%	90.0%	80.0%
2001	**19.4%**	110.3%	122.7%	26.0%	100.0%	1.5%
2002	**24.5%**	108.6%	118.8%	99.9%	79.9%	75.6%
2003	**23.1%**	114.5%	117.2%	99.8%	87.5%	76.8%
Percent Change	**41.2%**	-16.2%	-9.5%	-0.2%	9.1%	5.6%
Group II						
1999	**37.8%**	104.2%	109.3%	90.2%	100.6%	80.8%
2000	**24.2%**	97.6%	91.9%	54.8%	85.0%	50.6%
2001	**23.7%**	107.5%	101.9%	58.0%	73.5%	57.4%
2002	**28.1%**	103.6%	95.2%	62.4%	28.2%	51.3%
2003	**28.2%**	106.3%	102.5%	68.0%	34.1%	49.0%
Percent Change	**-25.2%**	2.0%	-6.2%	-24.6%	-66.1%	-39.4%
5614						
Group I						
1999	**18.2%** D	D	D	D	D	
2000	**20.0%** D	D	D	D	D	
2001	**20.0%** D	D	D	D	D	
2002	**30.0%** D	D	D	D	D	
2003	**27.3%** D	D	D	D	D	
Percent Change	**50.0%** D	D	D	D	D	

Note: Values for 5614, group 1 have not been included due to disclosure issues.

Table 6A-5 contains the results of difference-of-means statistical tests comparing MNCs in the four industries on selected financial indicators.

Table 6A-5
Services Off-Shorers and Non-Services Off-Shorers Average Differences in Selected Financial Performance Indicators

Group I							
	sales	sales/employee	outsourcing intensity	net income	average compensation	employment	employment compensation
3254: Group I - Services Off-Shorers	7,556,161	431	0.57	1,511,351	97	16,559	1,619,390
3254: Group I - Non-Services Off-Shorers	1,120,416	272	-0.26	77,587	64	2,831	237,575
Average Difference	6,435,745 **	159	0.83	1,433,764 **	33 **	13,728 **	1,381,815 **
5413: Group I - Services Off-Shorers	1,795,320	265	0.66	13,041	66	4,957	335,339
5413: Group I - Non-Services Off-Shorers	275,445	170	0.48	3,776	63	1,731	107,017
Average Difference	1,519,875 **	95 **	0.18	9,265 **	3 **	3,226 **	228,322 **
5415: Group I - Services Off-Shorers	2,743,466	325	0.47	357,526	629	9,900	850,010
5415: Group I - Non-Services Off-Shorers	309,038	175	0.48	12,602	242	1,883	115,997
Average Difference	2,434,428 **	150 **	-0.01	344,924 **	387 **	8,017 **	734,013 **
5614: Group I - Services Off-Shorers	1,993,636	97	0.38	27,107	45	14,025	812,435
5614: Group I - Non-Services Off-Shorers	1,299,619	76	0.30	44,178	30	12,792	525,149
Average Difference	694,017	21	0.08	-17,071	15	1,233	287,286

Group II							
	sales	sales/employee	outsourcing intensity	net income	average compensation	employment	employment compensation
3254: Group II - Services Off-Shorers	146,851,188	477	0.67	1,414,784	68	29,550	2,095,404
3254: Group II - Non-Services Off-Shorers	1,734,588	373	0.64	37,922	63	4,960	308,115
Average Difference	145,116,600 **	104	0.03	1,376,862 **	5 **	24,590 **	1,787,289 **
5413: Group II - Services Off-Shorers	11,709,982	616	0.67	335,376	63	25,456	1,631,943
5413: Group II - Non-Services Off-Shorers	2,779,534	341	0.65	50,220	64	9,225	507,861
Average Difference	8,930,448 **	275 **	0.02 **	285,156 **	-1	16,231 **	1,124,082 **
5415: Group II - Services Off-Shorers	8,218,474	337	0.57	343,315	69	29,179	2,126,683
5415: Group II - Non-Services Off-Shorers	2,340,466	272	0.61	29,719	67	8,383	557,679
Average Difference	5,878,008 **	65 **	-0.04	313,596 **	2	20,796 **	1,569,004 **
5614: Group II - Services Off-Shorers	8,475,384	340	0.63	1,208,754	53	21,833	1,247,088
5614: Group II - Non-Services Off-Shorers	3,463,999	287	0.55	226,780	57	15,824	848,221
Average Difference	5,011,385.00 **	53.00	0.08	981,974.00 **	-4.00	6,009.00	398,867.00 **

** Difference is statistically significant at the 5% significance level.
Note: Numbers, except for employment, are in thousands and are rounded up to the nearest whole number.

Table 6A-6 shows the percentage changes in seven economic indicators for foreign affiliates with MNC parents in each industry between the years 1999 and 2003 or 2000 and 2003.

Table 6A-6
Growth of U.S. Foreign Affiliates—Percentage Change From 1999 to 2003 or 2000 to 2003

	Sales	Value Added	Employment	Employment Compensation	Average Employment Compensation	Sales Per Employee	Net Income
	Total	Total	Total	Total	Total	Total	Total
3254							
Percent Change from 1999 to 2003*[1]	57.4%	40.5%	10.3%	24.4%	12.7%	42.7%	203.5%
5413							
Percent Change from 1999 to 2003*[1]	-12.7%	15.6%	28.5%	9.1%	-15.1%	-32.0%	55.2%
5415							
Percent Change from 1999 to 2003*[1]	9.0%	10.3%	5.5%	4.5%	-0.9%	3.3%	74.8%
5614							
Percent Change from 2000 to 2003*[2]	10.7%	12.5%	-3.3%	-2.6%	0.7%	14.5%	821.6%

*1/ Percent Change between years 1999 and 2003 is calculated as: (total variable value for 2003-total variable value for 1999)/total variable value for 1999.

*2/ Percent Change between years 2000 and 2003 is calculated as: (total variable value for 2003-total variable value for 2000)/total variable value for 2000.

Note: The number of foreign affiliates for business support services [5614] increased from 55 in 1999 to 160 in 2000. Changes in the primary industry of even a single large U.S. MNC parent can cause pronounced changes in the number of foreign affiliates classified by the industry of their parent because a given parent might have dozens of foreign affiliates. U.S. MNC parent are classified by their primary industry of sales. Because MNC parents tend to be large, diversified business enterprises, changes in the industrial mix of their activities can cause their primary industry to change. For this reason, we calculated the percentage change between 2000 and 2003 for 5614, rather than 1999 and 2003.

Table 6A-7 shows the percentage changes for the same seven economic indicators used in Table 6A-6 for MNC parents in each industry between 1999 and 2003 in order to compare the MNC parents' growth to their foreign affiliates' growth for each indicator.

Table 6A-7
Growth of MNC Parents- Percentage Change from 1999 to 2003

	Sales	Value Added	Employment	Employment Compensation	Average Employment Compensation	Sales Per Employee	Net Income
	Total	Total	Total	Total	Total	Total	Total
3254							
Percent Change from 1999 to 2003*[1]	43.2%	22.3%	10.9%	32.1%	19.1%	29.1%	13.8%
5413							
Percent Change from 1999 to 2003*[1]	1.3%	5.0%	-17.7%	0.1%	21.6%	23.0%	224.7%
5415							
Percent Change from 1999 to 2003*[1]	-6.8%	-3.7%	-8.4%	8.9%	18.8%	1.8%	-11.7%
5614							
Percent Change from 1999 to 2003*[1]	-12.2%	-7.0%	-9.3%	-8.6%	0.7%	-3.2%	-79.3%

*1/ Percent Change between years 1999 and 2003 is calculated as: (total variable value for 2003-total variable value for 1999)/total variable value for 1999.

Table 6A-8 contains foreign affiliate sales data—both goods and services—by destination--local sales, sales to other foreign customers, and sales to U.S. customer—and customer type—affiliated and unaffiliated customers, for 1999 to 2003.

Table 6A-8
Total Affiliated Sales by Destination and Customer Type (1999 to 2003)

	Total Local Sales to Other Foreign Affiliates of U.S. Parent % of Total Sales	Total Local Sales to Unaffiliated Customers % of Total Sales	Total Sales to U.S. Parent % of Total Sales	Total Sales to U.S. Unaffiliated Customers % of Total Sales	Total Sales to Other Foreign Affiliates of U.S. Parent in Other Countries % of Total Sales	Total Sales to Unaffiliated Customers in Other Countries % of Total Sales
3254						
1999	6.0%	55.5%	6.6%	0.3%	26.1%	5.4%
2000	3.0%	51.4%	6.8%	0.2%	28.6%	10.0%
2001	3.4%	51.8%	6.6%	0.3%	29.3%	8.7%
2002	3.5%	48.0%	8.6%	0.5%	31.2%	8.2%
2003	4.4%	43.2%	8.1%	0.1%	36.3%	7.9%
5413						
1999	0.5%	82.0%	0.3%	0.5%	1.4%	15.2%
2000	0.8%	71.4%	0.7%	1.5%	1.9%	23.7%
2001	0.6%	76.5%	1.0%	1.4%	1.4%	19.1%
2002	0.6%	76.9%	0.8%	1.2%	1.5%	18.9%
2003	3.4%	76.7%	0.3%	0.3%	2.6%	16.6%
5614						
1999	0.2%	97.1%	0.0%	1.4%	0.2%	1.1%
2000	10.6%	71.0%	4.2%	0.0%	1.8%	12.4%
2001	0.0%	48.6%	4.9%	0.0%	27.7%	18.8%
2002	0.3%	46.8%	2.1%	0.0%	17.9%	32.9%
2003	0.1%	53.3%	1.2%	1.5%	12.5%	31.3%
5415						
1999	0.4%	71.6%	11.4%	0.7%	13.9%	2.0%
2000	0.6%	73.4%	10.4%	0.4%	10.3%	5.0%
2001	0.2%	70.7%	10.3%	0.2%	15.7%	2.9%
2002	0.5%	73.3%	9.4%	0.3%	14.6%	2.0%
2003	0.8%	76.5%	8.4%	0.3%	12.6%	1.5%

Table 6A-9 shows the percentage change from 1999 to 2003 or 2000 to 2003 for total affiliated sales by destination and customer type.

Table 6A-9
Total Affiliated Sales by Destination and Customer Type—Percentage Change from 1999 to 2003 or 2000 to 2003

	Total Sales	Total Local Sales to Other Foreign Affiliates of U.S. Parent	Total Local Sales to Other Foreign Affiliates of U.S. Parent % of Total Sales	Total Local Sales to Unaffiliated Customers	Total Local Sales to Unaffiliated Customers % of Total Sales	Total Sales to U.S. Parent	Total Sales to U.S. Parent % of Total Sales	Total Sales to U.S. Unaffiliated Customers	Total Sales to U.S. Unaffiliated Customers % of Total Sales	Total Sales to Other Foreign Affiliates of U.S. Parent in Other Countries	Total Sales to Other Foreign Affiliates of U.S. Parent in Other Countries % of Total Sales	Total Sales to Unaffiliated Customers in Other Countries
3254												
% Change from 1999 to 2003*[1]	57.4%	15.0%	-27.0%	22.5%	-22.2%	93.6%	23.0%	-46.9%	-66.3%	118.4%	38.8%	130.7%
5413												
% Change from 1999 to 2003*[1]	-12.7%	449.1%	529.0%	-18.4%	-6.5%	-9.6%	3.6%	-53.1%	-46.3%	67.5%	91.8%	-4.5%
5614												
% Change from 1999 to 2003*[1]								1138.7%	9.6%			
% Change from 2000 to 2003*[2]	10.7%	-98.7%	-98.8%	-16.8%	-24.8%	-68.1%	-71.2%			655.3%	582.4%	179.6%
5415												
% Change from 1999 to 2003*[1]	9.0%	138.7%	119.0%	16.4%	6.8%	-19.5%	-26.1%	-57.4%	-60.9%	-1.6%	-9.7%	-20.1%

*1/ Percent Change between years 1999 and 2003 is calculated as: (total variable value for 2003-total variable value for 1999)/total variable value for 1999.

*2/ Percent Change between years 2000 and 2003 is calculated as: (total variable value for 2003-total variable value for 2000)/total variable value for 2000.

Note: The number of foreign affiliates for business support services [5614] increased from 55 in 1999 to 160 in 2000. Changes in the primary industry of even a single large U.S. MNC parent can cause pronounced changes in the number of foreign affiliates classified by the industry of their parent because a given parent might have dozens of foreign affiliates. U.S. MNC parent are classified by their primary industry of sales. Because MNC parents tend to be large, diversified business enterprises, changes in the industrial mix of their activities can cause their primary industry to change. For this reason, we calculated the percentage change between 2000 and 2003 for 5614, rather than 1999 and 2003. The average percentage change between 1999 and 2003 was used for "Sales to U.S. Unaffiliated Customers" for 5614 because there were only sales made by MNCs in this industry to U.S. unaffiliated customers in the years 1999 and 2003.

Table 6A-10 contains affiliate sales of services data by destination--local sales, sales to other foreign customers, and sales to U.S. customer—and customer type—affiliated and unaffiliated customers, for 1999 to 2003.

Table 6A-10
Total Affiliated Sales of Services by Destination and Customer Type

	Total Sales of Services % of Total Sales	Local Sales of Services to Other Foreign Affiliates of U.S. Parent % of Total Sales of Services	Local Sales of Services to Unaffiliated customers% of Total Sales of Services	Sales of Services to U.S. Parent % of Total Sales of Services	Sales of Services to U.S. Unaffiliated Customers % of Total Sales of Services	Sales of Services to Other Foreign Affiliates of U.S. Parent in Other Countries % of Total Sales of Services	Sales of Services to Unaffiliated Customers in Other Countries % of Total Sales of Services
3254							
1999	0.6%	6.0%	75.2%	9.0%	0.02%	9.8%	0.0%
2000	1.0%	19.0%	68.5%	2.0%	1.1%	7.3%	2.2%
2001	1.2%	8.8%	70.8%	5.2%	0.01%	15.1%	0.0%
2002	1.0%	19.4%	56.0%	4.9%	0.04%	19.6%	0.1%
2003	1.2%	3.3%	53.7%	10.7%	0.01%	31.7%	0.5%
5413							
1999	42.2%	1.3%	60.7%	0.4%	1.1%	3.1%	33.4%
2000	61.5%	1.3%	57.3%	0.6%	1.1%	2.9%	36.8%
2001	57.5%	0.9%	64.6%	0.9%	0.2%	2.4%	31.0%
2002	53.8%	1.0%	60.3%	1.0%	0.1%	2.7%	34.8%
2003	51.6%	3.0%	60.0%	0.5%	0.0%	5.0%	31.4%
5614							
1999	98.9%	0.2%	97.1%	0.0%	1.4%	0.2%	1.1%
2000	33.3%	32.0%	67.3%	0.0%	0.0%	0.3%	0.4%
2001	33.3%	0.0%	49.5%	1.4%	0.0%	48.8%	0.3%
2002	36.7%	0.0%	51.7%	1.3%	0.0%	46.7%	0.4%
2003	40.2%	0.0%	69.8%	0.6%	3.7%	25.5%	0.4%
5415							
1999	51.0%	0.5%	80.5%	7.0%	0.5%	8.8%	2.8%
2000	50.4%	0.8%	85.0%	2.3%	0.7%	4.9%	6.4%
2001	50.9%	0.2%	81.2%	4.9%	0.4%	10.5%	2.8%
2002	55.0%	0.2%	81.3%	4.9%	0.4%	11.2%	2.0%
2003	58.0%	0.7%	80.1%	6.6%	0.4%	11.0%	1.1%

Table 6A-11 shows the percentage change from 1999 to 2003 or 2000 to 2003 for affiliated sales of services by destination and customer type.

Table 6A-11
Affiliated Sales of Services by Destination and Customer Type—Percentage Change From 1999 to 2003 or 2000 to 2003

	Total Sales	Sales of Services	Sales of Services % of Total Sales	Local Sales of Services to Other Foreign Affiliates of U.S. Parent	Local Sales of Services to Other Foreign Affiliates of U.S. Parent % of Sales of Services	Local Sales of Services to Unaffiliated customers	Local Sales of Services to Unaffiliated customers % of Sales of Services	Sales of Services to U.S. Parent	Sales of Services to U.S. Parent % of Sales of Services	Sales of Services to U.S. Unaffiliated Customers	Sales of Services to U.S. Unaffiliated Customers % of Sales of Services	Sales of Services to Other Foreign Affiliates of U.S. Parent in Other Countries
3254												
% Change from 1999 to 2003*[1]	57.4%	192.9%	86.1%	62.0%	-44.7%	109.3%	-28.6%	248.4%	19.0%	43.5%	-51.0%	847.8%
% Change from 2000 to 2003*[2]												
5413												
% Change from 1999 to 2003*[1]	-12.7%	6.9%	22.4%	151.4%	135.3%	5.7%	-1.1%	27.0%	18.9%	-96.7%	-96.9%	72.1%
5614												
% Change from 1999 to 2003*[1]										1138.7%	170.0%	
% Change from 2000 to 2003*[2]	10.7%	33.6%	20.7%	-100.0%	-100.0%	38.6%	3.7%	3096.5%	2291.9%			11296.5%
5415												
% Change from 1999 to 2003*[1]	9.0%	23.8%	13.6%	99.8%	61.4%	23.2%	-0.5%	18.1%	-4.6%	9.4%	-11.6%	55.0%

*1/ Percent Change between years 1999 and 2003 is calculated as: (total variable value for 2003-total variable value for 1999)/total variable value for 1999.

*2/ Percent Change between years 2000 and 2003 is calculated as: (total variable value for 2003-total variable value for 2000)/total variable value for 2000.

Note: In the case of 3254, the percent change from 2000 to 2003 is taken when there are zero values for 1999. In the case of 5614, the number of foreign affiliates for business support services [5614] increased from 55 in 1999 to 160 in 2000. Changes in the primary industry of even a single large U.S. MNC parent can cause pronounced changes in the number of foreign affiliates classified by the industry of their parent because a given parent might have dozens of foreign affiliates. U.S. MNC parent are classified by their primary industry of sales. Because MNC parents tend to be large, diversified business enterprises, changes in the industrial mix of their activities can cause their primary industry to change. For this reason, we calculated the percentage change between 2000 and 2003 for 5614, rather than 1999 and 2003. However, the average percentage change between 1999 and 2003 was used for "Sales of Services to U.S. Unaffiliated Customers" and "Sales of Services to U.S. Unaffiliated Customers % of Sales of Services" for 5614 because there were only sales of services made by MNCs in this industry to U.S. unaffiliated customers in the years 1999 and 2003.

Table 6A-12 shows the composition of MNC parent exports using the ratios of MNC parent affiliated services exports to total MNC parent services exports, and MNC parent unaffiliated services exports to total MNC parent services exports.

Table 6A-12
MNC Parent Affiliated and Unaffiliated Services Exports (2001-2003)*1

	Total MNC Services Exports % of Total MNC Parent Exports	MNC Parent Affiliated Services Exports % of Total MNC Parent Services Exports	MNC Parent Unaffiliated Services Exports % of Total MNC Parent Services Exports
3254			
2001	19.8%	99.0%	1.0%
2002	22.2%	97.8%	2.2%
2003	16.3%	98.7%	1.3%
5413			
2001	**D**[*2]	76.1%	23.9%
2002	**D**	74.4%	25.6%
2003	**D**	62.8%	37.2%
5614			
2001	**D**	99.7%	0.3%
2002	**D**	97.4%	2.6%
2003	**D**	98.0%	2.0%
5415			
2001	**D**	85.6%	14.4%
2002	**D**	84.5%	15.5%
2003	**D**	85.4%	14.6%

*1/ BEA unaffiliated services export data are classified using NAICS codes starting in 2001, consequently total exports and total services exports could only be calculated for our four industries from 2001 to 2003.

*2/ Due to suppressions issues, BEA was unable to allow us to show data in these cases.

Table 6A-13 shows the percentage change from 2001 to 2003 for total MNC parent exports, MNC parent services exports, MNC parent unaffiliated services exports, and the ratios of MNC parent affiliated services exports to total MNC parent services exports and MNC parent unaffiliated services exports to total MNC parent services exports. The percentage change from 1999 to 2003 or 2000 to 2003 was used for MNC parent affiliated services exports.

Table 6A-13
MNC Parent Affiliated and Unaffiliated Services Exports—Percentage Change from 2001 to 2003 or 2000 to 2003

	Total MNC Parent Exports	Total MNC Parent Services Exports	MNC Services Exports % of Total MNC Parent Exports	MNC Parent Affiliated Services Exports	MNC Parent Affiliated Services Exports% of Total MNC Parent Services Exports	MNC Parent Unaffiliated Services Exports	MNC Parent Unaffiliated Services Exports% of Total MNC Parent Services Exports
3254							
% Change from 2001 to 2003*[1]	26.1%	3.8%	**D*[4]**		-0.3%	39.1%	34.0%
% Change from 1999 to 2003*[2]				-6.3%			
5413							
% Change from 2001 to 2003*[1]	41.4%	-4.1%	**D**		-17.4%	49.0%	55.4%
% Change from 1999 to 2003*[2]				-54.0%			
5614							
% Change from 2001 to 2003*[1]	-16.3%	-2.2%	**D**		-1.7%	594.7%	610.7%
% Change from 2000 to 2003*[3]				-0.8%			
5415							
% Change from 2001 to 2003*[1]	10.9%	35.1%	**D**		-0.3%	37.3%	1.6%
% Change from 1999 to 2003*[2]				32.1%			

*1/ Percent Change from 2001 to 2003 is calculated as: (total variable value for 2003-total variable value for 2001)/total variable value for 2001.

Note: BEA unaffiliated services export data are classified using SIC codes through 2000 and then are classified using NAICS codes starting in 2001, consequently total exports and total services exports could only be calculated for our four industry from 2001-2003.

*2/ Percent Change from 1999 to 2003 is calculated as: (total variable value for 2003-total variable value for 1999)/total variable value for 1999.

*3/ Percent Change from 2000 to 2003 is calculated as: (total variable value for 2003-total variable value for 2000)/total variable value for 2000.

Note: The number of foreign affiliates for business support services [5614] increased from 55 in 1999 to 160 in 2000. Changes in the primary industry of even a single large U.S. MNC parent can cause pronounced changes in the number of foreign affiliates classified by the industry of their parent because a given parent might have dozens of foreign affiliates. U.S. MNC parent are classified by their primary industry of sales. Because MNC parents tend to be large, diversified business enterprises, changes in the industrial mix of their activities can cause their primary industry to change. For this reason, we calculated the percentage change between 2000 and 2003 for 5614, rather than 1999 and 2003.

*4/ Due to suppressions issues, BEA was unable to allow us to show data in these cases.