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Distance Isn't Quite Dead: Recent Trade Patterns and Modes of Supply in Computer and Information Services in the United States and NAFTA Partners

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Abstract

This paper evaluates the statistical strengths and weaknesses of available data on US computer and information services trade and estimates the scope of delivery through GATS modes 1, 3, and 4. Trade values are estimated using a new methodology that adheres, to the greatest extent possible, to the definitions of modes of supply in the *2002 Manual on Statistics of International Trade in Services*. This paper finds that US trade (particularly exports) in computer and information services are overwhelmingly and increasingly delivered through mode 3. The United States is found to have experienced declining overall revealed comparative advantage (RCA) in traditional mode 1 cross-border computer and information services trade from 1986 to 2006, while having a stable, positive RCA in mode-3 trade. A new methodology for tentatively estimating US imports of computer and information services in GATS mode 4 suggests that the IT services sector dominates US mode-4 imports, and that these are several times larger than US traditional mode-1, cross-border imports of computer and information services.

Keywords: US computer and information services trade; Services trade data validity; GATS modes of supply; Revealed comparative advantage

JEL codes: L86, F16, F21, F22

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There are known knowns. There are things we know that we know. There are known unknowns. That is to say, there are things that we now know we don't know. But there are also unknown unknowns. There are things we do not know we don't know.

—Donald Rumsfeld, Pentagon Briefing, February 12, 2002

I INTRODUCTION

This paper describes developments in US and regional NAFTA trade patterns in computer and information services (C&IS) in recent years, with particular emphasis on the relative importance of and trends in different modes of supply of C&IS.¹ Due to superior data availability, the majority of this paper concerns the United States.

The study of C&IS trade warrants attention due to C&IS's general characteristics as an enabling technology, which, as input to other sectors and products, have been found to positively affect productivity in the United States.² Secondly, C&IS trade is intuitively among the most *digitizable* of commercial services and accordingly can be expected to be perhaps the most internationally tradable among commercial service categories. Investigating C&IS trade trends might therefore reveal early results also relevant for other, less immediately digitizable commercial services.

Analyzing specifically US C&IS trade by mode of supply is appealing for several reasons: The IT services industry is among the most globalized of all services industries, and US IT services companies are globally dominant and thus make up the majority of the world's top companies in this category of industry.³ The commercial activity and strategies of the US IT services industry can therefore indicate, with reasonable certainty, where the global IT services industry is heading. Even allowing for today's huge global scale advantage for the incumbent US IT services industry, it is a sensible benchmark for global trends in the industry. Furthermore, US government statistical agencies produce the most comprehensive statistical coverage of this industry in the world. As such, a much more elaborate analysis of the US IT services industry can be made than is possible for industries in other countries.

More detailed data available on C&IS trade in the United States is used in this paper to carry out a mode-of-supply analysis that adheres, to the greatest extent possible, to the definitions of modes of supply in the *2002 Manual on Statistics of International Trade in Services* (MSITS).⁴ This is particularly relevant

1. This paper was first presented at the OECD Services Expert Meeting on Business Services, Paris, June 24, 2008.

2. See, for instance, Oliner, Sichel, and Stiroh (2007) and Jorgenson, Ho, and Stiroh (2007).

3. OECD (2006, tables 1.A1.4 and 1.A1.5) show that US firms made up nine of the global top-ten IT services firms in 2005 (the registration, for tax purposes, of Accenture in Bermuda is disregarded here) and eight of the global top-ten software companies in 2005.

4. The MSITS was a joint publication by the UN, IMF, OECD, UNCTAD, European Commission, and WTO. For the sake of convenience, it is referred to as MSITS (2002), rather than by its authors.

in the analysis of mode 3, where this paper is able to adopt a very narrow and targeted definition of “commercial presence,” closely aligned with the traditional mode-1 definition of C&IS trade. In addition, mode 3 is quantified using data on local-market sales by foreign affiliates, rather than with the proxy of foreign direct investment (FDI) stock and flow data commonly used in the literature. The mode-3 trade data used in this paper thus possesses enhanced definitional validity, although partially at the expense of the number of available data points.

The superiority of available, relevant data from US official sources extends to mode-4 trade. This paper introduces a new methodology using wage and occupational data from the US Department of Homeland Security for temporary immigrants to the United States to attempt to quantify and approximate US mode-4 C&IS import trade.

C&IS trade is generally considered among the least-restricted categories under the General Agreement on Trade in Services (GATS). This paper briefly illustrates explicit sectoral trade barriers and investigate the types, scope, and importance of domestic regulation for C&IS trade by mode of supply in the United States and elsewhere. This paper further analyzes the impact of NAFTA on regional trade in C&IS.

This paper is structured as follows. Given the importance of methodological and statistical concerns, Section II discusses the numerous data limitations and caveats that are relevant to the analysis of C&IS trade by mode of supply, and identifies the specific data categories chosen for analysis in this paper. Section III describes the most recent trends in aggregate US C&IS trade in modes 1 and 3, estimates the revealed comparative advantages (RCA) for US C&IS trade by mode of supply, and analyzes bilateral differences in C&IS trade and the relative importance of different modes of supply in bilateral trade. Section IV covers the impact of explicit GATS barriers to C&IS trade, as well as the impact on trade of US domestic regulations, with an emphasis on national security concerns. Section V introduces a new methodology for estimating and evaluating the scope of US C&IS trade in mode 4 and considers the impact on C&IS mode-4 trade of US immigration laws. Section VI presents estimates for the relative importance of all modes of supply in US C&IS trade and compares with other studies’ findings. Section VII explores the impact of NAFTA on regional C&IS trade, while section VIII concludes.

II DATA AVAILABILITY AND CLASSIFICATION AND COMPATIBILITY ISSUES IN US AND NAFTA DATA FOR COMPUTER AND INFORMATION SERVICES

It is the nature of all greatness not to be exact. —Edmund Burke⁵

Accurately measuring almost any trade in services is intrinsically more complicated than measuring trade in goods. Precise and coherent definitions of services are hard to establish, as these are frequently abstract

5. Unless otherwise specified, quotes in this paper are from Shaw (2001).

concepts (such as, say, management consulting) and almost invariably possess no physical form. In contrast to merchandise trade, services trade very rarely entails a physical package crossing a customs frontier, dutifully stamped with an internationally recognized commodity code, and containing a description of contents, origin, and destination. Further, services trade data collection can not rely on the significant public administrative apparatus that exists for the collection of customs duties. Unlike for goods, the measurement of services trade is aided by few such mandatory data-generating administrative practices.

Instead, statisticians working on services trade measurements are compelled to rely on several different data-gathering techniques, including surveys, business accounting records, other (frequently nonmandatory) administrative records, and estimation techniques. Services trade data therefore rely on a multitude of different data sources and stakeholders, whose common and consistent understanding of services concepts is of the utmost importance for data validity. This gives rise to the ultimately insoluble services-trade data conflict between researchers, trade negotiators, and policy makers on the one hand, who desire accurate and comprehensive data, and the costs of collection, the burden of information provision on private businesses, and confidentiality concerns on the other.⁶ All services trade data originate from an unstable compromise between these conflicting demands. One must, when analyzing C&IS, never lose sight of these broader issues pertaining to services-trade data collection.

Fortunately, different parts of the US government maintain, by a significant margin, the most comprehensive, valid, and timely data collection effort in the world in areas relevant to the analysis of C&IS. The spoils of this ongoing data collection effort make the United States (and its NAFTA partners) the only country (or region) for which an empirically oriented paper of this nature could be written, while at the same time still raising substantial data availability, classification, and comparability issues. These issues are the subject of the remainder of this section.

The starting point of this analysis is the standard definition of C&IS from the International Monetary Fund's *Balance of Payments Manual*, 5th edition (1995, 39–40), henceforth referred to as BPM5, which defines it as follows:

“Computer and information services” covers resident/nonresident transactions related to hardware consultancy, software implementation, information services (data processing, data base, news agency), and maintenance and repair of computers and related equipment.

Further, the MSITS, as part of the Extended Balance of Payments Service classification system, identifies three disaggregated subcomponents of C&IS:⁷

6. See the introduction to MSITS (2002) for an elaboration of these general issues in services data collection.

7. When the MSITS was prepared, the classification of the provision of software downloaded from the internet was not decided upon. This issue remains under discussion in the process of updating BPM5 (IMF 2006). As the level of download

7.1 Computer services: consists of hardware and software-related services and data-processing services. Included are hardware and software consultancy and implementation services; maintenance and repair of computers and peripheral equipment; disaster recovery services, provision of advice and assistance on matters related to the management of computer resources; analysis, design and programming of systems ready to use (including web page development and design), and technical consultancy related to software; development, production, supply and documentation of customized software, including operating systems made on order for specific users; systems maintenance and other support services, such as training provided as part of consultancy; data-processing services, such as data entry, tabulation and processing on a time-sharing basis; web page hosting services (i.e., the provision of server space on the Internet to host clients' web pages); and computer facilities management. Excluded from *computer services* are the provision of packaged (non-customised) software (classified as goods and therefore not included in the Extended Balance of Payments Service Classification) and non-specific computer training courses (included in *other personal, cultural, and recreational services*).

7.2.1 News agency services: include the provision of news, photographs, and feature articles to the media. In the GNS/W/120 list of services that was a basis for the GATS commitments in the Uruguay Round, these services are a part of "recreational, cultural and sporting services" rather than *computer and information services* as in BPM5. These services are therefore separately identified in the Extended Balance of Payments Service Classification, thus facilitating a linkage with GNS/W/120.

7.2.2 Other information provision services: includes database services - database conception, data storage and the dissemination of data and databases (including directories and mailing lists), both on-line and through magnetic, optical or printed media; and web search portals (search engine services that find internet addresses for clients who input keyword queries). Also included are direct, non-bulk subscriptions to newspapers and periodicals, whether by mail, electronic transmission or other means.

Little or no data at this disaggregated level of detail are available from US statistical agencies (or from any other country or entity), and the policy relevance of analysis at this fully disaggregated, Extended Balance of Payments Service-level of detail is relatively limited as a result. Hence the principal analysis level of the aggregate C&IS category (Extended Balance of Payments Service Classification category 7) is maintained throughout this paper.⁸

activity of software over the internet has certainly expanded very dramatically in recent years, this outstanding issue poses noteworthy validity problems for international C&IS data.

8. As can be seen from the listed subcomponent definitions, the main benefits of this level of data detail are statistical compatibility with other data classification systems and its usefulness for GATS-negotiating purposes.

International Trade and Modes of Supply in C&IS

The principal analytical thrust of this paper is the analysis of US C&IS by GATS mode of supply. Yet, these two notions—international trade, as traditionally defined by BPM5, and GATS modes of supply—are not immediately compatible concepts. BPM5 defines international trade in services, similar to trade in goods, as occurring between the residents and nonresidents of an economy. However, services materially differ from goods with respect to the proximity of supplier and consumer. Some services are nontransportable in character and cannot be traded separately from their production. For instance, in order to get a haircut, either the customer must go to the hairdresser or (less frequently) vice versa.⁹

Reflecting this issue, the GATS agreement and the MSITS expands the BPM5 definition of international trade significantly beyond its traditional notion of “cross-border imports and exports” to include the GATS’ four modes of supply (MSITS, 11–12):

Mode 1: Cross-Border Supply—From the territory of one [WTO] Member [country] into the territory of any other Member;

Mode 2: Consumption Abroad—In the territory of one [WTO] Member to the service consumer of any other Member;

Mode 3: Commercial Presence—By a service supplier of one [WTO] Member, through commercial presence in the territory of any other Member;

Mode 4: Presence of Natural Persons—By a service supplier of one [WTO] Member, through presence of natural persons of a Member in the territory of any other Member.

Figure 1, reproduced from the MSITS, illustrates the different modes of supply. As a result of this expansion of the traditional notion of exports and imports, analysis of services trade by mode of supply requires that researchers look beyond the traditional sources of trade data. The statistical coverage of each mode of supply of C&IS by US data sources is summarized in table 1.

Table 1 does not claim that the included data sources offer comprehensive coverage of US C&IS trade by individual mode; rather they are merely the best sources available for each mode. Particular concerns pertaining to US data for each mode of supply, excluding mode 2, is discussed next.

C&IS Mode 1: Cross-Border Supply

Cross-border supply of C&IS is the trade mode most closely resembling traditionally defined imports and exports. However, as mentioned in the introduction, significant data validity issues nonetheless exist. A quick look at the total reported global trade in C&IS gives an illustration of the severity of one of these

9. See boxes 1 and 2 in the MSITS.

issues. Figure 2 shows the total global imports (reported by 133 countries) and exports (reported by 121 countries) of C&IS from 2000 to 2006.¹⁰

Figure 2 shows that by 2006 total reported C&IS exports were more than double globally reported imports, with the difference amounting to \$70 billion. Equally important, the relative difference between globally reported imports and exports has been rising steadily in the 21st century, both in absolute and relative terms. Given that, in principle, each category of the IMF Balance of Payments Statistics should “add up,” with globally reported imports and exports at similar annual levels,¹¹ the increasing magnitude of this divergence indicates that C&IS is an area of services trade where global data quality may be getting worse, not better, over time. This deterioration can be illustrated by estimating the standard Organization for Economic Cooperation and Development (OECD) quality metric for the comparability of exports and related import flows, the so-called asymmetry coefficient,¹² for global trade in C&IS from 2000 to 2006. This was 0.58 from 2000 to 2001 but had deteriorated to 0.78 by 2006. Due to the relatively large number of countries reporting each year, including all major industrialized nations (and India), which account for just over 90 percent of total global services for both imports and exports from 2000 to 2006, neither the size nor the increase of the divergence can not be attributed to annual differences in the number of reporting countries.¹³

It is noteworthy that a similar, almost 2-to-1, difference between reported exports and imports is also found when looking only at the OECD countries. The OECD International Trade in Services (ITS) database shows that total OECD mode-1 C&IS exports to the world were \$72 billion and \$74 billion in 2004 and 2005, respectively, while total OECD C&IS imports from the world amounted to \$40 billion and \$47 billion, respectively, in those same years. Superficially, this indicates a strong competitive position for OECD countries relative to the rest of the world, with an OECD C&IS trade surplus of approximately \$30 billion in 2004 and 2005. Comparing those data to the globally reported data in figure 2, it is clear that the OECD countries account for the overwhelming majority of reported C&IS trade. What cannot be immediately discerned, however, is whether the OECD countries, rather than

10. As reported in Lipsey (2006), it makes little sense to go further back in time than 2000 in terms of total reported global trade in C&IS in the IMF Balance of Payments Statistics data, as it was only in the late 1990s that the majority of countries began reporting this type of data. Lipsey (2006, tables 2 and 3) shows, for instance, that in 1993 just 19 and 20 countries reported C&IS exports and imports, respectively.

11. Global export and import symmetry of course assumes that all countries report both. Further, this symmetry may not necessarily hold for certain transportation services.

12. If X = Exports and mM = Mirror Imports, the Asymmetry Coefficient is given as $(X - mM) / ((X + mM) / 2)$. See OECD (2004). See also Cave (2007).

13. 117 countries reported both exports and imports during the period of 2000–2006, while four countries (Honduras, Israel, Panama, and Sri Lanka) reported exports but not imports, and 16 countries (Angola, Anguilla, Antigua/Barbados, Belize, Macao, Dominica, French Polynesia, Gambia, Kuwait, Libya, Rwanda, Sierra Leone, St. Kitts & Nevis, St. Vincent, Vanuatu, and Yemen) reported imports but not exports.

possessing a strong competitive position in C&IS trade, instead merely account for most of the globally measured import-export discrepancy. More statistical research is required to settle this issue.

Even relatively large statistical discrepancies in trade data are hardly unique to C&IS. See, for instance, the treatment in appendix II in the IMF *World Economic Outlook* (WEO) from April 2000, which discussed the origin of the roughly 3 percent global current-account discrepancy in 1999.¹⁴ Yet an aggregate discrepancy of more than 100 percent between reported imports and exports for C&IS in 2006 indicates the validity problems that research utilizing many traditional multicountry trade methodologies may face when analyzing C&IS trade.

US C&IS data for mode 1 has been collected by the Bureau of Economic Analysis (BEA) since 1986.¹⁵ The validity of these data, particularly with respect to bilateral C&IS trade between the United States and India, has been subject to substantial scrutiny in recent years. See, for instance, the in-depth analyses in OECD (2006, Box 3.2) and GAO (2005). It should be further noted that large bilateral discrepancies are not just a US-India issue; US-EU C&IS data, for instance, also show conflicting trade balances. According to the BEA (2008a, table 7.21), in 2006 the United States ran a \$3.4 billion bilateral trade surplus in C&IS with the EU-25, whereas Eurostat (2008, table 4.4) lists a €1.5 billion EU-25 bilateral C&IS trade surplus with the United States. Several commentators have recommended, and the BEA itself has supported, improving the statistical survey coverage of US C&IS (as well as of several other services sectors) cross-border trade, particularly of US imports of cross-border C&IS.¹⁶ As such, the data presented in this paper likely understate US imports of mode-1 C&IS, due to the exclusion of imports by US companies not covered by BEA surveys.¹⁷ The data in figure 2 suggest that this potential underestimate of C&IS imports is a global issue and not confined to the United States.

Another factor complicating mode-1 C&IS analysis is that while cross-border US C&IS data have been collected since 1986, this is true solely for unaffiliated trade data (i.e., arms-length transactions between different businesses). Only since 1997 has the BEA collected C&IS mode-1 trade data between

14. See also Marquez and Workman (2000) and the discussion by then IMF director of research Michael Mussa at the IMF press conference launching the April 2000 WEO on April 12, 2000, available at www.imf.org (accessed on October 3, 2008).

15. For these, see BEA (2008a). See BEA (2008b) for an overview of the full list of surveys carried out by the BEA in this data collection effort. See Kozlow (2006) for an overview of recent BEA efforts.

16. See, for instance, Sturgeon et al. (2006), the National Academy of Sciences (2007), and the response from the US Department of Commerce to the GAO (2005). In the latter, it is stated (29) that: “We support GAO’s recommendations that the Bureau of Economic Analysis (BEA) should strive to improve its coverage of services imports and, in particular that BEA work to obtain additional company information from the Census Bureau. As GAO is aware, before this GAO study began, BEA had initiatives underway that would help accomplish these objectives. . . . Nonetheless, we agree that some portion of the difference between the US and Indian estimates [of bilateral C&IS flows] may reflect under-reporting on BEA’s surveys.”

17. Sicsic (2006) makes the argument that, for a broader category of services, the underreporting of services imports is less of a problem in the statistical survey coverage in France.

affiliated entities (i.e., intrafirm data). It is sufficient to note here the confusion between traditionally internationally compatible trade-data sources regarding whether or not to include affiliated C&IS data in the US total. The IMF Balance of Payments Statistics data presented in figure 2 do not include affiliated trade, only presenting unaffiliated trade. At the same time, the OECD ITS database for trade in services between OECD member states from 1991 to 2005 (OECD 2008c) does include affiliated trade in C&IS in the years after 1997 where it is available.¹⁸ As we shall see in section III, this has important implications for net US C&IS trade.

C&IS Mode 3: Commercial Presence

Transactions in GATS mode 3 are outside the traditional BPM5 realm of trade between residents and nonresidents of a country and instead apply an ownership criterion to the analytical units, separating out either foreign-owned companies in the home country or subsidiaries of locally-owned companies in other countries.

Due to data scarcity, most researchers approximate mode-3 trade as a constant function of the value of FDI. Hoekman (2006, 8), for example, estimates an aggregate mode-3 sales/FDI-stock ratio for US outward FDI of 0.35. This paper uses superior data available for the operations of US multinational companies and non-US multinational companies operating in the United States and does not have to rely on this type of FDI data proxy for its estimates of the scope of mode-3 trade in C&IS services. Instead actual, local-market sales data are used. As this section elaborates, however, significant statistical issues remain pertaining to this choice of data source.

Since the late-1970s the BEA has surveyed the operations of US multinational companies abroad, as well as the operations of non-US multinational companies in the United States (BEA 2008c). Collection of this Foreign Affiliate Trade in Services (FATS) data has historically been carried out using two separate ownership-thresholds: 10 percent, and 50 percent (i.e., majority ownership). As described in the MSITS (2002, 57–58), the GATS concerns itself with “cases of majority ownership—where by the very fact, control typically could be assumed to exist—as well as cases in which control can be demonstrated to have been achieved with a smaller ownership share.” A case could thus be made for including all trade related to foreign affiliates with only a 10 percent foreign ownership in mode-3 trade data. At the same time, the overlap in US data between the two categories of ownership is very high and the bulk of recently released data from the BEA have been related to majority-owned affiliates.¹⁹ Therefore, following an intuitive understanding of “foreign-ownership,” for the purposes of this paper, only majority-owned

18. The ITS database, however, does not indicate in its footnotes that in C&IS, as in “Financial Services,” there is a break in the series from 1996 to 1997, with both unaffiliated and affiliated trade included in and after 1997.

19. See Mataloni (2007) for data showing that in employment terms 87 percent of all US affiliates abroad were majority-owned in 2005.

foreign affiliate data are discussed. This demarcation further eliminates from analysis in this paper indirect means for companies to achieve commercial presence in a market via, for instance, licensing agreements, collaborative distribution agreements between companies, or online sales.

An axiomatic distinction exists between mode-1 trade data, which, as described earlier, are classified according to product or unit characteristics and transactionally occurs between residents and nonresidents, and FATS mode-3 data, which are instead classified on the basis of the sectoral business activities of the foreign affiliate. In the United States (and, in principle, also in the other NAFTA countries), the industrial classification system since 1997 has been the North American Industrial Classification System, or NAICS.²⁰ Prior to the introduction of the NAICS, US statistical authorities relied on the Standard Industrial Classification (SIC) system. Since the two classification systems are not compatible with respect to the industries relevant to this paper and longer time series therefore suffer some additional data impairment, only NAICS-based data are presented.²¹ The original NAICS system from 1997 was updated to reflect changes in the real economy by the US Census Bureau in 2002 and 2007.²² As computer services are among the most innovative and dynamic sectors in the US economy, these periodic NAICS industry classification revisions have had a direct impact on several of the industries relevant to this paper. As a result, some data are chosen for industries that have had unchanged NAICS classifications since 1997, while other data from closely overlapping sectors from both NAICS 1997 and NAICS 2002 constitute another time series.

Much of the firm-level data collected by the BEA and other statistical agencies are proprietary, and any data that potentially could reveal details of business strategy for any individual company are suppressed by the BEA to avoid such disclosure.²³ This means that researchers wishing to publicly cite this type of data are faced with the insoluble dilemma that additional, analytically attractive industry and country data detail results in a higher risk of data points being suppressed for confidentiality reasons.²⁴

20. The new NAICS system was introduced gradually by the BEA in its different annual and benchmark surveys, and all types of data are therefore not available on a NAICS basis starting immediately in 1997.

21. There are significant differences between the SIC and NAICS classification systems, which makes combining detailed industry data very difficult. SIC was an establishment-based industry classification system that classified each establishment according to its primary activity. It had been updated several times since its inception in the 1930s with new—particularly services—industries added and small, declining industries deleted or combined with other activities. Nonetheless, the SIC provided very poor statistical coverage of the services sectors. Instead the NAICS classification is based on a concept in which companies that use the same or similar processes to produce goods or services are grouped together. This makes the NAICS significantly closer to the international ISIC system. See US Census Bureau (2004) for an overview of this system and Mann and Kirkegaard (2006) for a discussion of how one can attempt to combine SIC- and NAICS-based data.

22. See the International Concordances in US Census Bureau (2004) for an overview of the industry classification changes made in 2002 and 2007.

23. Failure to do so would likely lead to reduced compliance among US companies in filling out BEA survey forms, resulting in reduced data validity. See GAO (2005) for an elaboration of these concerns among BEA officials.

24. Researchers with US citizenship can get access to the full micro firm-level datasets on BEA premises and publicly

Hence there is an unavoidable trade-off involved when choosing the relevant mode-3 industry or industries with which to match mode-1 C&IS data. This paper aims for the highest level of industry specificity possible, as it is overwhelmingly desirable, from the point of view of data validity, to avoid adding the activities of spurious and unrelated non-IT services industries to the data for mode-1 C&IS trade.²⁵

Keeping these trade-offs in mind, and based upon the level of data detail in the publicly available BEA data tables, the following NAICS industries have been chosen to represent mode-3 trade in C&IS.²⁶

Two NAICS industries with unaltered NAICS industry classifications from 1997 onward:

NAICS 5112 Software Publishers: This industry comprises establishments primarily engaged in computer software publishing or publishing and reproduction. Establishments in this industry carry out operations necessary for producing and distributing computer software, such as designing, providing documentation, assisting in installation, and providing support services to software purchasers. These establishments may design, develop, and publish, or publish only.

and

NAICS 5415 Computer Systems Design and Related Services: This industry comprises establishments primarily engaged in providing expertise in the field of information technologies through one or more of the following activities: (1) writing, modifying, testing, and supporting software to meet the needs of a particular customer; (2) planning and designing computer systems that integrate computer hardware, software, and communication technologies; (3) on-site management and operation of clients' computer systems and/or data processing facilities; and (4) other professional and technical computer-related advice and services.

In addition to these, the following NAICS industry from 1997 to 2002:

NAICS (1997) 514 Information Services and Data Processing Services: Industries in the Information Services and Data Processing Services subsector group establishments providing information, storing information, providing access to information, and processing information. The main components of the subsector are news syndicates, libraries, archives, on-line information service providers, and data processors.

are combined with a BEA NAICS 2002 metadata category, termed in the BEA data tables "internet, data processing, and other information services." This metaclassification is the aggregate of the following three NAICS 2002 industries:

report macro-level research results based on these.

25. Put in statistical terms, this can be likened to an attempt to minimize type I errors, i.e., reducing the risk that this paper reports C&IS false positives. This would occur if data variation attributed to C&IS in reality originates with changes in other sectors.

26. These partly follow Mann and Kirkegaard (2006). This paper subsequently uses the terms mode-3 imports and exports.

NAICS (2002) 516 Internet Publishing and Broadcasting: Industries in the Internet Publishing and Broadcasting subsector group establishments that publish and/or broadcast content exclusively for the Internet. The unique combination of text, audio, video, and interactive features present in informational or cultural products on the Internet justifies the separation of Internet publishers and broadcasters from more traditional publishers included in subsector 511, Publishing Industries (except Internet) and subsector 515, Broadcasting (except Internet).

NAICS (2002) 518 Internet Service Providers, Web Search Portals, and Data Processing Services: Industries in the Internet Service Providers, Web Search Portals, and Data Processing Services subsector group establishments that provide: (1) access to the Internet; (2) search facilities for the Internet; and (3) data processing, hosting, and related services. The industry groups (Internet Service Providers and Web Search Portals, Data Processing Hosting, and Related Services) are based on differences in the processes used to access information and process information. The Internet Service Providers and Web Search Portals industry group includes establishments that are providing access to the Internet or aiding in navigation on the Internet. The Data Processing, Hosting, and Related Services industry group includes establishments that process data. These establishments can transform data, prepare data for dissemination, or place data or content on the Internet for others. In addition, the shared use of computer resources is included in the Data Processing, Hosting, and Related Services industry group. Establishments that are publishing exclusively on the Internet are included in Subsector 516, Internet Publishing and Broadcasting and establishments that are retailing goods using the Internet are included in Sector 44–45, Retail Trade.

NAICS (2002) 519 Other Information Services: Industries in the Other Information Services subsector group establishments supplying information, storing information, providing access to information, and searching and retrieving information. The main components of the subsector are news syndicates, libraries, and archives.

For the sake of simplicity, the combined time series from 1997 onward for these industries are termed throughout this paper as “Internet and Information Services,” while breaks in the series are identified.

This is quite a narrow NAICS-based sectoral definition of C&IS, compared to, for instance, Mann and Kirkegaard (2006) and Yuskavage, Strassner, and Medeiros (2006). It does, however, essentially mirror the NAICS-based definition of the Canadian “software development and computer services industry” used by Statistics Canada in their annual survey.²⁷

27. See Statistics Canada (2008). Statistics Canada includes three NAICS industries in their survey: NAICS 5112: Software Publishers; NAICS 5182: Data Processing, Hosting, and Related Services; and NAICS 5415: Computer Systems Design and Related Services.

Several circumstances add a nontrivial degree of additional uncertainty to any such choice of “computer and information services industries.” These are now elaborated. First of all, any classification of a given foreign affiliate in a given industry is done on the basis of the affiliate’s primary industry, i.e., the industry in which the affiliate has most of its activities and sales. As it can safely be assumed that many companies in the three industries listed above do not carry out all their activities within the classification of just that single industry, the recorded data should be interpreted as indicative of the total activity levels of firms predominantly engaged in these industries, rather than as a precise measure.²⁸

Second, in a dynamic business world it may be that companies change corporate strategy and thus, with time, their primary industry. This introduces an additional element of variation into any time series of FATS data. As the broader ICT industry has in recent years expanded rapidly in services, a degree of underrepresentation of newer services activities relative to traditional, primarily ICT hardware firms can therefore not be ruled out. At the same time, as illustrated in figure 3, the transition of a very large US IT company—IBM was, until 2001, still mostly in IT hardware—to a primarily IT services company biases data collection in the other direction. At the very least, major company reclassifications such as IBM from 2000 to 2001²⁹ may introduce substantial, spurious year-to-year variation in the time series.

Third, as a result of the inherent trade-off between analytically relevant data detail and disclosure concerns, the starting point for the collection of mode-3 export data will typically be total sales made by the foreign affiliate in identified industries. Total sales data, however, are too aggregate in character and require two adjustments to improve validity. First a disaggregation into total sales by product must be made, such that foreign-affiliate sales of goods and services are separated out. For the purposes of this paper, only affiliate sales of services are of interest.³⁰ Such a disaggregation is possible in principle with the BEA data.³¹ Yet, the data at the industry level relevant to this paper are only sporadically available, due to the privacy concerns discussed above. It is therefore difficult to make a detailed empirical determination of the level of mode-3, affiliate services sales in the industries selected for analysis; only an approximate adjustment can be made.

The second adjustment that must be made to foreign affiliate total sales is of particular concern to

28. The MSITS (2002, 63, footnote 69) in fact singles out computer services as a service that “may be provided not only by firms classified in the computer services industry....”

29. Note that the revenue breakdown from IBM’s annual 10-K filings may not correspond to the industry classification of sales data used by the BEA to determine IBM’s primary industry. As such, it cannot be discerned precisely in which year the reclassification took place.

30. Serious conceptual doubt remains concerning the validity of this disaggregation by product into goods and services for the IT services industries. This reflects the inherent duality of many electronic products, which can, for instance, be traded as an electronic service, only to be transformed into a good upon printing. It is beyond the scope of this paper to explore this issue further. However, attempting to distinguish between goods and services sales retains substantial analytical value.

31. See annual tables III-F14 and III-F16 in the BEA’s comprehensive financial and operating data for US multinationals abroad as well as tables 10 and 11 in the BEA’s international services data (BEA 2008a).

this paper, as it attempts to compare the flows of mode-1 and mode-3 trade to the degree the data permit. The issue concerns the ultimate destination of foreign affiliate sales. The MSITS (2002, 18) demarcates this issue in the following manner: “In the present [MSITS] Manual and following GATS coverage, domestic sales by foreign affiliates are covered by the term ‘international trade in services’.” In other words, only sales by foreign affiliates made in their own local market (i.e., the foreign affiliate’s domestic market) should be included in mode-3 trade, while all sales made outside the local market, by definition, cross an international border and thus become part of mode-1 trade. Some of this mode-1 trade may be “affiliated in nature” and conducted between the foreign affiliate and the parent group, while the rest is with unaffiliated third parties. This issue principally concerns US mode-3 C&IS exports, as the size of the US domestic market makes the large-scale sale of services by US-located foreign affiliates to non-US markets unlikely, and for the purposes of this paper these sales are therefore assumed to be zero. With respect to US mode-3 C&IS exports, the adjustment of total affiliate sales to local services sales is, based on available data, set at a deduction of 30 percent from total affiliate sales.

Fourth, a noteworthy issue concerns the (primary) industry under which foreign affiliates are classified. Intuitively, this would be the industry in which the foreign affiliate is operating, which would usually be the same primary industry as the entire multinational group. However, there are circumstances in which some foreign affiliates operate primarily in industries other than the industry of their parent company.³² This especially concerns foreign affiliates that have their principal activities in wholesale operations and are subsequently classified under NAICS industry 42—Wholesale. Typically, this difference in industry classification is an issue in merchandise producing sectors,³³ where analysts may miss some relevant foreign affiliate activities because of the different classifications. It also poses a challenge in the industries relevant to this paper.

One way to illustrate the potency of this issue with available BEA data is to compare total foreign affiliate sales classified by the industry of the affiliate (as presented in table 2) with total foreign affiliate sales in the same industry, but with all foreign affiliates organized by the industry of their US parent company. In the latter method, all foreign affiliates of US multinational parent companies in computer services industries would be classified as computer services industries affiliates, irrespective of the primary industry of any individual affiliate. According to the latest available preliminary data for NAICS 5415 from 2005, total sales that year classified by the industry of the affiliate amounted to \$68.4 billion. Other BEA data for the same industry, also from 2005 but classified by the industry of the US parent company, show total affiliate sales of \$100.8 billion.³⁴ This is a discrepancy of more than 50 percent.

32. Note that the BEA collects operation and financial data for US parent companies and their foreign affiliates using separate surveys (survey forms BE-11A and BE-11B, Long/Short Form, respectively). See BEA (2008c) for an overview of different surveys for US FDI abroad.

33. See Mann and Kirkegaard (2006) for the IT hardware sector, as well Bensidoun and Ünal-Kesenci (2008).

34. See annual table III-F3 and III-F9 in the BEA’s comprehensive financial and operating data for US multinationals

It cannot immediately be judged which of the two methodologies of affiliate classification is the most valid for capturing the true level of economic activities of foreign affiliates in any given industry. However, it seems probable that a significant risk of “double-counting” economic activities exists when classifying all foreign affiliates according to the industry of the US parent company (for instance, when the same service activity is transacted and resold through multiple foreign affiliates in different “primary sectors”—from, say, a primary production affiliate to a wholesale affiliate to a financial holding affiliate—within a single multinational group). Subsequently, this methodology unduly inflates the true level of the economic activities of foreign affiliates. In the aggregate, this latter risk of inflated estimates is likely to be larger for the industries analyzed in this paper than the former risk of missing some economic activities because of the classification of affiliates in other industries. Forced to choose on this admittedly weak methodological basis, this paper presents only data classified according to the primary industry of the individual foreign affiliate.

Less detailed data are generally available for affiliates of foreign parent companies operating in the United States and while it is certain that these data are affected by the same validity issues just discussed, it is frequently not possible to gauge the degree to which this is the case. One final data issue concerning only inward investment data for the United States must be mentioned: The BEA geographically classifies affiliates of foreign multinational companies operating in the United States according to the residence of the “Ultimate Beneficial Owner” (UBO), defined as “that person, proceeding up a US affiliate’s ownership chain, beginning with and including the foreign parent, that is not owned more than 50 percent by another person” (Anderson 2007, 195). This definition means that, in a very limited number of cases, a company classified as a “foreign-owned affiliate in the United States” may be ultimately owned by American investors. In 2005, 0.5 percent of all assets of majority-owned foreign affiliates had an UBO resident in the United States.³⁵

C&IS Mode 4: Presence of Natural Persons

Mode-4 trade in services involves the supply of services through the temporary movement and presence of foreign nationals or “natural persons.” These may work as independent service providers or as employees of domestic companies, foreign affiliates, or foreign companies with no lasting presence in the country of supply (MSITS 2002, annex 1). Of the three modes of supply described in section II, by far the most daunting data availability and validity issues concern mode 4 and the movement and presence of natural persons. Rather than facing the issues of incompatible data classification as in modes 1 and 3, mode

abroad in BEA (2008d).

35. See table III-A3 in the BEA’s comprehensive operating and financial data for FDI in the United States (BEA 2008e). This applied to approximately \$28.5 billion out of a total foreign-owned asset base of \$5.9 trillion in 2005.

4 suffers instead from a near complete lack of relevant data collected with the aim of measuring and analyzing trade flows. The MSITS (2002, 24) is quite forthright in its assessment, stating:

Mode 4 services supplied through the presence of natural persons pose particular measurement problems that cannot be fully resolved within the BPM5 and FATS framework. In addition, no simple correspondence can be readily established between any existing statistical framework and the part of GATS mode 4 services that is not covered by the BPM5 concept of trade in services. The trade-related movement of natural persons has given rise to a need for information collected on a new conceptual basis. Although not a new phenomenon, the concept of mode 4 delivery of services in trade is new; it must first be defined, and then a new statistical framework must be elaborated for measuring it.

Analysis of mode 4, therefore, invariably has to rely on data providing only indirect, auxiliary, and supplementary information. Some such data are available through the general BPM5 framework, which specifies two non-trade data categories of labor-related resource flows relevant to mode-4 trade: “Compensation of Employees” and “Worker Remittances.”³⁶

For papers concerned with analyzing relatively detailed services trades, both these categories present challenges. First of all, as discussed above, the BPM5 concerns itself with transactions between residents and nonresidents and, similar to the 1993 System of National Accounts (SNA), draws the distinction at 1 year of residency; if present in a foreign country for more than 12 months, visitors are considered residents and thus fall outside the BPM5 subject area. Unfortunately, this BPM5 definition of “nonpermanent” presence as less than a year is at odds with the implied definition in the GATS, where countries’ “nonpermanent” commitments are usually rooted in diverse national regulations and typically operationalized as lasting for two to five years (IMF 1995, 12). It is not possible to align these two definitions in a satisfactory manner. Second, neither “Compensation of Employees” nor “Workers’ Remittances” data are collected in a fashion that distinguishes between compensation to individuals working in services-producing activities and those working in other sectors. As such, for the purposes of this paper, US data of this type are of limited value.³⁷

Somewhat resembling the situation in mode 3, in order to provide a basis for quantifying US mode-4 trade, it is necessary to establish a link between trade and data describing temporary foreign nationals present in the United States. For this purpose, US data from the Department of Homeland Security, covering the characteristics of recipients of temporary US employment-based visas, such as the H-1B and

36. Both are part of the BPM5 current account classification, but not the trade balance. “Compensation of Employees” is part of the income category of the BPM5 and covers wages, salaries, and other benefits, in cash or in kind, and includes those of border, seasonal, and other nonresident workers. “Workers Remittances” are part of current transfers in the BPM5 classification and involve transfers between residents and nonresidents that do not involve a quid pro quo in economic value. See IMF (1995, chapter 8).

37. See World Bank (2008) for the most recent estimates of the scope of the remittances.

L-1 visa, are useful. These data provide some information concerning the industry of the employing firm, as well as the occupational circumstances of visa holders' temporary employment in the United States.

For the purposes of this paper, it is possible to identify the number of temporary visa holders employed in the same industries as identified for mode-3 trade, namely 5112 Software Publishers; NAICS (2002) 514: Information Services and Data Processing Services; and NAICS 5415 Computer Systems Design and Related Services. A reasonable degree of sectoral-classification overlap between trade in computer services in mode 4 and other modes can therefore be established.

The details of the methodology used in this paper are described in section IV, but it is pertinent to highlight here an important conceptual issue: US temporary employment visa data (and visa-based data in general) contain information about when a foreign individual is given permission to enter and take up temporary employment in the United States.³⁸ Methodologically, this type of data is akin to gross employment data for job openings. However, temporary visa-based data contain no information regarding the duration and termination of the employment. This type of temporary visa-based data should therefore be treated as fundamentally distinct from the most prevalent type of labor market data, which measures net employment and changes in employment (Pinkston and Spletzer 2004). Only through the use of explicit assumptions about the expected duration and termination of employment can the economic impact of temporary visa-based data be estimated.

III RECENT TRENDS IN US TRADE PATTERNS IN COMPUTER AND INFORMATION SERVICES—MODES 1 AND 3

Mode-1 Trade

Powered by the frequently mentioned drivers of globalization, Moore's Law,³⁹ and declining costs of communication,⁴⁰ we saw in figure 2 that global mode-1 trade in C&IS has risen rapidly in recent years. The same is true for US mode-1 trade in C&IS, which has risen from close to zero to a combined total exports and imports of over \$20 billion during the 21 years from 1986 to 2006, the period during which US data have been collected. Available data for both affiliated and unaffiliated trade are shown in figure 4.

Figure 4 reveals two relatively distinct time periods in US mode-1 trade in C&IS; during the first decade from the mid-1980s to the mid-1990s, unaffiliated US exports of C&IS rose relatively modestly to approximately \$2.5 billion, while unaffiliated US imports of C&IS remained trivial and the US maintained a small net-trade surplus over the period. In the second decade from the mid-1990s to the

38. Data on the issuance of employment visas granting access to permanent migration—"green cards" in the case of the United States—should instead be treated as additions to a country's labor force.

39. Moore's Law states that the number of transistors on a chip will double about every two years.

40. See, for instance, OECD (2008a, figure 6.4) for estimates showing how dramatically international communications prices across the OECD have fallen since 1973.

present (the latest available data are for 2006), unaffiliated C&IS trade increased more dramatically and reached almost \$8 billion for exports and approximately \$5 billion for US imports. In other words, in terms of unaffiliated C&IS services trade, the United States in recent years has maintained a stable trade surplus of between \$4 billion and \$5 billion.⁴¹

Figure 4 further illustrates that in 1997 the BEA data publication started to include affiliated mode-1 C&IS trade as well.⁴² Taking account of this trade among affiliated entities in C&IS dramatically alters the net result for total US C&IS trade after 1997. Figure 4 shows that the US maintains a healthy unaffiliated C&IS surplus throughout the period of available data, but this surplus disappears and by 2006 is even transformed into a small total deficit when affiliated trade is included.⁴³

It is noteworthy that the ratio of affiliated trade to unaffiliated trade in US C&IS imports is very different from the ratio in exports. For US mode-1 exports, the share of the total made up by unaffiliated trade remains relatively steady after 1997 at between 75 and 80 percent. However, for US mode-1 imports, unaffiliated trade is approximately 50 percent of total imports in 1997, but drops to slightly above 25 percent by 2006. Hence, US mode-1 imports of C&IS in recent years have come to be overwhelmingly made up of transactions between affiliated entities, while for US mode-1 C&IS exports transactions among unaffiliated entities consistently dominate. Another way to interpret figure 4 is that for affiliated mode-1 trade in C&IS, the United States has in recent years built up a substantial trade deficit of more than \$5 billion by 2006. This of course stands in sharp contrast to the unaffiliated trade surplus discussed above.

When attempting to explain the reason for these inverse trends in affiliated and unaffiliated trade, it is useful to further break down affiliated trade into its main components. Conceptually, all affiliated trade can be thought of as occurring between a parent company and its foreign affiliates.⁴⁴ Hence, US affiliated exports are made up of two types of exports: exports by US parent companies to their US-owned foreign affiliates abroad, and exports by foreign affiliates in the United States to their foreign parent group abroad. The reverse is also true for US affiliated imports. This is illustrated in figure 5.

Detailed BEA data for US mode-1 trade in C&IS from 1997 to 2006 show the relative importance of the two types of affiliated exports and imports. These data are presented in figure 6.

Figure 6 shows that US affiliated mode-1 exports of C&IS, amounting to just over \$2 billion in

41. This is the unaffiliated trade surplus in C&IS that is reported in the IMF Balance of Payments Statistics.

42. In figure 4 this has been added on top of the bars illustrating unaffiliated trade after 1997

43. These data are subject to periodic revision by the BEA, so the conclusion that in 2006 the United States saw its first trade deficit in C&IS should be treated as preliminary. See Koncz and Flatness (2007).

44. Some trade takes place between different foreign affiliates of the same parent group across international borders. In the case of such mode-1 trade occurring across US international borders, it will always be recorded as a transaction between a parent group and a (majority-owned) foreign affiliate, due to the BEA's use of the UBO-concept of allocating this trade with the ultimate foreign owner. See Anderson (2007).

2006, are overwhelmingly made up of exports from US parent companies to their foreign affiliates in other countries; exports from US-located foreign affiliates back to their foreign parent groups are very small. The relative weight of the two types of US-affiliated imports of C&IS is roughly similar to the pattern for exports: Imports from foreign affiliates back to their US parent group dominate US C&IS imports. It is striking however that since 2005 the relative importance of US-affiliated C&IS imports in the form of payments by US-located foreign affiliates to their foreign parent group has increased rapidly. This rise is consistent with an increase in the level of FDI coming into the United States in the computer and information services sector in recent years.⁴⁵ An increased establishment of operations in the US market by foreign IT services multinationals would further point to the need for foreign suppliers to be directly present on-site with US clients and illustrate that non-US IT services multinationals, in their servicing of the US market, are imitating the global delivery model of established US IT services multinationals.

It is clear from figure 6 that in terms of US-affiliated mode-1 C&IS trade, parent companies of US multinationals are running a trade deficit with their affiliates abroad, which is mirrored after 2005 for US-located foreign affiliates with their foreign parent group. For the latter group, the presence of a “headquarters services effect” would predict this to be the case, with the headquarters in multinational companies typically running a services trade surplus with the rest of the group (Ekholm 1998). As foreign IT-services companies expand in the US market, this effect seems to be increasing. The surprising thing is that since 1999 there has been no headquarters effect for US parents in C&IS trade. This is possibly an indication that in this trade category the offshoring of headquarters services traditionally conducted in the “back-office” to captive, overseas units has counterbalanced the traditional positive services-trade impact of the location of a multinational group’s headquarters.⁴⁶

Mode-3 Trade

Section II discussed the methodological issues concerning mode-3 trade data and identified the appropriate NAICS industries for analysis in this paper. Figure 7 shows the relevant mode-3 exports in the form of annual adjusted local services sales by US majority-owned IT services foreign affiliates from 1999 to 2005.⁴⁷

Figure 7 shows that total US mode-3 C&IS exports almost doubled from 1999 to 2005, with a

45. See also OECD (2008b, 349ff), which is demarcated by ISIC rev. 3 industries and thus different from the data used in this paper. Country data for the United States show that for US foreign affiliates in ISIC 72—“Computer and Related Services”—employment, turnover, and value-added rose by 76, 66, and 109 percent, respectively, from 2001 to 2004. Unfortunately, the ISIC classification at the two-digit level is not compatible with NAICS industries, preventing a more direct comparison of these different data sets. See US Census Bureau (2001) for a detailed comparison.

46. The BEA table E for intrafirm trade for different subcategories of “other private services” shows that this reversal of the traditional positive services trade effect of the company headquarters is also found in the financial services industry, another industry in which relatively intense adoption of offshoring and offshore outsourcing has occurred in recent years. See Deloitte Research (2004).

47. Raw data for local market services sales for the industries in question are overwhelmingly suppressed by the BEA for confidentiality reasons. As a result, local services sales in figure 7 are approximated as “adjusted local services sales,” equaling 70 percent of total foreign affiliate sales.

total rise of more than 85 percent, to a total of over \$90 billion. The relative importance of individual industries in total mode-3 C&IS trade is quite stable, with NAICS 5415 making up approximately 50 percent of the total and the two remaining NAICS industries roughly splitting the other half.⁴⁸ It is immediately obvious that the magnitude of mode-3 C&IS exports—over \$90 billion by 2005—is very different from that of C&IS trade in mode 1, shown in figure 4.

The C&IS mode-3 export data in figure 7 make no distinction between affiliated and unaffiliated exports. It can be shown from the BEA's detailed table III.F.3, which shows the ultimate destination of affiliate sales, that local sales to affiliated entities make up only a trivial share of total local sales, while the overwhelming share is comprised of local sales to unaffiliated entities. As such, one might validly compare the US C&IS mode-3 export data either with unaffiliated-only exports or with total mode-1 exports. Table 2 presents a comparison of the total magnitudes of the two modes of trade.

Table 2 highlights two things concerning US C&IS exports by mode. First, mode 3 outstrips mode 1 by about an order of magnitude. And second, the relative growth rate of US C&IS mode-3 exports—surprisingly given the large difference in starting levels—is higher than that of US C&IS mode-1 exports over the period of available data, from 1999 to 2005.

Turning attention to US C&IS mode-3 imports, the analysis is hampered by the less detailed operating and financial data available for foreign affiliates operating in the United States. Relevant industry data are much more frequently suppressed for confidentiality reasons. At the same time, the analysis is aided by the separate publication by the BEA of foreign majority-owned US affiliate (MOUSA) sales data to US persons (i.e. local sales) disaggregated by product category, which, unlike the similar data for US foreign affiliate sales abroad, is not suppressed for confidentiality reasons. These unadjusted data for US mode-3 C&IS imports are presented in figure 8.

Figure 8's data for US mode-3 C&IS imports show that these increased very rapidly from a low starting point of \$7 billion in 1997 to about \$25 billion in 2005, a total of about 250 percent, although the rate of increase slowed dramatically after 2003. As with US mode-3 C&IS exports, NAICS 5415 accounts for about 50 percent of the total, while US mode-3 imports in NAICS 5112 is relatively less

48. By combining the information for US foreign-affiliate C&IS sales to affiliated entities in the United States (BEA's table III.F.3 shows that up to 5 percent of total foreign-affiliate sales go back to the US parent) with the data in figure 7, it is possible to carry out a rough validity test of some of the trade data presented so far. Ideally, the share of total US foreign-affiliate C&IS sales going to their US parent group should be "mirror data" of affiliated C&IS mode-1 imports in the form of payments by the US parent to its foreign affiliates, presented in figure 6. Comparing the data for the two data series reveals that estimated foreign affiliate sales back to their US-located parent group are slightly higher (between \$1 billion to \$2 billion annually over the period of available data) than published affiliated mode-1 C&IS imports from figure 6. This would be in line with the general assumption that BEA surveys somewhat underestimate the level of US C&IS mode-1 imports. Given the magnitude of local foreign affiliate services sales—over \$90 billion by 2005—an annual discrepancy of \$1 billion to \$2 billion can, *ceteris paribus*, nonetheless be considered reasonable and adds some validity to the methodology adopted so far in this paper. The estimated asymmetry coefficient for these two "mirror data series" fluctuates between 0.25 and 0.50 in the 1999–2005 period.

important than US mode-3 exports in this sector. No information is available concerning the breakdown of US mode-3 C&IS imports by ownership and the data in figure 8 can therefore be compared to both unaffiliated US mode-1 C&IS imports and the total hereof. This is done in table 3.

Table 3 illustrates that—as with US C&IS exports—mode 3 is the dominant mode of delivery. However, the dominance of mode 3 is less pronounced than for US C&IS exports and, unlike for US C&IS exports, appears relatively stable over the period of 1997–2005. A noticeable difference concerns the increasing dominance of affiliated trade in US mode-1 C&IS imports, illustrated above in figure 4. Table 3 shows that since 1999, when (as figure 4 shows) total imports first became dominated by affiliated mode-1 imports, the ratio of affiliated trade in US mode-1 C&IS imports to total mode-1 imports has grown about as rapidly as US mode-3 C&IS imports up to 2005. Unlike US C&IS exports, US mode-1 C&IS affiliated imports thus roughly keep pace with the expansion of US mode-3 C&IS imports.

At least three issues become clear from this section. First of all, mode 3 reveals itself to be the delivery mode of overwhelming choice for US C&IS trade, particularly on the export side. Table 3 showed that more than 90 percent of combined US mode-1 and mode-3 C&IS exports were delivered through mode-3, while the share of mode 3 in total US C&IS imports is only marginally lower.⁴⁹ This makes C&IS delivery far more reliant on mode 3 than aggregate US services exports, where Mataloni (2007, table A) shows that total US mode-3 services exports in 2005 were \$528 billion, compared to \$368 billion in mode 1, thus accounting for just 59 percent of the aggregate total.

Second, at least for US C&IS exports, it becomes clear that the dominance of mode 3 is increasing, with mode-3 C&IS exports growing faster than those of mode 1.⁵⁰ Both these findings may surprise some, as mode-1 C&IS services—which one intuitively would predict to be the single individual service among if not the most easily digitizable, transportable, and tradable cross-border via international telecommunication—should have benefitted most from technological innovation and plummeting costs of international communication in the United States,⁵¹ and hence we should have seen a rapid increase in cross-border mode-1 C&IS trade. To a degree this has in fact happened relative to other services categories. Cave (2006) finds that C&IS services trade within the OECD has expanded more rapidly from 1999 to 2005 than trade in any other individual services category. For the United States, however,

49. Data in Bensidoun and Ünal-Kesenci (2008) for aggregate US services trade in modes 1(+4), 2, and 3 for 2000–2001 reveal a similar relative magnitude of aggregate US mode-1(+4) and mode-3 trade. Figure 1 in Bensidoun and Ünal-Kesenci (2008) indicates that mode 1 accounted for 12 and 9 percent of the combined US mode-1 and 3 exports and imports, respectively. This issue is explored in section VI.

50. Table 3 shows that mode-3 C&IS exports grew a total of 85 percent from 1999 to 2005, against less than 50 percent for mode 1.

51. OECD (2008a, figure 6.4) shows how the cost of a one minute international phone call from the United States fell by more than 98 percent from 1973 to 2004 and by more than 75 percent during the period in question for this paper from 1999 to 2004.

it is clear that C&IS mode-3 exports—when measured by local market affiliate sales—has expanded even faster.

As such, the relative mode-1 tradability of C&IS services vs. other services categories may have risen since 1999, but at least for US C&IS trade, the tradability of mode 1 relative to mode 3 has not. It must therefore be concluded, given the continued and increasing dominance of mode-3 delivery, that the so-called cross-border tradability revolution of US C&IS exports is frequently overstated. Distance, at least in US C&IS trade, seems far from dead.

Third, this section sheds some light on the issue of whether, for US C&IS, trade delivery through modes 1 and 3 are complementary in nature or a substitute for each other. The finding in table 2 that US mode-3 C&IS exports have risen faster than US mode-1 exports suggests that mode 3 might act as a substitute for US C&IS mode-1 exports.⁵² Similarly, the finding in table 3 that US-affiliated imports of mode-1 C&IS services rise in relatively close tandem with US mode-3 imports, and the finding from figure 6 that the rise in affiliated mode-1 services increasingly comes from imports to foreign affiliates operating in the US market, indicate that US affiliated mode-1 C&IS imports and C&IS mode-3 imports are complementary in nature. Affiliated mode-1 C&IS imports could thus be speculated to increasingly act as input to mode-3 sales by foreign multinational IT services companies in the US market. This would indicate that US C&IS import trade is increasingly mirroring the US manufacturing sector, where an extensive literature has highlighted the rise in intermediate goods trade and the increasing role of foreign multinationals herein.⁵³

Revealed Comparative Advantage in US C&IS Trade

A standard empirical methodology for the analysis of trade patterns is that of revealed comparative advantage (RCA), first developed by Balassa (1965). Based on standard Heckscher-Ohlin theory, a country's RCA is assumed to be a function of relative factor endowments and is affected by various trade-relevant public policies. Due to the data scarcity highlighted elsewhere in this paper, empirical work on RCA in the services sectors, and especially by modes of supply, has been scarce. Hoekman's (2006) recent survey of services trade literature lists only one such paper: Langhammer (2004), which covers select services sectors for the United States, the European Union, and Japan and different modes of supply for only a subset of US services sectors.

This section uses the data presented in the previous section to estimate available RCA in US C&IS

52. See, however, the next section, which indicates that perhaps US IT multinational corporations are selling differentiated products through each mode of supply.

53. See, for instance, Markusen, Feenstra, and Zeile (1992); Hanson, Mataloni, and Slaughter (2001); Borga and Zeile (2004); and Bernard, Jensen, and Schott (2005).

trade by mode of supply from 1986 to 2006. It uses the standard own-country RCA formula from Balassa (1965), also relied upon in Langhammer (2004):⁵⁴

$$RCA = \ln[(X_i/M_i)/(X/M)] * 100, \text{ with } X_i/M_i \text{ denoting US exports and imports of mode-1 C\&IS and } X/M \text{ denoting total US mode-1 exports and imports of private services.}$$

With the data available it is possible to estimate mode-1 RCAs both for total and for unaffiliated and affiliated US C&IS trade for different time spans.

Computing RCA for US mode-3 C&IS trade relies on the sectoral data from tables 2 and 3 above and total sales of services to foreign persons by US multinational corporations (MNCs) through their nonbank majority-owned foreign affiliates (MOFAs) (X) and total sales of services to US persons by foreign MNCs through their nonbank MOUSAs (M).

Available RCAs for US C&IS trade by mode of supply are presented in figure 9, where several things are visible. First of all, US RCA in mode-1 trade has been generally declining since 1986. This decline becomes particularly pronounced with the inclusion of intrafirm affiliated trade in 1997. Unlike in the case of mode-1 unaffiliated C&IS trade, which viewed separately remains (if declining) a comparative advantage for the United States throughout the period of 1986–2006, the United States has had a comparative disadvantage in affiliated mode-1 C&IS trade since 1997. By 1999–2000 US comparative advantage in total mode-1 C&IS trade had been reduced to zero, and turned negative in 2005–06, the most recent years for which data are available. Figure 9's mode-1 RCAs thus broadly reflect the findings in figures 4 and 6 of a dwindling US trade surplus in mode-1 C&IS, caused largely by surging imports of affiliated C&IS services.

Second, figure 9 shows that US RCA in mode-3 C&IS trade remains both strong and relatively stable throughout the shorter timeframe of 1999–2005 during which data are available. This again follows the finding above that US mode-3 C&IS exports have grown strongly in recent years. This continued US competitiveness can also be illustrated by computing the US mode-3 trade balance from the data in figures 7 and 8. During the period of available data, the mode-3 surplus in US C&IS trade almost doubled from \$38 billion in 1999 to \$66 billion by 2005.

RCA methodology inherently relies on raw trade data to uncover a country's revealed comparative advantage and thus offers few insights, apart from the theoretically assumed relative factor endowments and trade policies, into the underlying sources of these. Hoekman (2006, 10) describes how relative factor endowments can be expected to dominate the determination of mode-1 RCAs, while services characteristics that affect the need for producer-consumer proximity and public policies that govern

54. Due to the dearth of data, only own-country versions of RCA can be computed. This formulation of RCA recognizes the possibility of simultaneous exports and imports of a commodity. See Vollrath (1991) and Utkulu and Seymen (2004) for an overview of different versions of RCA formulae.

various domestic regulations and FDI attractiveness should explain most of mode-3 RCAs.⁵⁵ Following from this, one can speculate that the decline found in figure 9 in US mode-1 RCA in C&IS trade reflects the expansion of supply hereof in other countries after 1990. And further, the continued comparative disadvantage in US affiliated mode-1 C&IS trade indicates the very rapid expansion of US multinationals abroad (especially in India),⁵⁶ as well as the increasing penetration of foreign multinationals into the US C&IS market. Both trends would increase foreign factor intensity by adding to the market C&IS supply under multinational ownership outside US borders.

Continued US RCA in mode-3 C&IS trade can similarly be speculated to originate from things such as a strong advantage among US IT services multinationals in advanced, high value-added, nonstandardized C&IS, which requires consumer-producer adjacency for delivery. Following Langhammer (2004, 7), who notes that early-stage, nonstandardized services typically favor mode-3 delivery while later-stage standardization of a service facilitates mode-1, cross-border supply, figure 9 might therefore illustrate a trade pattern in which US multinational IT services companies retain a strong competitive position in all types of C&IS services, but that this position manifests itself very differently depending on the mode of supply. Persistent US RCA in mode-3 indicates that US IT services multinationals continue to deliver high value-added C&IS mostly through commercial presence, while persistent US negative RCA in affiliated mode-1 trade in more standardized C&IS indicates that these are supplied cross-border to the US market from overseas sources of supply. The latter development would be indicative of increased offshoring of this type of services. Increased cross-border imports of affiliated C&IS would further be a channel through which increases in productivity could be diffused throughout the domestic US economy.

In other words, it is possible that figure 9 illustrates a trade pattern that is very advantageous to US (and non-US) multinational IT services companies, which optimizes company productivity and profitability through delivery of high-end services through mode-3 and supplies the US market with standardized services through mode-1 from abroad. This pattern is perhaps less fortuitous when viewed from the perspective of the traditional accounting of the US trade balance. Mode-3 supplies of advanced C&IS would not be included herein, whereas cross-border affiliated imports of mode-1 C&IS would,⁵⁷ with the result that, *ceteris paribus*, the traditional US services trade balance would appear worse the more standardized, and thus cross-border tradable, a C&IS becomes.

US Bilateral C&IS Trade in Modes 1 and 3

Shifting the analysis from aggregate US C&IS trade to the more detailed level of bilateral US trade is inhibited by both the availability of bilateral C&IS trade data and the increased risk at this finer level of

55. We shall see below that, when measured in WTO commitments, C&IS trade is relatively unconstrained.

56. IBM, Intel, Dell, and HP have all expanded rapidly in India in recent years. See, for instance, *BusinessWeek*, "Multinationals: Are They Good for America?" February 28, 2008.

57. Mann and Kirkegaard (2006) find a similar development among US multinationals in the IT hardware sector.

detail that individual data points are suppressed by the BEA for confidentiality reasons.

More geographic detail is available for C&IS mode-1 trade, for which regional and select individual country data go back to 1986. However, this detail is available only for unaffiliated mode-1 C&IS trade, whereas only aggregate data exists for affiliated trade. As we saw in figure 4, this means that the validity of geographic analysis of US mode-1 C&IS imports is adversely affected, as it can cover only a relatively small minority of total US mode-1 C&IS imports. The situation for US mode-1 C&IS exports is relatively better, as geographic detail (per figure 4) includes approximately three-quarters of total US mode-1 C&IS exports. Figure 10 shows US unaffiliated C&IS mode-1 exports by region.

Figure 10 shows that Europe has consistently been the largest market for US unaffiliated mode-1 C&IS exports, receiving more than half of total exports, while Asia-Pacific and Canada account for most of the rest. Figure 11 shows the corresponding data for US unaffiliated mode-1 C&IS imports.

Figure 11 shows that the United States imports more than half of its unaffiliated mode-1 C&IS from Canada and that Canada accounts for the overwhelming majority of the increase in unaffiliated imports since 1997. The frequently discussed issue of increased US C&IS imports from India is revealed, at least in terms of unaffiliated mode-1 imports, to be of substantially smaller magnitude. After 1997 a relatively modest increase occurs in unaffiliated US C&IS mode-1 imports from India, reaching approximately one third the level of Canadian imports by 2006. Sections V and VI suggest an explanation for this finding.

Analysis of US bilateral trade in C&IS mode 3 is harder. The BEA publishes US foreign-affiliate operations data at the industry level for only nine individual and relatively large countries (Canada, Germany, France, the Netherlands, the United Kingdom, Brazil, Mexico, Japan, and Australia)⁵⁸ and five regions (Europe,⁵⁹ Latin America,⁶⁰ the Middle East,⁶¹ Africa, and Asia-Pacific⁶²). Further, during the period of available data from 1999 to 2005, in numerous instances individual annual industry and country data are suppressed for confidentiality reasons, meaning that for Australia and Asia-Pacific no data are actually publicly available and for no country or region is a complete time-series available. Table 4 summarizes the publicly available data for US C&IS mode-3 exports by geographic entity.

Looking between the holes in the data presented in table 4, a few things are noteworthy. The bilateral data for countries and entities for which actual time-series exists, such as Canada, France, Germany, the Netherlands, Latin America, and Mexico, show relative stable levels of US C&IS mode-

58. See BEA (2008e, annual tables III-F18 and III-F20).

59. Comprised of the EU-27, the EEA, the CIS states and former Yugoslavia states, as well as Turkey, Albania, Andorra, Gibraltar, Liechtenstein, and Moldova.

60. Includes all countries in Central and South America, as well as the Caribbean.

61. Includes Israel, Saudi Arabia, UAE, Iran, Iraq, Jordan, Qatar, Bahrain, Kuwait, Lebanon, Oman, Syria, and Yemen.

62. Includes ASEAN, Australia, New Zealand, Japan, China, Hong Kong, India, South Korea, other South Asian nations, and all Pacific Island nations.

3 exports at the bilateral level. This contrasts with rapidly rising aggregate US C&IS mode-3 exports and suggests that this aggregate growth is occurring in countries for which no bilateral data is available. Table 4 further indicates that relatively low levels of US C&IS mode-3 exports go to Africa, the Middle East, and Latin America, meaning that the overwhelming majority of US C&IS mode-3 exports go to advanced economies in Europe and the Asia-Pacific region.⁶³

The scarcity of bilateral mode-3 data further severely restricts the opportunities for analysis of the relative importance of mode 1 and mode 3 in US bilateral C&IS exports. Figure 12 combines available mode-1 and mode-3 data (see table 4) and plots individual country data and country averages by their level of economic development to provide an overview.⁶⁴

Several things can be seen in figure 12, although the dearth of data points prevents meaningful statistical validation of these visual observations. First there seems to be some correlation between the relative importance of mode 3 (demonstrated by a higher ratio of mode 3 to mode 1) and the level of economic development. The higher a country's GDP per capita, the higher the relative importance of C&IS mode-3 exports. This would support the proposition advanced above that US IT services companies supply high-end services to economically advanced clients mostly via mode 3.⁶⁵

At the same time, the relatively lower ratios of mode-3 to mode-1 exports for both Canada and the United Kingdom relative to other developed nations indicate that a shared English language reduces the relative importance of mode-3 by boosting the relative attractiveness of direct supply from the United States via mode-1 exports. Evidently sharing a common language matters when US IT services MNCs choose the mode through which to supply their services.

Similarly, it is noteworthy that geographic proximity and sharing a common border is important and tends to increase the relative importance of mode-1 exports. Distance seems to matter in US C&IS export-mode determination. The United States' two neighboring markets, Canada and Mexico have—relative to their peers among developed nations and in Latin America, respectively—a lower relative importance of C&IS mode-3 exports. We shall return to this issue in section VII concerning NAFTA.

63. This assertion is supported by geographically distributed asset data from the BEA for the three chosen NAICS industries. These show that roughly two thirds of US foreign-affiliate assets are located in Europe, one quarter in the Asia-Pacific region, and the remainder spread throughout the rest of the world. See BEA (2008e, table IIIB-5) and Hamilton and Quinlan (2005).

64. Figure 12 plots the ratio of mode-3 unaffiliated exports to mode-1 unaffiliated exports on the Y-axis. For Europe, Africa, and the United Kingdom, only one data point is available, making the period average equal hereto. Period averages are estimated as the average of only the years for which data are available. Note that for the United Kingdom, data are only available for 2005. This biases the UK data upwards and is the reason that the United Kingdom is shown with the highest average per capita income of the countries included in figure 12. Similarly, the category "Europe" includes many low-income countries and only has data for the year 2000. This explains the low per capita GDP value.

65. The issue of the importance of importing-country GDP per capita is discussed in Egger (2008). See also Nordas (2008).

The standard finding from gravitational regression work on trade flows that sharing a language and a common border boosts bilateral trade is therefore verified in figure 12, as these characteristics also affect the relative importance of the mode of supply for US C&IS exports.

Table 5 shows available bilateral data for US C&IS mode-3 imports and shows that at least in the period from 1997 to 1999, the data indicate that US mode-3 imports came overwhelmingly through European-owned multinationals, with Japan accounting for most of the rest. However, table 5 also shows that while total US mode-3 imports have risen sharply since 2000, imports from both Japan and the United Kingdom have been relatively stagnant. As with mode-3 exports above, growth in recent years has therefore come from countries not covered by bilateral data. One can thus speculate that much of the increase in recent years in total US mode-3 C&IS imports might originate from Indian multinational IT services companies recently established in the US market.

Given the increasing dominance of affiliated trade in US C&IS mode-1 imports (see figure 4), for which no bilateral data is available, it is not meaningful to pursue the analysis of the relative importance of bilateral modes of supply based only on unaffiliated mode-1 imports.

IV C&IS TRADE RESTRICTIONS IN MODES 1 AND 3 AND US DOMESTIC REGULATION

US C&IS Mode-1 and 3 Trade and GATS Trade Commitments

The finding above that US C&IS mode-3 trade is generally far more prevalent than US C&IS mode-1 trade, despite the existence of some geographic and country wealth–level variation in this trend, leads to the question of whether this might be caused by variation in countries' services trade commitments in this area under the GATS. The further finding that US RCA in mode 1 has been declining in recent years could also hypothetically be linked to a potential increase in trade restrictions among destination countries for US C&IS mode-1 exports. Data on GATS commitments in the C&IS sector can shed light on the extent of at least some of the traditional, explicit, at-the-border type trade restrictions.

For GATS negotiations and trade commitment schedule purposes, C&IS trade is covered under provisional UN Central Product Classification (CPC) 84: Computer and Related Services.⁶⁶ According to UNCTAD (2006), CPC 84 trade in both modes 1 and 3 is generally among the most liberalized services sectors negotiated in the WTO, largely owing to the relative novelty of the entire sector and subsequent low trade barriers during the Uruguay round of trade negotiations. Furthermore, this is what one would expect to be the case in an industry whose input is generally considered to enhance productivity for other sectors of the economy.

Combining the IMF Balance of Payments Statistics C&IS mode-1 import data for 133 reporting

66. See WTO (1991). Provisional CPC division 84 contains five subcategories: CPC 841: Consultancy Services Related to the Installation of Computer Hardware; CPC 842: Software Implementation Services; CPC 843: Data Processing Services; CPC 844: Data Base Services; and CPC 845+849: Other Computer and Related Services.

countries in figure 2 with WTO member states' trade commitments in CPC 84 corroborates this notion of relatively free global trade in C&IS. Just below 90 percent of world C&IS imports entered countries with no mode-1 limitations on market access. World C&IS imports and CPC 84 trade commitments are summarized in table 6.

About 10 percent of global C&IS mode-1 imports are subject to different degrees of modal trade restrictions, with most of these imports going to just three major developing nations: Brazil, India, and Indonesia. A small number of countries that reported C&IS data are not members of the WTO. For illustrative purposes, the same shares of mode-1 C&IS imports are shown with respect to mode-3 CPC 84 commitments. As is the case with mode-1 restrictions, about 90 percent of world mode-3 trade goes to countries with no mode-3 restrictions, while, again similar to the state of affairs in mode 1, a small number of developing nations account for the majority of trade affected by restrictions. In summary, very few explicit trade barriers affect CPC 84 in either mode 1 or 3.

To the degree that bilateral US C&IS trade data are available, a similar situation emerges for US C&IS exports. Over 95 percent of (unaffiliated) mode-1 and 98 percent of mode-3 exports go to countries with no limitations on market access.⁶⁷ While it could, of course, be argued that such high percentages of US free trade C&IS exports indicate precisely how distorting existing GATS market barriers are in the few countries that have them, the more relevant implication is that market access under the GATS is not a particularly important hindrance for US C&IS trade. Instead, relevant trade barriers for US C&IS trade, similar to most professional services, are to be found in the form of behind-the-border regulations.

US Domestic Regulatory and Other Barriers to Modes 1 and 3 Trade in C&IS

C&IS as analyzed in this paper is a relatively novel product category, and further it is characterized by a very high degree of dynamism with rapidly changing product characteristics and capabilities. As a result, government regulation hereof in general can be expected to struggle to catch up with developments in the C&IS market place and the sector should be relatively lightly regulated. The C&IS product category further benefits from its intangible character, which inherently places it outside the jurisdiction of most product safety regulation. It is simply not a worry to US regulators whether imported C&IS services might contain too much lead. Similarly, this author has found no instances of official professional-

67. Aggregate asset data suggest that more than 80 percent of analytically relevant US investments are in countries with no restrictions on CPC 84 mode-3 market access. Asset data are only available for the higher two-digit NAICS categories. 81 percent of assets in categories "51: Information" and "54: Professional, technical, and scientific services," which includes all three C&IS industries chosen for this paper, were in countries with no limits on mode-3 market access in CPC 84 in 2005 (BEA 2008e, table IIIB-5).

certification requirements for workers taking up employment in the IT services industry.⁶⁸ In total, this points to C&IS being a sector with relatively light domestic regulation.

At the same time, however, C&IS is a high-tech product for which trade might potentially be regulated on the grounds of national security. The United States is a participant in the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies.⁶⁹ The aim of the Wassenaar Arrangement is to ensure that transfers of advanced technology products do not contribute to the development or enhancement of military capabilities that undermine international security and stability, and that they are not diverted to support such capabilities.⁷⁰

On the Wassenaar “control list” of regulated dual-use products, as well as the associated lists of “sensitive items” and “very sensitive items,” trade and exchange of software for the development, production, and use of a series of high-tech products is regulated and restricted.⁷¹ US national law—the Export Administration Regulations (EAR)—administered by the Department of Commerce’s Bureau of Industry and Security implements the Wassenaar rules in the United States. Yet as information concerning the precise implementation of EAR is overwhelmingly confidential, it is not immediately possible to gauge the scope of its potential inhibiting effect on US C&IS trade. However, since the Wassenaar Arrangement explicitly does not cover software that is generally available to the public⁷² or already in the public domain, and covers only software related to very high-performance items,⁷³ the direct quantitative impact of these national security related trade restrictions can be expected to be relatively modest.

EAR concerns itself only with US C&IS exports, but a related national security worry of potential relevance to foreign investments in the United States, i.e., C&IS mode-3 imports, is the so-called CFIUS process. Since 1977 the Committee for Foreign Investments in the United States has regulated foreign acquisitions of US companies.⁷⁴ The CFIUS is an interagency committee led by the US Treasury, which reviews proposed foreign takeovers of US companies and may advise the US president that the executive

68. In fact, many initial workers in the IT services industry were self-taught and had relatively few formal educational qualifications. The Indian IT services industry association, NASSCOM, has a voluntary program to combat the risk of data theft in which employees are subjected to background screenings before being employed in the industry.

69. The Wassenaar Arrangement consists of 40 countries and includes all OECD and most EU countries as well as Russia and the Ukraine.

70. See the Introduction of the Wassenaar Arrangement at www.wassenaar.org (accessed on October 3, 2008).

71. See the Wassenaar Arrangement at www.wassenaar.org (accessed on October 3, 2008) for the full control lists.

72. Defined as being sold from stock at retail selling points or outlets without restriction.

73. The US Department of Commerce, Bureau of Industry and Security’s Export Administration Regulations Database states that US export controls concern only computers and software with a capacity of more than 0.75 Weighted TeraFLOPS (WT). See “Category 4—Computers” in Government Printing Office (2008).

74. The discussion of CFIUS in this section draws extensively on the authoritative analysis in Graham and Marchick (2006).

“suspend or prohibit any foreign acquisition, merger or takeover of a U.S. corporation that is determined to threaten the national security of the United States” (US Treasury 2008). Companies about to engage in cross-border acquisitions that fear their plans may be deemed to pose a risk to “US national security” will notify the CFIUS of their intentions, submit supporting material to the Committee, and hope to receive an official clearance for the transaction to go through.⁷⁵ What “national security” actually means, however, was not precisely defined in the original US law. Several subsequent amendments to the original regulation⁷⁶ have since provided several factors that the CFIUS may consider in determining whether a threat to US national security arises from a particular proposed transaction (US Treasury 2008):

1. Domestic production needed for projected national defense requirements;
2. The capability and capacity of domestic industries to meet national defense requirements, including the availability of human resources, products, technology, materials, and other supplies and services;
3. The control of domestic industries and commercial activity by foreign citizens as it affects the capability and capacity of the U.S. to meet the requirements of national security;
4. The potential effects of the transaction on the sales of military goods, equipment, or technology to a country that supports terrorism or proliferates missile technology or chemical and biological weapons;
5. The potential effects of the transaction on U.S. technological leadership in areas affecting U.S. national security.
6. The acquirer is controlled by or acting on behalf of a foreign government; and
7. The acquisition could result in control of a person engaged in interstate commerce in the U.S. that could affect the national security of the U.S.

The CFIUS legislation and the power of the US government to block foreign acquisitions of high-tech US IT services companies and thereby inhibit C&IS mode-3 imports can be seen as quite broad in theory. In reality, however, this sweeping authority is countered by the stated desire of US authorities to maintain an open investment policy and actual instances of CFIUS blocking foreign acquisitions of US companies have been very few. As laid out in Graham and Marchick (2006, 56ff), out of a total 1,593 notifications to CFIUS from 1988 to 2005 (accounting for approximately 10 percent of total FDI in the United States over this period), the CFIUS carried out just 25 investigations, resulting in 13 voluntary withdrawals of proposed transactions and just a single formal presidential rejection of a transaction. In reality, therefore, the overall direct impact of CFIUS on investments in the United States has been very limited and in the IT services sector nonexistent.⁷⁷

75. The voluntary aspect of the CFIUS notification process is of course strongly incentivized by the desire of transacting companies to ensure that their transaction is not revisited and annulled by US authorities post facto for national security reasons.

76. Executive Order 11858 from 1975.

77. None of the transactions that were voluntarily withdrawn or the single rejection, according to Graham and Marchick

At the same time, however, the indirect pre-emptive effect of the CFIUS legislation—i.e., the number of foreign investments that were never attempted, or voluntarily withdrawn soon after initial, informal inquiries from US authorities, or submitted for notification in an altered, reduced form so as to gain CFIUS approval—cannot be gauged, but according to Graham and Marchick (2006) might be substantial. The extent to which this has affected US mode-3 C&IS imports cannot be immediately quantified. Similarly it is clear that in the case of acquisitions made by foreign entities either controlled by or acting on behalf of a foreign government that are explicitly targeted by the CFIUS process, many if not most companies from China, as well as some European companies, may find it difficult to gain regulatory approval for their attempted acquisition of US IT services companies.⁷⁸

In summary, it is appropriate to conclude that US domestic regulation and national security concerns raise few direct barriers to US C&IS trade. However, this relative scarcity of explicit US domestic regulations directly affecting C&IS trade in all probability masks another, and likely much larger, effect that indirect domestic regulation of IT services products has on the scope of C&IS trade. The key issue here is the characteristic of C&IS to act as an intermediate input to other traded products and services, and as a facilitator and vehicle of transmission for frequently regulated information flows. This occurs when, for instance, domestic regulation requires that website interfaces and audiovisual services are made available in multiple (local) languages. Another example of regulation indirectly affecting US C&IS trade—this time not US domestic regulation, however—is the EU Directive for Data Protection (DDP), which since 1998 has prohibited the transfer of personal data to non-EU countries (including the United States) that are deemed not to meet the EU-adequacy standard for privacy protection. The EU DDP has mattered profoundly for US C&IS trade, even if this effect does not come from regulation directly applicable to the US IT services sector. A brief discussion of the DDP therefore illustrates how an indirect effect on C&IS trade flows can result from the domestic regulation of other sectors.

The DDP requires a high level of protection of personal information⁷⁹ within the European Union and forbids the transmission and processing of such data by non-EU entities not adhering to this standard. Moreover, the DDP is very far reaching in its jurisdiction, as it employs a wide-ranging definition of “processing” of personal data. The legal definition of processing goes far beyond collection of personal data and takes the following meaning:

(2006), occurred in the IT services industry.

78. See discussion in Graham and Marchick (2006, 104ff) and the testimony of Pieter Bottelier before the US-China Economic and Security Commission, Washington, April 16, 2004.

79. EU Directive 95/46/EC article 2 has the following definition of personal information: “‘personal data’ shall mean any information relating to an identified or identifiable natural person (‘data subject’); an identifiable person is one who can be identified, directly or indirectly, in particular by reference to an identification number or to one or more factors specific to his physical, physiological, mental, economic, cultural or social identity.”

processing of ‘personal data’ (‘processing’) shall mean any operation or set of operations which is performed upon personal data, whether or not by automatic means, such as collection, recording, organization, storage, adaptation or alteration, retrieval, consultation, use, disclosure by transmission, dissemination or otherwise making available, alignment or combination, blocking, erasure or destruction.⁸⁰

Essentially the DDP therefore covers almost any type of action carried out involving a very extensive list of personal information (see definition in footnote 79) and effectively excludes non-EU companies (as well as noncompliant domestic EU companies) from engaging in such transactions. The US Department of Commerce (2008) notes diplomatically that:

As a result of...different privacy approaches, the Directive could have significantly hampered the ability of U.S. companies to engage in many trans-Atlantic transactions.

As a result of the potential for the DDP to act as a regulatory barrier to trade, the United States and EU regulators in 2000 set up the so-called safe harbor arrangement, under which US companies can voluntarily submit to a series of requirements that are deemed by the European Commission to guarantee adequate protection of EU personal data. According to the online list provided by the US Department of Commerce, 1,487 US organizations have registered with the safe harbor since its start in 2000 (US Department of Commerce 2008). Breaking down the registered companies by industry illustrates just how important the safe harbor has been for the US IT services industry since 2000 and by extension illustrates how hard, relative to other industries, this type of domestic EU regulation would have hit the US IT services industry’s ability to trade with the European Union. Figure 13 provides the top 20 industries registered in June 2007.⁸¹

Figure 13 shows that the top-3 industries in which US companies have registered for safe harbor status in order to be able to conduct their business within the European Union or with EU entities roughly approximate the US IT services industry.⁸² While it is very difficult to quantify the impact hereof, figure 13 shows that a domestic data-privacy regulation in Europe has clearly directly affected the ability of the US C&IS industry to trade in and deliver its services.

80. EU Directive 95/46/EC article 2.

81. In the online Department of Commerce listing, individual companies are frequently registered in multiple individual industries. This reflects the same issue of individual companies conducting business in multiple sectors of the economy as illustrated with IBM in figure 3. The Department of Commerce list for safe harbor registration, however, unlike the BEA’s surveys, is not administered on a “primary industry of operations basis,” but instead registers individual companies in all of their principal industries of operation. IBM for instance is registered in “computer services,” “computer software,” and “computer and peripherals” (hardware) in this list. As a result, the total sum of individual industry registrations significantly surpasses the number of registered companies.

82. A similar dominance of US IT services companies is found in the safe harbor list provided in Greer (2007). The industry classification system used in the Department of Commerce online list is not provided by the Department of Commerce.

A similar instance of a large indirect effect of domestic regulation on US C&IS trade would have occurred when the US government in late 2006 banned internet gambling.⁸³ Suddenly an entire US industry, whose product—gambling over the internet—can only be delivered utilizing C&IS products, was outlawed. Another example is the American Registry of Radiologic Technologists' (ARRT) requirement that readers of certain medical radiologic scans of US patients be certified in the United States to carry out this task. Were this not the case, this service could likely be offshored to other destinations more easily, utilizing products and services provided by US or foreign C&IS companies. Domestic regulation in the medical sector in this instance directly blocks the potential business of US C&IS providers. As C&IS continues to develop, the list of such indirect effects of domestic regulation on the C&IS sector is likely to continue to expand.

At the same time, however, it is crucial to note that domestic regulation need not always act to block C&IS trade. It might just as easily create a novel market niche for new products. Just as is the case in the financial sector, where new products—such as off-balance sheet special purpose vehicles (SPVs)—are constantly developed to attempt to circumvent fiduciary regulations and accounting rules, government regulation of other sectors can create new demand for C&IS. A high-profile US example of new government regulation in another sector suddenly creating a new market for C&IS products is the 2002 Sarbanes-Oxley Act. This law implemented sweeping changes in US corporate governance, accounting, and disclosure rules, and required that all US public companies put in place far-reaching new internal controls and disclosure procedures. This spurred the creation of an entire new market for Sarbanes-Oxley compliance software for US corporate clients, which quickly became a multibillion dollar market for the US software and IT services industry.⁸⁴

In brief summary, US C&IS trade seems to face few explicit trade barriers at the border and is similarly subject to limited direct C&IS-specific domestic US regulation and national security concerns. However, the demand for C&IS is heavily affected by the domestic regulation in the United States or abroad of other sectors and products and changes herein. Such regulatory changes have a large, indirect impact on C&IS trade, although the quantitative scope hereof is very difficult to estimate.

V US C&IS TRADE IN MODE 4

Toward an Empirical Methodology for Estimating US C&IS Trade in Mode 4

As mentioned in section II above and stated repeatedly in MSITS (2002, annex 1), no existing national or international statistical system satisfactorily captures the scope of mode 4 from a trade perspective.⁸⁵

83. See, for instance, MSNBC News, "Will ban end Internet gambling? Don't bet on it," October 17, 2006.

84. See, for instance, *BusinessWeek*, "The Sarbanes-Oxley Software Race," July 12, 2005; *Wall Street Journal*, "Software for Sarbanes," April 25, 2005; and *SearchCIO.com*, "Spending on Sarbanes-Oxley software climbs," February 8, 2006.

85. See also Dobson (2002), Lemaitre (2004), and Singh (2005) for explorative evidence and discussions of mode 4.

This section sketches out a preliminary methodology for approximating US C&IS trade in mode 4. Two substantial constraints must, however, be made immediately clear. First of all, no estimate can be made of US C&IS mode-4 exports, as no data are available that quantify the temporary presence abroad of either US citizens or employees of US companies. Second, this section must adopt the definition of “temporary presence” used in US domestic immigration laws, as immigration records provided by the US Department of Homeland Security are the source of data for this section.

US immigration law operates with two main temporary visa categories that are of interest to the analysis of C&IS mode-4 trade: the L-1⁸⁶ visa for intracompany transferees and the H-1B⁸⁷ visa for high-skilled workers.⁸⁸ The temporary L-1 visa is available to transfer foreign workers who have been employed by a (by definition) multinational company outside the United States for a minimum of 1 year to a US location within the same company. As such it corresponds with the US horizontal GATS commitments for intracompany transferees, as described in the US schedule of specific commitments.⁸⁹

Figure 14 shows how rapidly issuance of L-1 visas has increased in recent years and that L-1 visas issued to Indian nationals account for essentially the entire increase after 2000.

No data are available on the total sectoral breakdown of L-1 visa recipients. However, since the L-1 visa is granted at the company level, data are available for the most recent years on the use of L-1 visas by individual companies. This is also the case for the H-1B visa category. Table 7 shows the top-25 company recipients of L-1 and H-1B visas in FY2006.

Table 7 shows several things. First of all, the most intensive company users of both the L-1 and H-1B visa are IT services/software companies. As such, it is evident that US mode-4 imports are concentrated in C&IS, and are far less prevalent in other individual sectors. Second, it is evident that a relatively limited number of Indian IT services companies are the most intensive users of both the L-1 and H-1B visas. As such, it is reasonable to assume that the vast majority of the increase in the issuance L-1 visas to Indian nationals since 2000, shown in figure 14, is accounted for by an increase in L-1 recipients in the IT services industry. Third, and of most the immediate relevance here, the fact that the

86. The L-1 visa category applies to intracompany transferees who, within the three preceding years, have been employed abroad continuously for one year, and who will be employed by a branch, parent, affiliate, or subsidiary of that same employer in the United States in a managerial, executive, or specialized-knowledge capacity. It is valid for up to 7 years (5 years for specialized-knowledge capacity). No labor certification is necessary. See Bureau of Consular Affairs (2008).

87. The H-1B visa category applies to persons in a specialty occupation that requires the theoretical and practical application of a body of highly specialized knowledge requiring completion of a specific course of higher education, generally the equivalent of a bachelor's degree. It is valid for three years and renewable once.

88. In addition, US law provides foreign graduates of US universities with a temporary, 1-year Optional Practical Training (OPT) opportunity for employment after receiving their degree. However, as no data are available on the sectoral and occupational characteristics of foreign students temporarily employed in the US under OPT, it cannot be included in the analysis in this paper. See Kirkegaard (2005, 2007) for a detailed discussion of the characteristics of these visa categories and OPT.

89. GATS/SC/90, available in WTO (2008).

same IT services companies are the most intensive users of both the L-1 and H-1B systems (12 companies in total and nine IT services/software were among the top-25 users of both the L-1 and H-1B in FY2006) indicates that in the IT services industry the two visas function as close substitutes for each other. An estimate of both L-1 and H-1B visa usage should therefore be included in any US C&IS mode-4 import approximation. This would further indicate that the working conditions for foreign workers on L-1 and H-1B visas in the IT services are likely to be quite similar. This is important, since information on average wages for temporary workers in the IT services sector are only available for H-1B workers and not for L-1 workers. However, based on table 7, this paper argues that it is reasonable to assume that foreign temporary workers on L-1 visas in the IT services industry earn roughly the same wages as their colleagues toiling on H-1B visas.⁹⁰

More detailed data are generally available on the population of foreign workers on H-1B visas in the United States. An H-1B visa is initially valid for three years and then renewable for another 3 years. The H-1B visa hereby accounts for the US horizontal commitment in mode 4 for “specialty occupations.”⁹¹ From 2000 to 2005 the Department of Homeland Security published an annual report called “Characteristics of Specialty Occupation Workers (H-1B),” which included detailed data by fiscal year (in the United States from October to September) on the number of H-1B recipients by occupation and sector of employer, as well as the wages they receive.^{92,93} Data for the number of H-1B recipients working in the sectors of interest for this paper and their average annual wages allow for the estimation of the approximate total annual wage income received by H-1B holders working in the IT services industry in the United States. Annual H-1B visa issuance numbers and wage data for the IT services industry, as well as cumulative wages-received estimates, are presented in table 8.

A large number of simplifying methodological assumptions underlie the data in table 8. The most important are: (1) As all visa data should be treated as gross data, the departure assumption in table 8

90. The GATS mode 4 covers foreign workers temporarily employed at both foreign-owned and domestically owned companies. In GATS mode-4 terms, there is subsequently no distinction between a US and an Indian IT services company operating in the US market. See MSITS (2002) 74. However, in terms of the potential overlap between modes 3 and 4 in estimated C&IS imports, whether the ownership is American or Indian makes a very large difference. This issue is discussed in section VI.

91. See GATS/SC/90, available in WTO (2008).

92. All wage estimates are base wages, and do not include the value of employment benefits (e.g., healthcare coverage) or bonuses.

93. Note that all data used for H-1B visas in this paper are from official US government sources and refer only to actual H-1B visas issued. This sets the data in this paper apart from data presented on H-1B visa recipients coming from the US Department of Labor’s Foreign Labor Certification Database. The data in this database include submitted data for all potential H-1B recipients, rather than the far smaller subcategory of foreign workers who ultimately receive an H-1B visa. As such, use of the Department of Labor database for work analyzing the actual population of US H-1B workers is misleading and should be avoided. See Kirkegaard (2005) for a discussion of this issue. At the same time, the accuracy of the DHS data presented here should not be overestimated and very significant degrees of uncertainty surround all estimated values in this section as a result.

is that all H-1B recipients remain employed in the United States for the entire three-year duration of their H-1B visas;⁹⁴ (2) It is assumed that all H-1B recipients received their H-1B visa on the first day of the fiscal year; (3) It can be seen in table 7 that H-1B recipients on renewed visas earn significantly higher wages than do initial H-1B visa recipients (\$68,000 vs. \$52,000 in 2005). This is not surprising, as a continuing H-1B visa recipient will usually have at least 3 years of additional work experience. For cumulative wage estimations, it is subsequently assumed that H-1B recipients have annual linear-wage increases throughout their full 6 year stay in the United States, equivalent in scope to 1/3 of the increase between initial and continuing H-1B recipients.

Table 8 shows that there was a very large drop in H-1B usage by the US IT services industry after the internet bust and the end of Y2K from FY2001–2002. This shows that mode-4 trade is strongly affected by the business cycle—perhaps indicating that companies let go of foreigners first.⁹⁵ Table 8 further presents estimates of the total wages received by H-1B visa holders employed in the US IT services industry; they amounted to about \$15 billion annually during FY2003–2005. The decline from FY2003 to FY2004 is a delayed echo effect of the large decline in H-1B visa issuance after 2001. Note that due to the three year duration of the H-1B visa and the lack of data before 2001, cumulative estimates cannot be computed for 2001 and 2002.

Table 7 showed that a large number of L-1 recipients are also temporarily employed in the US IT services industry. How many cannot be accurately discerned from available data. However, as a very rough approximation, this paper arbitrarily assumes that a conservative 50 percent of the total number of Indian L-1 recipients take up 5-year employment in the US IT services industry at wages equivalent to similar workers employed with H-1B visas. Employing the same methodological assumptions as for table 8, this indicates that foreign workers on L-1 visas in the US IT services industries received an approximate total wage remuneration of \$1.8 billion, \$2.3 billion, and \$2.9 billion annually from 2003 to 2005. A very tentative total, approximate wage income for foreign workers temporarily employed in the US IT services industry on L-1 and H-1B visas, based on available data, therefore lies in the \$16 billion to \$19 billion range from 2003 to 2005.

As discussed in section II, the BPM5 captures aggregate compensation for the provision of cross-border labor under the entry “compensation of employees” if earned from employment lasting less than 1 year and under the entry “workers’ remittances” for employment of longer durations. For the purpose of estimating the value of services provided by natural persons in mode 4, it is not just wage income that must be included, but rather an estimate of the total value of the service or services package delivered. Wage costs make up the largest share of the total value of services delivered by natural persons, but in order

94. See, for instance, Lowell (2000) for earlier estimates that include other assumptions for H-1B departure times.

95. Kirkegaard (2005 and 2007) discusses the cyclical aspects of H-1B program usage in greater detail.

to approximate the total service value, a mark-up profit margin should be added to aggregate wage costs.

How large such an aggregate mark-up for mode-4 services delivered in the IT services industry in the United States ought to be is a difficult empirical question. The IT services industry is generally a relatively high-margin industry. A quick look at the financial statements of the top companies in table 7 confirms this and reveals that the gross profit margins⁹⁶ at Infosys from 2003 to 2008 were over 40 percent,⁹⁷ over 30 percent in the same period for Wipro,⁹⁸ about 44 percent for Tata Consulting Systems in 2006–08,⁹⁹ and over 40 percent for IBM in 2005–07.¹⁰⁰ Based on total gross profit margins of companies in the IT services sector, a sizeable mark-up on wage costs to reach the total value of services delivered by natural persons in the US market through mode 4 would seem justified. However, as it is not possible to estimate the specific margins involved in the work carried out by L-1 and H-1B visa holders, and as the profit margins for leading industry firms are likely to be higher than for the industry as a whole, this paper settles for a more conservative 20 percent gross profit margin to be added to mode-4 wage costs. This produces an approximate estimate for the total value of US mode-4 C&IS imports from 2003 to 2005 in the range of \$20 billion to \$23 billion annually.

This estimate is highly dependent on the assumptions made in its calculation and should therefore be treated with substantial caution concerning its validity. The issue of overlap between mode 4 and other modes of supply in US C&IS imports is analyzed in section VI.

Impact of US Visa Regulations on Mode-4 C&IS Trade

Immigration policies have been the subject of intense domestic debate in the United States in recent years and the L-1 and H-1B visas have not been exceptions.¹⁰¹ This raises the issue of the degree to which the regulation of these two visa programs may have acted as a domestic regulatory barrier to trade in mode 4 by limiting the access of temporary foreign workers to the US market. This is particularly an issue with the H-1B program, which has been regulated by an annual quota since its inception with the Immigration and Naturalization Act of 1990.¹⁰²

96. Gross profit margin refers to company revenues minus the cost of goods sold (COGS). COGS refers to the costs of production directly attributable to the product sold (i.e., variable costs). As such, it includes direct labor costs and materials, but not indirect (fixed) costs, such as buildings, distribution, and administration. For the purposes of mode-4 trade, fixed costs can, by definition, be expected to be relatively small and use of gross profit margins is most appropriate. All financial data directly referred to in this paper are reported on the basis of US Generally Accepted Accounting Principles (GAAP).

97. See Infosys 2008 20-F filing with the SEC, available at www.sec.gov (accessed on October 3, 2008).

98. See Wipro 2008 20-F filing with the SEC, available at www.sec.gov (accessed on October 3, 2008).

99. See TCS financial report from Q4 2007–08, available at www.tcs.com (accessed on October 3, 2008).

100. See IBM statement of consolidated earnings, available at www.ibm.com (accessed on October 3, 2008).

101. See the numerous statements and legislative activities of, for instance, US Senator Charles Grassley (R-IA). See also Kirkegaard (2005, 2007) and Hanson (2005) for listings of media coverage of this issue.

102. This section discusses only the quantitative impact of explicit restrictions on visas in the L-1 and H-1B visa programs and not consider any potential trade impact of the general tightening of security at US borders since September 2001 and

The L-1 program has no numerical limits or quotas and therefore offers relatively free access to intracompany transfers to the United States under the L-1 guidelines described above. Undoubtedly, this is one of the reasons that the IT services companies in table 7 are heavy users of this visa and that the inflow of Indian nationals on L-1s has been rising rapidly in recent years.¹⁰³

The H-1B program has always had an annual quota attached to it, initially of 65,000 but increased to 195,000 between FY2001 and FY2003. Since FY2004, the annual quota has been 65,000 with an additional 20,000 H-1B visas made available to foreign graduates of US universities in 2005. However, it is important to realize that the annual H-1B quota is not comprehensive and does not cover all types of H-1B applications. Several important exceptions to the quota exist, meaning that the total number of H-1B visas actually issued each fiscal year to foreign workers is far higher than the annual quota. The two most important exceptions are that the quota applies to initial H-1B visas only and does not apply to H-1B visa extensions, nor does it apply to educational and nonprofit research organizations. Table 9 has the most recent available data.

Table 9 shows that, despite the H-1B quota, over 250,000 H-1B visas were issued in FY2004–05, with over 100,000 issued for initial employment in each year. In a broad, quantitative sense, the impact of the H-1B quota on the ability of foreign temporary workers to enter the United States is therefore evidently smaller than the headline 65,000 quota would suggest. Similarly it can be seen that the IT services industry, especially in 2004 and 2005, accounts for a very large share of the total number of H-1B visas issued for initial employment. The dominance of the IT services industry in terms of obtaining available H-1B visas increases if one assumes, not unreasonably, that most prospective employers in the IT services industry are subject to the H-1B quota. The aggregate data from FY2000–05 in table 9 therefore confirms the large role of the IT services industry in the H-1B program found also at the company level in table 7 in FY2006.

At the same time table 9 shows that in FY2002 and FY2003, for instance, when the quota was 195,000, there were large numbers of unused H-1B visas available under the quota. This again illustrates the cyclical nature of companies' use of temporary work visas, as US businesses do not always snap up all available visas. It is the business cycle, rather than H-1B quotas and availability, that largely determines how many temporary visas IT services companies require.

This points to the perhaps surprising conclusion that while quotas in the H-1B program clearly restrict the number of foreign workers who can temporarily enter the United States on an H-1B visa in the aggregate—something that can be seen on the right hand side of table 9, as the number of petitions

the subsequent creation of the Department of Homeland Security.

103. The L-1 visa is also in some respects cheaper for companies to use than is the H-1B visa, which is subject to specific fees of several thousand dollars per visa. See Kirkegaard (2007) for details.

for H-1B visas have far exceeded the quota of available visas in both FY2007 and FY2008—this likely does not impact the IT services industry very much, as IT services companies seem consistently able to acquire a very large number of H-1B visas, so large, in fact that it seems unlikely that the quantitative restrictions on H-1B visas have had a material impact on the IT services industry’s ability to trade in mode 4 in recent years.

This ability of IT services companies to secure large numbers of H-1B visas for their temporary foreign workers is in all probability directly related to the very substantial resources individual IT services companies spend on immigration lawyers and other visa-related costs. Infosys, for example, the top company in FY2006 for H-1B usage, states in its 2008 annual 20-F filing with the SEC that it incurred up to \$16 million per financial quarter in costs directly related to obtaining US work visas. The willingness of profit-oriented IT services companies to incur such high visa-related expenses indicates the high importance of both temporary workers and of mode-4 trade for their business models (see section VI below).

In brief summary, while not immediately quantifiable, it seems unlikely that US visa rules have significantly restricted mode-4 C&IS trade in recent years. IT services companies have been consistently able, at considerable costs, to acquire such a large number of US temporary work visas—both in absolute terms and relative to other industries—that the adverse impact from quantitative H-1B restrictions largely will have fallen outside the C&IS sector. Certainly, IT services companies would have been more profitable in the absence of any quantitative restrictions on US temporary work visas, but it is unlikely that US mode-4 C&IS trade would have expanded much.

VI TOTAL US C&IS TRADE BY MODE OF SUPPLY

With all modes of supply for US C&IS trade now approximated to the extent that data availability allows, it is possible to present rough values for the relative shares of US C&IS trade by mode of supply. This is done in table 10, which also presents several modal estimates of services trade from other sources.

As mentioned earlier, it is clear that for US C&IS exports mode 3 is the increasingly dominant means of delivery. In table 10, it can be seen that it is far more important than the frequently cited aggregate shares of services trade from Karsenty (2002) would imply. The 90 percent figure for US C&IS mode-3 exports is relatively close to the level found for aggregate services exports from four leading industrial nations in Bensidoun and Únal-Kesenci (2008), even if the slightly higher value again indicates little support for any cross-border tradability revolution in US C&IS exports. Of particular relevance, however, is the comparison with the survey in Reserve Bank of India (2005), which covered Indian exports of computer services.¹⁰⁴ Comparing US and Indian export figures leads to several conclusions.

104. See Reserve Bank of India (2006, 2008) for later estimates of Indian exports of C&IS.

First, it is appropriate, as this paper has done, to disregard the analysis of mode 2 as a means of delivery for C&IS. Second, the Indian data give a far higher importance of mode-1 delivery than do the US export data. This supports the interpretation from section III that C&IS trade is stratified by mode, with the more standardized C&IS services, in which India excels, relatively more cross-border deliverable through mode 1, while the higher value-added C&IS services dominated by US IT services multinationals require a higher share of local content, making mode 3 the increasingly preferred choice for delivery.

On the C&IS import side, due to lack of available data, this paper so far has attempted no analysis of the potential for overlap between US C&IS imports in modes 3 and 4 as estimated in this paper. Such an overlap through double counting would occur if, for instance, foreign majority-owned affiliates in the US market sold services in mode 3, overwhelmingly delivered by a foreign workforce temporarily employed at these foreign affiliates and thus in theory also counting toward mode-4 trade as defined in this paper. While the available data do not allow for a sensible quantification of the scale of any such double counting for the entire industry, table 7 makes it clear that at least for Indian IT services companies operating in the United States, this overlap between modes 3 and 4 is extremely high. The vast majority of employees at Indian IT services affiliates operating in the US market are without doubt Indian nationals temporarily employed in the United States.¹⁰⁵ As such, it is overwhelmingly likely that substantial overlap exists between the estimates made in this paper of US C&IS imports in mode 3 and mode 4.

Further comparison of the different estimates in table 10, irrespective of the scale of the overlap between modes 3 and 4 in US C&IS imports, lends support to the conclusion of section V that mode-4 trade seems much more important for C&IS trade than for services trade in general. Similarly, mode-1 delivery for US C&IS imports is relatively less important than for services in general.

VII US C&IS TRADE AND THE IMPACT OF NAFTA

The North American Free Trade Agreement (NAFTA) went into effect in 1994 and through its negative list liberalized most services trade and investment between Canada, Mexico, and the United States.¹⁰⁶ We saw in figures 10, 11, and 12 that Canada is the largest unaffiliated mode-1 C&IS exporter to the United States, that it receives a limited amount of US mode-1 unaffiliated C&IS exports, and that US C&IS exports to both Canada and Mexico have a higher ratio of mode-1 to mode-3 delivery relative to exports to other regions, which suggests that sharing a border increases the importance of mode-1 deliveries. The question is whether or not any of this has anything to do with the provisions in NAFTA.

105. The SEC filings of the top Indian IT services companies support the data in table 7 and indicate that each has thousands of Indian IT professionals temporarily employed in the United States. See also Commander et al. (2008).

106. The discussion of NAFTA in this sections draws upon the analysis in Hufbauer and Schott (1992, 2005). None of the NAFTA members have any GATS restrictions on CPC84.

Hufbauer and Schott (2005, 25) note that, in a relative sense, the services component of NAFTA has been a disappointment, with both NAFTA merchandise trade and two-way services trade with non-NAFTA countries growing faster than intra-NAFTA services trade since 1994. A detailed analysis of the impact of NAFTA on C&IS trade is made difficult by the lack of bilateral trade data at this level of detail. No bilateral data are available from Canadian or Mexican sources. Figure 15 illustrates US two-way trade with Mexico and Canada in unaffiliated mode-1 C&IS trade. This is the only available unbroken data series that includes the periods both before and after the enactment of NAFTA.

Figure 15 illustrates that bilateral, unaffiliated mode-1 C&IS trade between the United States and Canada is quite small (less than \$3 billion in total in 2006) and trivial between the United States and Mexico. A strong increase in US imports of this category of services is visible in figure 15, but not until 1997, indicating that this increase is likely not related to NAFTA provisions.¹⁰⁷ Similarly, table 4 indicated that US C&IS mode-3 exports to both Canada and Mexico have been flat since 1999.

NAFTA contains provisions in mode 4 concerning the so-called TN or Trade NAFTA visa, which allows Canadian and Mexican citizens to take up professional occupations on the NAFTA Professional Job List in the United States, provided that several specific provisions are met.¹⁰⁸ Among the 25 professional occupations on the general NAFTA list is “Computer Systems Analyst,” indicating that these NAFTA provisions might have had some impact on the temporary cross-border labor in IT services.¹⁰⁹ No data are available for visa issuance by individual professional occupation, but the US Department of State’s Bureau of Consular Affairs publishes annual aggregate data for the total TN visa category. These are provided in table 11 from 1997 to 2006.

As can be seen, the aggregate uptake of the TN visa since 1997 has been decisively modest, particularly for Canadian citizens. There are subsequently few indications that any NAFTA provisions have had any noteworthy impact on mode-4 trade in C&IS, as computer systems analyst is just one of the many occupations that account for the small total for the TN program.

At the same time, survey data of the domestic Canadian IT services industry indicates that it has experienced continued strong growth, with operating revenues, employment, and the number of companies in the sector nearly tripling from 1997 to 2006.¹¹⁰ Total sales of the Canadian IT services industry reached \$CA33 billion in 2006, which, when compared to US unaffiliated mode-1 imports of

107. There were no gradual phase-ins of NAFTA provisions in C&IS after 1994.

108. Three criteria must be met for occupations on the list: The alien must possess the specific criteria for that profession; The prospective position must require someone in that professional capacity; And the alien must be going to work for a US employer. See US Embassy Canada (2008). The NAFTA visa is valid for one year, but can in theory be renewed indefinitely.

109. See the full list of NAFTA categories in NAFTA (2003).

110. See Statistics Canada (2008) and table 354-0005 in Statistics Canada online database.

C&IS from Canada of just \$US1.7 billion (a little over 5 percent of total Canadian sales), indicates that despite rising exports to the United States, the Canadian IT services industry is not strongly engaged in C&IS trade.

In summary therefore, available data indicate that NAFTA has had very limited impact on regional trade in C&IS after 1994.

VIII SUMMARY CONCLUSION AND POLICY IMPLICATIONS

Not everything that can be counted counts; and not everything that counts can be counted.

—Albert Einstein

This paper carefully evaluates the statistical strengths and weaknesses of available data on US C&IS trade and estimates the scope of delivery through GATS modes 1, 3, and 4. Estimated trade values adhere, to the greatest extent possible, to the definitions of modes of supply in the 2002 MSITS, and mode 3 is approximated by adopting a narrow definition of “commercial presence” based on sales-in-the-local-market data, closely aligned with the traditional mode-1 definition of cross-border C&IS trade.

This paper finds that US exports of C&IS are overwhelmingly and increasingly delivered through mode 3, which at approximately \$90 billion in 2005 accounts for about 90 percent of the aggregate total. US C&IS imports are also found to be mostly delivered through mode 3, reaching \$24 billion in 2005, although a strong increase in affiliated mode-1 imports is also found. 2006 was the first year in which the United States ran a mode-1 trade deficit in C&IS, predominantly due to this strong increase in affiliated imports. This suggests that, concerning US C&IS exports, modes 1 and 3 are substitutes for each other to some degree, while for US C&IS imports, some complementarity between mode 3 and affiliated mode-1 imports seems to exist.

The United States is found to have experienced declining overall revealed comparative advantage (RCA) in unaffiliated C&IS trade from 1986 to 2006, while having a constant negative RCA for affiliated C&IS trade after 1997. A strong and stable, positive RCA is estimated for US C&IS trade through mode 3. These results are interpreted to indicate that the United States retains a strong competitive position in high value-added, nonstandardized C&IS that require a large share of local content and therefore is preferably delivered through mode 3. Meanwhile, the United States is increasingly importing more-standardized C&IS services as intermediate inputs through intrafirm mode-1 delivery.

Bilaterally, Europe is found to be the largest US C&IS trading partner by a significant margin in both modes 1 and 3, and no recent surge in US C&IS mode-1 imports from India can be discerned from available data. In terms of the relative importance of modes 1 and 3 in US bilateral C&IS exports, the limited data indicate a positive relationship between the level of economic development in the

destination market and delivery through mode 3. This is taken as support for the finding of strong US competitiveness in high value-added C&IS, for which demand predominantly exists in economically advanced countries. Indications are also found that a shared language (English) and a common border boost the relative importance of mode-1 delivery of US C&IS exports. The general trade pattern in modes 1 and 3 for US C&IS trade clearly shows that distance and local content requirements continue to play a crucial role, despite the fact that this category of services is intrinsically among the most digitizable of traded services.

US C&IS trade faces few explicit GATS trade barriers at the border, as only a limited number of developing countries have any mode-1 and 3 restrictions in this category. Similarly, US C&IS is found to be subject to limited direct, specific domestic-US regulation and national security concerns. However, the demand for US C&IS is heavily affected by domestic regulation in the United States or abroad of other sectors and products and of changes in such regulation, as revealed by an analysis of the impact of EU regulations on data privacy.

US C&IS imports in mode 4 are explored through the utilization of the L-1 and H-1B visa programs in recent years. Both programs are found to be dominated by companies in the IT services industry, indicating that mode 4 plays a significantly larger role in C&IS than in other business service categories. US C&IS imports are tentatively approximated to have reached \$20 billion to \$23 billion in 2003–2005. Due to the employment of large numbers of foreign temporary workers by, particularly Indian, IT services companies operating in the US market, the overlap between US C&IS mode-3 and mode-4 imports as estimated in this paper is likely to be substantial. Overall, the importance of mode 4 in US C&IS trade is found to be larger than estimates of the relative weight of modes of supply in more aggregate services categories. Due to the ability of IT services companies to consistently secure a very large share of available US temporary work visas, the adverse impact of US immigration regulation on US C&IS mode-4 imports is deemed to be quite modest. Instead, the trade impact of restrictions on US temporary immigration can be expected in other economic sectors.

With limited data available for analysis from the pre-NAFTA period, the impact of the 1994 regional free trade agreement (FTA) is found to be small. US mode-1 imports of Canadian C&IS starts to rise only in the late 1990s and US mode-3 exports are stagnant. C&IS trade is of limited importance to the Canadian IT services industry. NAFTA's limited provisions in mode 4 have had very little impact on C&IS trade.

The findings in this paper have several policy-relevant implications. First of all, with US IT services companies increasingly counting on foreign affiliates to deliver to customers the high valued-added services in which they have their revealed comparative advantage, the global dominance of US IT services companies is unlikely to lead to large-scale creation of domestic US (cross-border) export jobs in IT

services industries. Instead, the global prominence of US firms in the sector seems likely to lead to the rapid expansion of companies' local workforces in non-US markets.

Second, US IT services companies are overwhelmingly likely to concern themselves with issues of investment and the national treatment of their affiliates in global, regional, and bilateral trade negotiations. As such, they are unlikely to engage fully in negotiations in which at least two of the four Singapore issues (investment protection and competition policy) are not on the agenda.

Third, a situation in which high value-added C&IS services with a US revealed comparative advantage are traded increasingly through mode 3, while lower value-added, standardized C&IS services in which the United States has a revealed comparative disadvantage are traded cross-border in mode 1 produces a structural, negative bias for the US C&IS trade balance. With mode 3 explicitly outside the traditional BPM5 framework and mode 1 included, the US C&IS trade balance essentially includes only the parts of C&IS trade in which the United States has a revealed comparative disadvantage. As such, the dominant position of US IT services companies is not accurately reflected in the United States' standard trade accounts. Instead, the global prowess of US IT services companies can be expected to show up predominantly in their earnings from their overseas operations.

Fourth, with other developed nations—especially in Europe—remaining the largest destination markets for US IT services by a significant margin, deepening the already close trading relationship with developed countries, especially in the services sectors, seems likely to have the greatest positive effect on the US IT services industry. Pursuing services-only FTAs with, for instance, the European Union, or other developed economies, therefore seems a fruitful policy path for the United States to explore in the future.

Fifth, with the increasing importance of mode 3 as the way for US IT services firms (and likely firms in other services industries as well) to deliver services, it will become increasingly important for businesses to be able to seamlessly transfer high-skilled employees throughout their global operations. Current US immigration restrictions, with their explicit restrictions on high-skilled visas, therefore pose an increasing obstacle for the opportunities of US IT services companies to conduct business.

REFERENCES

- Anderson, Thomas. 2007. US Affiliates of Foreign Corporations: Operations 2005. *Survey of Current Business* (August). Washington: Bureau of Economic Analysis.
- Balassa, B. 1965. Trade Liberalisation and 'Revealed' Comparative Advantage. *The Manchester School* 33: 99–123.
- Bensidoun, Isabelle, and Deniz Ünal-Kesenci. 2008. *Globalisation in Services: From Measurement to Analysis*. OECD Statistics Directorate Working Paper STD/DOC(2008)3/REV1. Paris: Organization for Economic Cooperation and Development.
- Bernard, Andrew B., J. Bradford Jensen, and Peter K. Schott. 2005. *Importers, Exporters, and Multinationals: A Portrait of Firms in the U.S. that Trade Goods*. NBER Working Paper 11404. Cambridge, MA: National Bureau of Economic Research.
- Borga, Maria, and William Zeile. 2004. *International Fragmentation of Production and the Intra-firm Trade of U.S. Multinational Companies*. Bureau of Economic Analysis Working Paper 2004-02. Washington: Bureau of Economic Analysis.
- Bureau of Consular Affairs. 2008. *Temporary Workers*. Available at <http://travel.state.gov> (accessed on October 3, 2008).
- BEA (Bureau of Economic Analysis). 2008a. *U.S. International Services: Cross-Border Trade 1986–2006, and Sales Through Affiliates, 1986–2005*. Available at www.bea.gov (accessed on October 3, 2008).
- BEA (Bureau of Economic Analysis). 2008b. *International Surveys: U.S. International Services Transactions*. Available at www.bea.gov (accessed on October 3, 2008).
- BEA (Bureau of Economic Analysis). 2008c. *International Investment Division Product Guide*. Available at www.bea.gov (accessed on October 3, 2008).
- BEA (Bureau of Economic Analysis). 2008d. *International Surveys: U.S. Direct Investment Abroad*. Available at www.bea.gov (accessed on October 3, 2008).
- BEA (Bureau of Economic Analysis). 2008e. *International Economic Accounts*. Available at www.bea.gov (accessed on October 3, 2008).
- Cave, William. 2006. How Are Services Being Internationalized? Paper presented at 7th OECD International Trade Statistics Export Meeting, ITS, Paris, September 11–14.
- Cave, William. 2007. Asymmetries in the OECD Trade in Services By Partner Country Dataset. Presentation at OECD-Eurostat Meeting of Experts in Trade in Services Statistics (TIS), Paris, September 18–19.
- Commander, Simon, Rupa Chanda, Mari Kangasniemi, and L. Alan Winters. 2008. The Consequences of Globalisation: India's Software Industry and Cross-border Labour Mobility. *The World Economy* 31: 187–211.

- Deloitte Research. 2004. *The Titans Take Hold*. Deloitte Research Financial Services Report by Chris Gentle. New York.
- Dobson, Howard R. 2002. *Movement of Natural Persons (Mode 4) Under the GATS*. Paper presented at Joint WTO-World Bank Symposium April 11–12, 2002. Available at www.wto.org (accessed on October 3, 2008).
- Ekholm, Karolina. 1998. Headquarter Services and Revealed Factor Abundance. *Review of International Economics* 6, no. 4: 545–53.
- Egger, P. 2008. On the Role of Distance for Bilateral Trade. *The World Economy* 31: 653–62.
- Eurostat. 2008. *European Union Trade in Services: Analytical Aspects*, 2008 edition. Luxembourg.
- GAO (Government Accountability Office). 2005. *U.S. and India Data on Offshoring Show Significant Differences*. GAO Report to Congressional Committees GAO-06-116. Washington.
- Government Printing Office. 2008. Export Administration Regulations Database. Available at www.gpo.gov (accessed on October 3, 2008).
- Graham, Edward M., and David M. Marchick. 2006. *US National Security and Foreign Direct Investment*. Washington: Peterson Institute for International Economics.
- Greer, Damon. 2007. The US-EU Safe Harbour Framework: Cross Border Data Flows, Data Protection and Privacy. Presentation given at Department of Commerce/European Commission Conference on Cross Border Data Flows, Data Protection, and Privacy, Washington, October 15–16.
- Hamilton, Daniel S., and Joseph P. Quinlan, eds. 2005. *Deep Integration: How Transatlantic Markets are Leading Globalization*. Washington: Center for Transatlantic Relations and Centre for European Policy Studies.
- Hanson, Gordon H. 2005. *Why Does Immigration Divide America? Public Finance and Political Opposition to Open Borders*. Washington: Institute for International Economics.
- Hanson, Gordon H., Raymond J. Mataloni, Jr., and Matthew J. Slaughter. 2001. Expansion Strategies of U.S. Multinational Firms. In *Brookings Trade Forum 2001*, eds. Dani Rodrik and Susan Collins. Washington: Brookings Institution.
- Hoekman, Bernard. 2006. *Liberalizing Trade in Services: A Survey*. World Bank Policy Research Working Paper 4030. Washington: World Bank.
- Hoekman, Bernard, Joseph Francois, and Julia Woerz. 2007. Does Gravity Apply to Intangibles? Measuring Openness in Services Trade. Presentation at CEPII-OECD Workshop, Paris, November 23.
- Hufbauer, Gary Clyde, and Jeffrey J. Schott. 1992. *North American Free Trade: Issues and Recommendations*. Washington: Institute for International Economics.
- Hufbauer, Gary Clyde, and Jeffrey J. Schott. 2005. *NAFTA Revisited: Achievements and Challenges*. Washington: Institute for International Economics.
- IMF (International Monetary Fund). 1995. *Balance of Payments Manual*, 5th ed. Washington.

- IMF (International Monetary Fund). 2000. *World Economic Outlook* (April). Washington.
- IMF (International Monetary Fund). 2006. *Issues Arising from the Update of Balance of Payments Manual*, 5th ed.. Contribution by the IMF Statistics Department for the Nineteenth Meeting of the IMF Committee on Balance of Payments Statistics, Frankfurt, October 23–26.
- Jorgenson, Dale W., Mun S. Ho, and Kevin J. Stiroh. 2007. *A Retrospective Look at the U.S. Productivity Growth Resurgence*. Staff Reports 277. New York: Federal Reserve Bank of New York
- Karsenty, Guy. 2002. Assessing Trade in Services by Mode of Supply. In *GATS 2000—New Directions in Services Trade Liberalization*, eds. Pierre Sauvé and Robert M. Stern. Washington: Brookings Institution.
- Kirkegaard, Jacob Funk. 2005. *Outsourcing and Skill Imports: Foreign High-Skilled Workers on H-1B and L-1 Visas in the United States*. Institute for International Economics Working Paper 05-15. Washington: Institute for International Economics.
- Kirkegaard, Jacob Funk. 2007. *The Accelerating Decline in America's High-Skilled Workforce: Implications for Immigration Policy*. Policy Analysis in International Economics 84. Washington: Peterson Institute for International Economics.
- Koncz, Jennifer, and Anne Flatness. 2007. *U.S. International Services Cross-Border Trade in 2006 and Sales Through Affiliates in 2005*. Survey of Current Business, October 2007. Washington: Bureau of Economic Analysis.
- Kozlow, Ralph. 2006. Globalization, Offshoring, and Multinational Companies: What Are the Questions, and How Well Are We Doing in Answering Them? Paper presented at American Economic Association, Allied Social Science Associations, 2006 Annual Meeting, Boston, January 6.
- Langhammer, Rolf. 2004. Revealed Comparative Advantage in Services Trade in the USA, EU and Japan. What Do They Tell Us? *Journal of World Investment and Trade* 5, no. 6: 887–96.
- Lemaitre, George. 2004. Migration Statistics and the Movement of Natural Persons under GATS Mode 4. Presentation given at UN Statistics Division Meeting, September. Available at <http://unstats.un.org> (accessed on October 3, 2008).
- Lipsey, Robert E. 2006. *Measuring International Trade in Services*. NBER Working Paper 12271. Cambridge, MA: National Bureau of Economic Research.
- Lowell, Lindsay B. 2000. *H-1B Temporary Workers: Estimating the Population*. Washington: Institute for the Study of International Migration.
- Mann, Catherine L., and Jacob F. Kirkegaard. 2006. *Accelerating the Globalization of America: The Role for Information Technology*. Washington: Peterson Institute for International Economics.
- Markusen, James R., Robert Feenstra, and William Zeile. 1992. Accounting for Growth with New Inputs: Theory and Evidence. *American Economic Review, Papers and Proceedings* 82: 416–21.
- Marquez, Jaime, and Lisa Workman. 2000. *Modeling the IMF's Statistical Discrepancy in the Global Current Account*. International Finance Working Paper 678. Washington: Board of Governors of the Federal Reserve System.

- Mataloni, Ray. 2007. *Operations of U.S. Multinational Companies in 2005*. Survey of Current Business, November 2007. Washington: Bureau of Economic Analysis.
- National Academy of Sciences. 2007. *Rising Above the Gathering Storm—Energizing and Employing America for a Brighter Economic Future*. Washington: National Academies Press.
- Nordas, Hildegunn Kyvik. 2008. Trade and Regulation: Computer Services and Other Business Services. Paper presented at the OECD Services Expert Meeting on Business Services, Paris, June 24.
- NAFTA (North American Free Trade Agreement). 2003. *Chapter Sixteen: Temporary Entry for Business Persons*. Available at www.nafta-sec-alena.org (accessed on October 3, 2008).
- OECD (Organization for Economic Cooperation and Development). 2004. International Trade in Services Statistics: Monitoring Progress in Implementation of the Manual and Assessing Data Quality. Paper presented at OECD-EUROSTAT Expert Meeting on Trade-in-Services Statistics, Paris, April 28–29.
- OECD (Organization for Economic Cooperation and Development). 2006. *OECD Information Technology Outlook 2006*. Paris.
- OECD (Organization for Economic Cooperation and Development). 2008a. *Going For Growth 2008 Edition*. Paris.
- OECD (Organization for Economic Cooperation and Development). 2008b. *Measuring Globalization: Activities of Multinationals Volume II: Services 2000–2004*. Paris.
- OECD (Organization for Economic Cooperation and Development). 2008c. International Trade Indicators Database. Paris. Available at www.oecd.org (accessed on October 3, 2008).
- Oliner, Stephen D., Daniel E. Sichel, and Kevin J. Stiroh. 2007. *Explaining a Productive Decade*. Finance and Economics Discussion Series 2007-63. Washington: Board of Governors of the Federal Reserve System.
- Pinkston, Joshua P., and James R. Spletzer. 2004. Annual Measures of Gross Job Gains and Gross Job Losses. *Monthly Labor Review* (November): 3–13. Washington: Department of Labor.
- Reserve Bank of India. 2005. Computer Services Exports from India: 2002–03. *RBI Monthly Bulletin* (September). Mumbai.
- Reserve Bank of India. 2006. Invisibles in India's Balance of Payments. *RBI Monthly Bulletin* (November). Mumbai.
- Reserve Bank of India. 2008. Invisibles in India's Balance of Payments. *RBI Monthly Bulletin* (February). Mumbai.
- Shaw, J. E. H. 2001. Some Quotable Quotes for Statistics. Available at www.warwick.ac.uk/statsdept/staff/JEHS/data/jehsquot.pdf (accessed on October 3, 2008).
- Sicsic, Pierre. 2006. Are There Missing Imports of Services? Paper presented at the 7th OECD International Trade Statistics Expert Meeting, Paris, September 11–14.
- Singh, Bhupal. 2005. Services Exports Under Mode 4 of GATS: Exploratory Evidence from India. Paper presented at the Meeting of the Technical Subgroup on Movement of Natural Persons, Paris, January 31–February 1.

- Statistics Canada. 2008. Annual Survey of Software Development and Computer Services. *The Daily*, May 23. Ottawa: Statistics Canada.
- Sturgeon, Timothy J., Frank Levy, Clair Brown, J. Bradford Jensen, and David Weil. 2006. *Services Offshoring Working Group Final Report*. MIT IPC Working Paper 06-006. Cambridge: MIT.
- UNCTAD (United Nations Conference on Trade and Development). 2006. *Information Economy Report (2006): The Development Perspective*. Geneva.
- United Nations, the European Commission, the IMF, OECD, UNCTAD, and the WTO. 2002. *Manual on Statistics of International Trade in Services (MSITS)*. Geneva, Luxembourg, New York, Paris, Washington.
- US Census Bureau. 2004. *Development of NAICS*. Available at www.census.gov (accessed on October 3, 2008).
- US Department of Commerce. 2008. *Safe Harbor Overview*. Available at www.export.gov (accessed on June 13, 2007).
- US Embassy Canada. 2008. *TN Visas: Professionals under NAFTA*. Available at www.consular.canada.usembassy.gov (accessed on October 3, 2008).
- US Treasury. 2008. *Committee on Foreign Investment in the United States (CFIUS)*. Available at www.treas.gov (accessed on October 3, 2008).
- Utkulu, Utku, and Dilek Seymen. 2004. Revealed Comparative Advantage and Competitiveness: Evidence for Turkey vis-à-vis the EU/15. Paper presented at the European Trade Study Group 6th Annual Conference, ETSG 2004, Nottingham, September.
- Vollrath, T. L. 1991. A Theoretical Evaluation of Alternative Trade Intensity Measures of Revealed Comparative Advantage. *Weltwirtschaftliches Archiv* 130: 265–79.
- World Bank. 2008. *Migration & Remittances Factbook 2008*. Washington.
- WTO (World Trade Organization). 1991. Services Sectoral Classification List. MTN.GNS/W/120. Available at www.wto.org (accessed on October 3, 2008).
- WTO (World Trade Organization). 2008. *Schedules of Commitments and Lists of Article II Exemptions*. Available at www.wto.org (accessed on October 3, 2008).
- Yuskavage, Robert E., Erich H. Strassner, and Gabriel W. Medeiros. 2006. Outsourcing and Imported Services in BEA's Industry Accounts. Paper presented for the NBER Conference on Research in Income and Wealth (CRIW) Conference on International Services Flows, Bethesda, MD, April 28–29.

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Table 1 Statistical coverage of US international trade in C&IS, by mode of supply

Mode 1	Cross-border supply	Covered partly by standard Balance of Payments Statistics (BOPM5). Primary sources are (1) IMF Balance of Payments Statistics on global trade in C&IS; and (2) Bureau of Economic Analysis trade data for C&IS.
Mode 2	Consumption abroad	Only trivial amounts of C&IS trade exist in this mode and it will hence not be covered in this paper. See note.
Mode 3	Commercial presence	Covered by data on foreign affiliate economic activities. Primary source is Bureau of Economic Analysis financial and operating data for US multinational companies and non-US multinational companies operating in the United States.
Mode 4	Presence of natural persons	Covered partly by aggregate BOPM5 trade data for Compensation of Employees and Worker Remittances. However, these aggregate data do not specify C&IS related flows. Primary US source is Department of Homeland Security (DHS) data on the flows of migrants among computer and IT specialists on US temporary (H-1B and L-1) employment-based visas.

Note: The MSITS states that mode 2 includes only travel services (excluding goods purchased by travellers), repairs to carriers in foreign ports, and parts of transportation services (supporting and auxiliary services to carriers in foreign ports).

Table 2 US C&IS exports, modes 1 and 3, 1999–2005 (billions of dollars)

Exports	1999	2000	2001	2002	2003	2004	2005
Mode 3	48.7	51.2	55.5	56.4	68.7	81.2	90.5
Mode-1 unaffiliated	5.4	5.6	5.4	5.4	6.3	6.7	7.5
Mode-1 total	6.6	6.8	6.7	7.1	8.5	8.8	9.8
Ratio of mode 3 to mode-1 unaffiliated	8.9	9.1	10.2	10.5	11.0	12.1	12.1
Ratio of mode 3 to mode-1 total	7.3	7.5	8.3	7.9	8.1	9.2	9.2

Source: Author's calculations based on Bureau of Economic Analysis data.

Table 3 US C&IS imports, modes 1 and 3, 1997–2005 (billions of dollars)

Imports	1997	1998	1999	2000	2001	2002	2003	2004	2005
Mode 3	7.0	7.7	10.5	12.3	n.a.	n.a.	23.6	24.1	24.3
Mode-1 unaffiliated	0.8	1.1	1.5	1.8	1.8	1.5	1.9	2.3	2.7
Mode-1 total	1.6	2.0	4.5	4.4	4.7	4.3	5.4	6.9	9.0
Ratio of mode 3 to mode-1 unaffiliated	9.1	7.2	7.1	6.7	n.a.	n.a.	12.2	10.7	8.9
Ratio of mode 3 to mode-1 total	4.5	3.9	2.3	2.8	n.a.	n.a.	4.3	3.5	2.7

n.a. = not available

Source: Author's calculations based on Bureau of Economic Analysis data.

Table 4 US mode-3 C&IS exports, by country or region, 1999–2005
(millions of US dollars)

Country/region	1999	2000	2001	2002	2003	2004	2005(p)
World total ^a	48,660	51,163	55,511	56,363	68,741	81,220	90,462
Canada	2,761	3,137	3,160	3,129	(D)	2,662	(D)
Europe	(D)	31,251	(D)	(D)	(D)	(D)	(D)
France	2,731	2,667	2,482	(D)	2,863	2,756	2,715
Germany	(D)	4,412	4,153	4,470	4,110	(D)	(D)
Netherlands	2,448	2,710	3,156	2,366	(D)	(D)	(D)
United Kingdom	(D)	(D)	(D)	(D)	(D)	(D)	18,269
Latin America	3,750	3,443	2,703	2,774	3,296	2,753	(D)
Brazil ^b	(D)	(D)	(D)	773	734	955	(D)
Mexico ^b	312	346	405	432	(D)	624	696
Africa ^b	(D)	(D)	(D)	(D)	(D)	385	(D)
Middle East ^b	279	234	(D)	(D)	(D)	(D)	(D)
Asia and Pacific	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Australia	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Japan	7,692	9,711	(D)	(D)	(D)	(D)	(D)

(D) = data suppressed by the BEA for confidentiality reasons; (p) = preliminary

a. Estimated data as per figure 7.

b. No data available for NAICS 5112.

Sources: Bureau of Economic Analysis, Annual Comprehensive Operating and Financial Data for US Foreign Affiliates, Table III.F.20; Bureau of Economic Analysis, International Services Trade, Annual Table 10b; author's calculations.

Table 5 US mode-3 C&S imports, by country or region, 1997–2005
(millions of US dollars)

Country/region	1997	1998	1999	2000	2001	2002	2003	2004	2005
All countries	6,969	7,726	10,534	12,253	n.a.	n.a.	23,625	24,095	24,343
Canada	493	480	600	584	n.a.	959	n.a.	n.a.	n.a.
Europe total	5,053	5,750	8,241	n.a.	n.a.	9,504	n.a.	n.a.	n.a.
France	722	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Germany	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Netherlands	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Switzerland	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
United Kingdom	2,837	n.a.	4,126	4,236	n.a.	3,230	n.a.	3,679	4,398
United States and other Western Hemisphere	n.a.	43	46	49	n.a.	n.a.	n.a.	n.a.	n.a.
Other country total	1,215	1,277	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Australia	n.a.	32	34	n.a.	n.a.	9	12	19	21
Japan	n.a.	1,030	1,283	n.a.	n.a.	n.a.	1,524	n.a.	n.a.

n.a. = not available

Source: Bureau of Economic Analysis, International Services Trade Data, table 11.

Table 6 Global C&S imports and WTO CPC 84 trade commitments, 2000–06 (percent of total reported C&S imports)

		2000	2001	2002	2003	2004	2005	2006
Total reported C&S imports, 133 countries (billions of dollars)		25,048	28,069	30,173	34,782	41,362	48,636	54,203
Mode 1	No limitations on market access in CPC 84	88.3	88.1	88.6	90.6	89.8	88.1	88.0
	CPC 84 not included in sector specific commitments or with only partial (partial) or no market access (unbound)	9.0	9.0	8.6	7.0	8.5	9.9	10.0
	Of which, Brazil/India/Indonesia	6.9	7.3	6.8	5.0	6.5	7.9	8.9
	IMF BOPS reporting country not member of the WTO	2.0	2.1	2.1	1.8	1.2	1.5	1.6
Mode 3	No limitations on market access in CPC 84	89.1	89.0	89.7	91.7	90.6	89.1	88.0
	CPC 84 not included in sector specific commitments or with only partial (partial) or no market access (unbound)	8.9	8.9	8.2	6.5	8.2	9.4	10.4
	Of which, Brazil/India/Indonesia/ Malaysia ^a	7.7	8.0	7.4	5.6	7.3	8.7	9.8
	IMF BOPS reporting country not member of the WTO	2.0	2.1	2.1	1.8	1.2	1.5	1.6

a. China has only partial access to UN Central Product Classification (CPC) 8421-25, as foreign investment must be in the form of a joint venture with foreign majority ownership permitted.

Sources: IMF Balance of Payments Statistics (BOPS), January 2008; WTO (2008).

Table 7 Top-25 company recipients of L-1 and H-1B visas in FY2006

Top 25 L-1 employers of 2006					Top 25 H-1B employers of 2006				
Rank	Company	Sector	Home country	Number of visas	Rank	Company	Sector	Home country	Number of visas
1	Tata Consulting Systems	IT services/software	India	5,408	1	Infosys Technologies Limited	IT services/software	India	4,908
2	Cognizant Technology Solutions	IT services/software	India	1,888	2	Wipro Limited	IT services/software	India	4,002
3	Wipro Limited	IT services/software	India	1,187	3	Microsoft Corporation	IT services/software	United States	3,117
4	IBM	IT services/software	United States	614	4	Tata Consultancy Services Limited	IT services/software	India	3046
5	Hewlett-Packard	IT Hardware	United States	417	5	Satyam Computer Services LTD	IT services/software	India	2880
6	Satyam Computer Service	IT services/software	India	336	6	Cognizant Tech Solutions US Corp	IT services/software	India	2226
7	Intel Corporation	Semiconductors	United States	314	7	Patni Computer Systems Inc.	IT services/software	India	1391
8	Caritor, Inc.	IT services/software	United States	280	8	IBM Corporation	IT services/software	United States	1130
9	Ernst & Young	Business services	United States	249	9	Oracle USA Inc.	IT services/software	United States	1022
10	HCL Technologies	IT services/software	India	244	10	Larsen & Toubro Infotech Limited	IT services/software	India	947
11	Infosys Technologies Inc.	IT services/software	India	235	11	HCL America Inc.	IT services/software	India	910
12	Patni Computer Systems Inc.	IT services/software	India	221	12	Deloitte & Touche LLP	Accounting	United States	890
13	Schlumberger	Oil services	France	198	13	Cisco Systems Inc.	ICT hardware	United States	828
14	Syntel	IT services/software	United States	197	14	Intel Corp	Semiconductors	United States	828
15	M&E Group, Inc.	n.a.	n.a.	194	15	I-Flex Solutions Inc.	IT services/software	India	817
16	Exxon-Mobil	Oil	United States	187	16	Ernst & Young LLP	Accounting	United States	774
17	Kanbay Inc.	IT services/software	India	178	17	Tech Mahindra Americas Inc.	IT services/software	India	770
18	Halliburton	Oil services	United States	157	18	Motorola Inc.	ICT hardware	United States	760
19	PriceWaterhouse Coopers	Business services	United States	152	19	Mphasis Corporation	IT services/software	India	751
20	Oracle Inc.	IT hardware	United States	148	20	Deloitte Consulting LLP	Consulting	United States	665
21	Nokia	Mobile telephony	Finland	141	21	Lancesoft Inc.	IT services/software	United States	645
22	Microsoft	IT services/software	United States	133	22	New York City Public Schools	Education	United States	642
23	Perot Systems	IT services/software	United States	121	23	Accenture LLP	Consulting	United States	637
24	Deloitte	Business services	United States	112	24	JPMorgan Chase & Co.	Financial services	United States	632
25	HSBC	Financial services	United Kingdom	103	25	Polaris Software Lab India Ltd	IT services/software	India	611

Note: Gray cells indicate IT services company.

n.a. = not applicable

Table 8 Number of and wages for H-1B visa recipients in the IT services industry, FY2001–05

Fiscal year	Number of initial recipients of H-1B visas^a	Average wage received^b	Number of continuing recipients of H-1B visas^c	Average wage received^d	Total annual wage income for cumulative number of H-1B workers present in fiscal year (billions of US dollars)
2001	87,480	\$52,200	58,758	\$68,560	n.a.
2002	17,803	\$55,194	35,814	\$65,173	n.a.
2003	20,160	\$50,833	39,323	\$63,993	16.5
2004	47,362	\$51,667	51,182	\$66,000	13.5
2005	44,644	\$51,667	43,550	\$68,333	16.2

n.a. = not available

a. Sum of initial recipients of H-1B visas in NAICS 514, NAICS 5112, and NAICS 5415.

b. Weighted average wage for initial recipients of H-1B visas in computer-related occupations.

c. Sum of continuing recipients of H-1B visas in NAICS 514, NAICS 5112, and NAICS 5415.

d. Weighted average wage for continuing recipients of H-1B visas in computer-related occupations.

Sources: US Immigration and Naturalization Service (INS), *Characteristics of Specialty Occupation Workers (H1-B): Fiscal Year 2000* and *Characteristics of Specialty Occupation Workers (H1-B): Fiscal Year 2001*; US Citizenship and Immigration Services (USCIS), *Characteristics of Specialty Occupation Workers (H1-B): Fiscal Year 2002*; *Characteristics of Specialty Occupation Workers (H1-B): Fiscal Year 2003*; *Characteristics of Specialty Occupation Workers (H1-B): Fiscal Year 2004*; and *Characteristics of Specialty Occupation Workers (H1-B): Fiscal Year 2005*; author's calculations.

Table 9 Issuance of H-1B visas, FY2000–2008

	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
H-1B cap legislated by Congress	115,000	195,000	195,000	195,000	65,000	85,000 ^a	85,000 ^a	85,000 ^a	85,000 ^a
Total number of H-1B petitions granted by USCIS	257,640	331,206	197,537	217,340	287,418	267,131	n.a.	n.a.	n.a.
Number of H-1B petitions granted for initial employment	136,787	201,787	103,584	105,314	130,497	116,927	n.a.	n.a.	n.a.
Of which, number that started working in the IT services industry	n.a.	87,480	17,803	20,160	47,362	44,644	n.a.	n.a.	n.a.
Total H-1B petitions received in FY for visas subject to quota	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	123,400	163,000

n.a. = not available.

a. Includes 20,000 H-1B visas for foreign graduates of US universities.

Sources: Same as table 8.

Table 10 Trade in services, share by mode of supply (percent)

	Mode 1	Mode 2	Mode 3	Mode 4
US C&IS exports, average 2003–05	10	Assumed zero	90	n.a.
US C&IS imports, average 2003–05	13	Assumed zero	46 ^a	41 ^a
Karsenty (2002): Total services trade, 1997	41	20	38	1
Hoekman, Francois, and Woerz (2007): Total services trade, 2001	28	14	56	1
Bensidoun and Ünal-Kesenci (2008): Average of total services exports for United States, France, Japan, and Germany, 2000–01	11	8	82	Included in mode 1
Bensidoun and Ünal-Kesenci (2008): Average of total services imports for United States, France, Japan, and Germany, 2000–01	22	16	62	Included in mode 1
Reserve Bank of India (2005): Exports of Indian computer services, 2002–03	39	0.1	48	13

n.a. = not available

a. No attempt has been made at disentangling the two modes of supply. Shares are estimated based on the full dollar value of each individual mode of supply estimate. A very large overlap of trade between modes is probable.

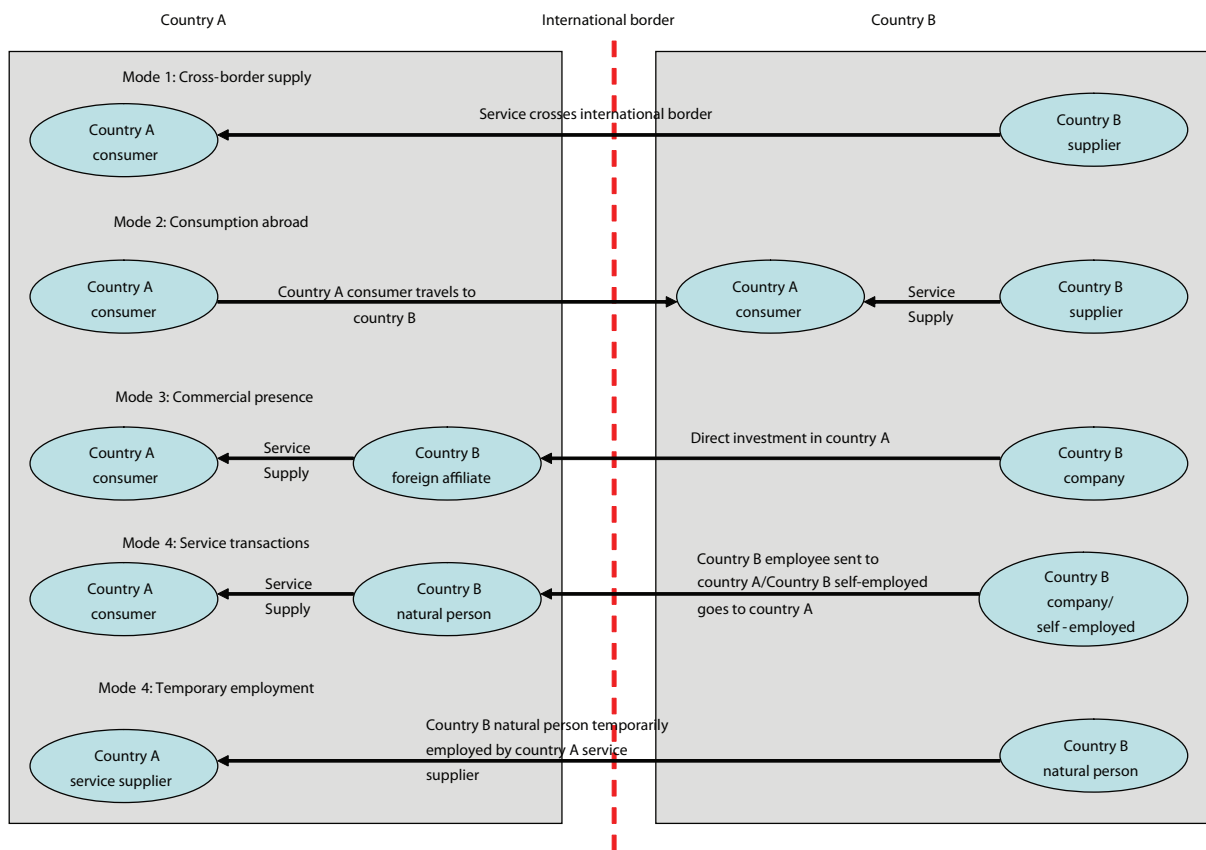
Source: Author's calculations.

Table 11 Annual issuance of the NAFTA TN visa, 1997–2006

Year	Canadian citizens	Mexican citizens
1997	3	168
1998	8	287
1999	20	463
2000	28	878
2001	18	769
2002	13	686
2003	8	415
2004	6	902
2005	14	1,888
2006	23	2,949

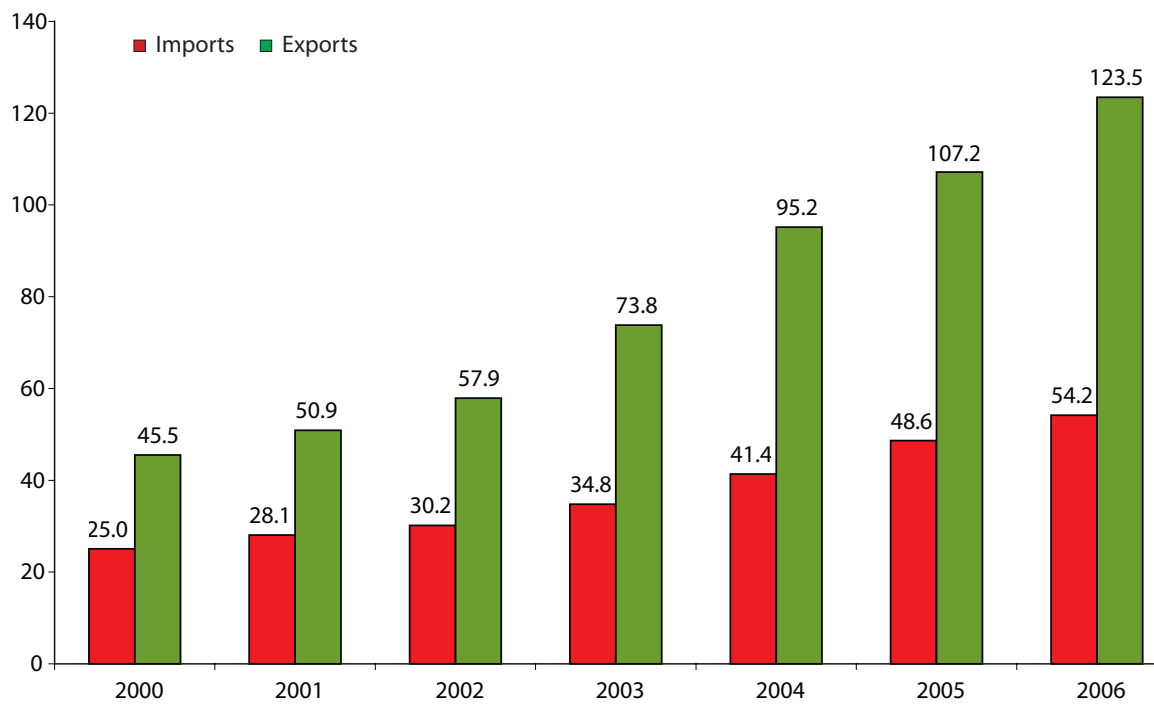
Source: US Department of State, Annual Visa Statistics.

Figure 1 Modes of supply



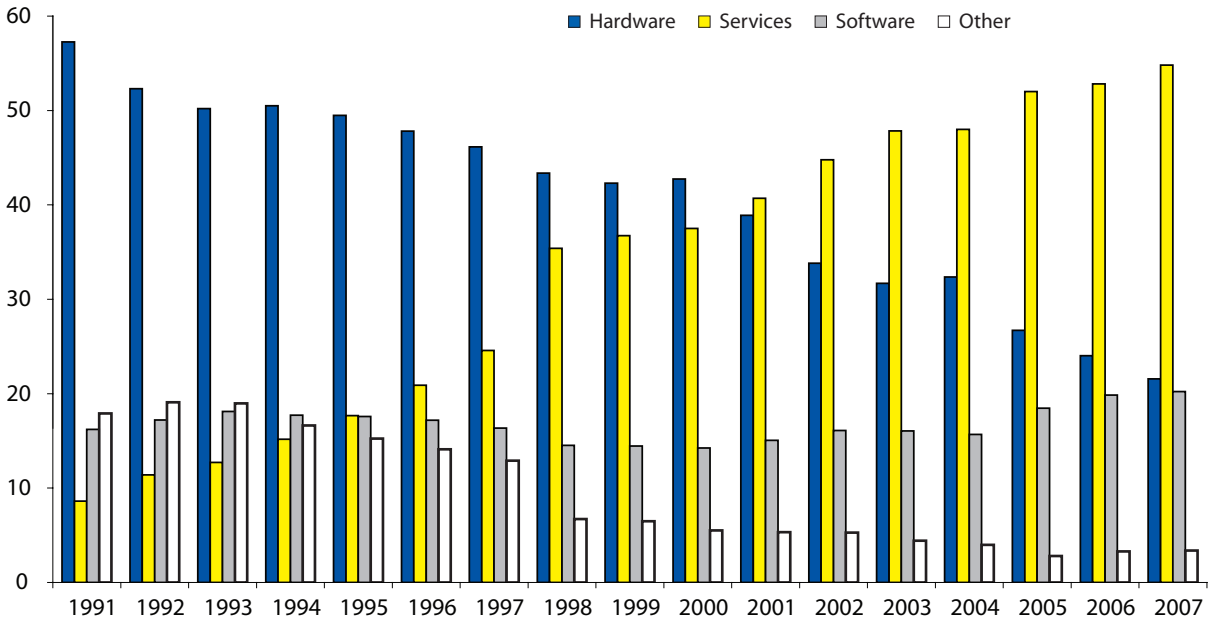
Source: MSITS (2002, 23).

Figure 2 Global unaffiliated C&S trade, 2000–06 (billions of US dollars)



Source: IMF Balance of Payments Statistics, January 2008.

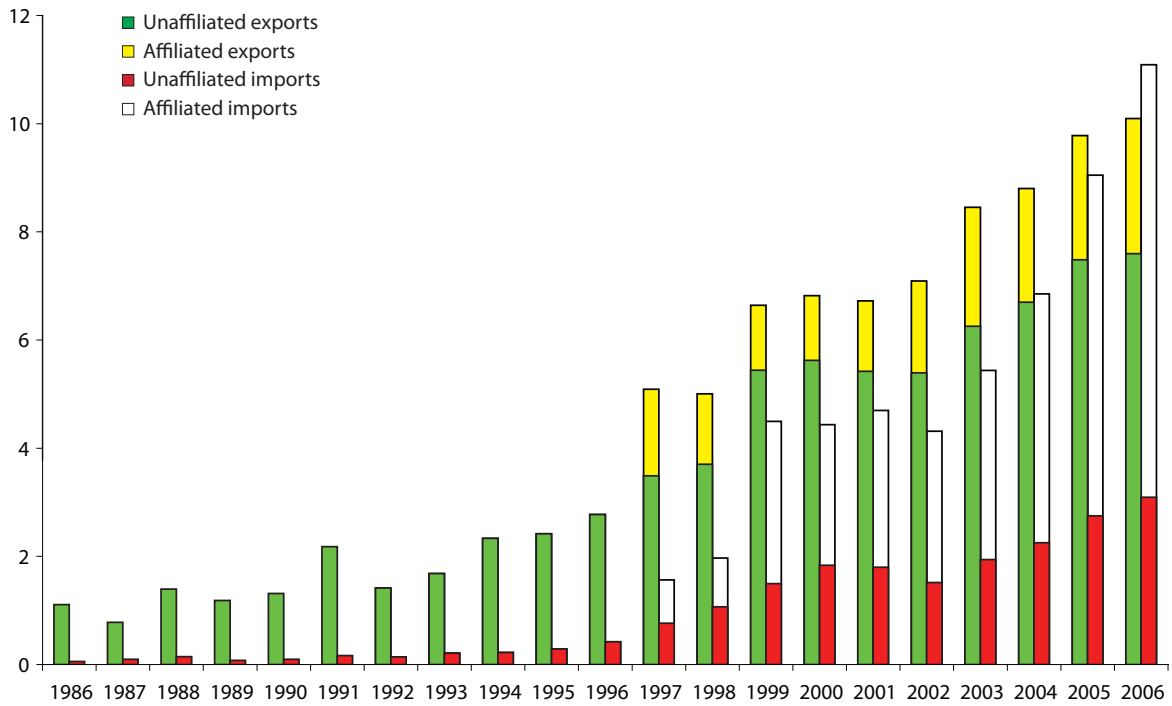
Figure 3 IBM revenues by business segment, 1991–2007 (percent)



Note: Content varies throughout the period but includes segments such as maintenance, rentals, financing and enterprise investment, and “other.” Due to a change in reporting segments from 1997 to 1998, a break in the time series for “other” is present between these two years. This, however, does not affect the main conclusions of this figure.

Source: Company annual 10-K filings.

Figure 4 US mode-1 C&IS trade by corporate ownership, 1986–2006 (billions of US dollars)



Source: Bureau of Economic Analysis, Trade in Services, table 7.

Figure 5 Affiliated trade

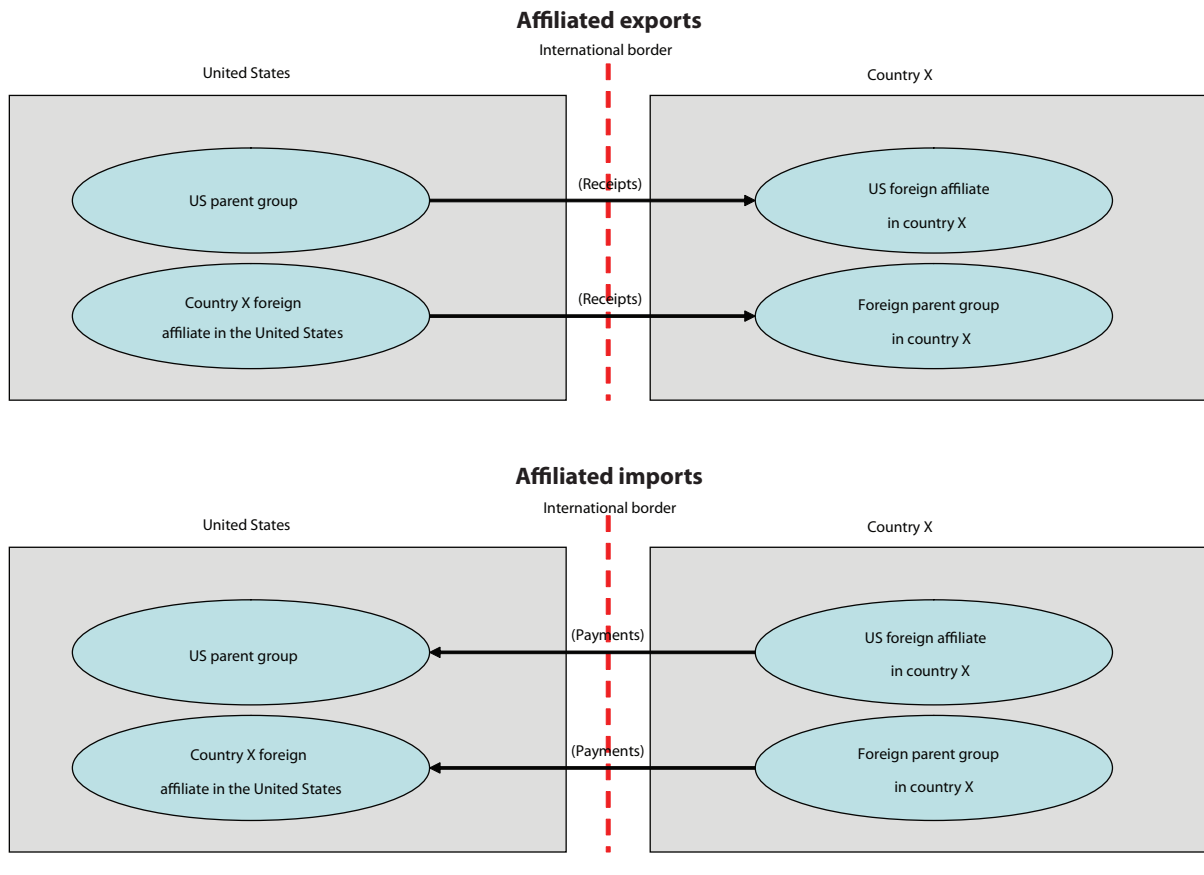
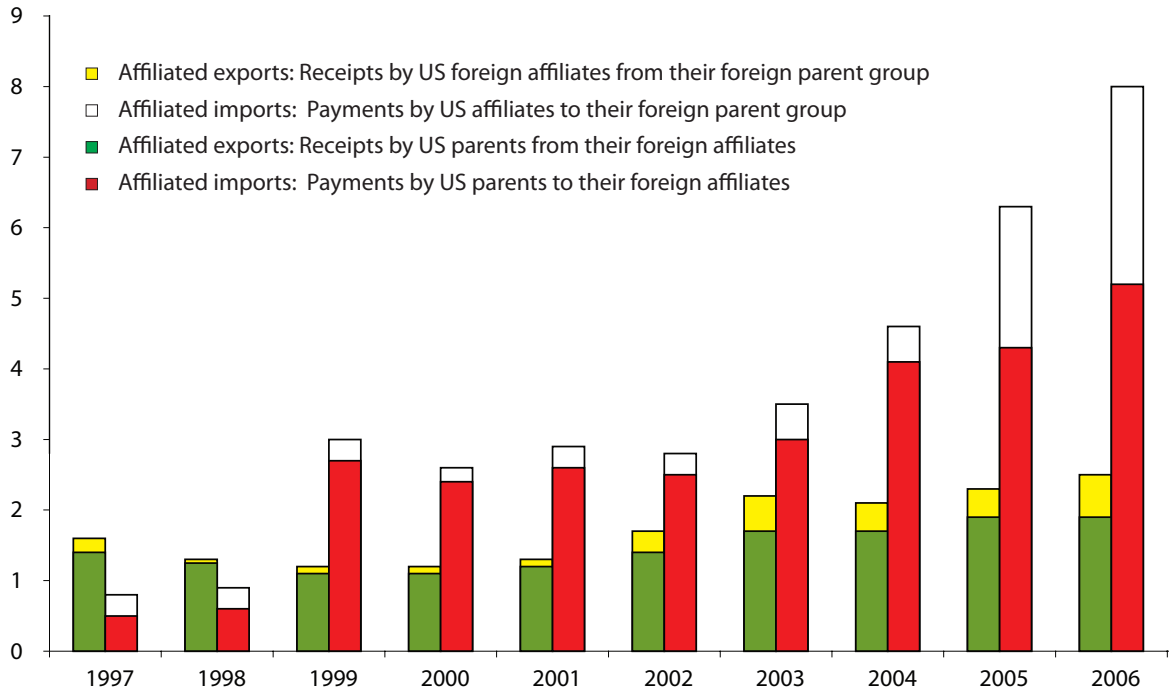
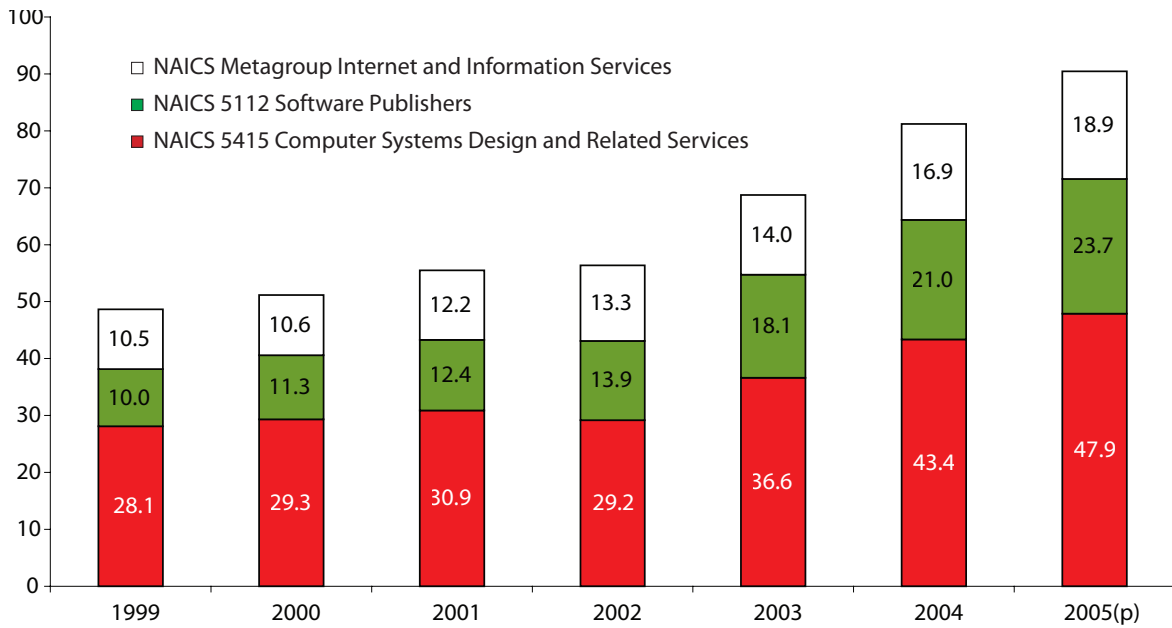


Figure 6 US intrafirm trade in C&IS, by corporate ownership, 1997–2006 (billions of US dollars)



Source: Bureau of Economic Analysis, Trade in Services, table E.

Figure 7 US mode-3 C&IS exports—“adjusted local services sales” by US foreign affiliates in computer services industries, 1999–2005, by industry of affiliate (billions of US dollars)

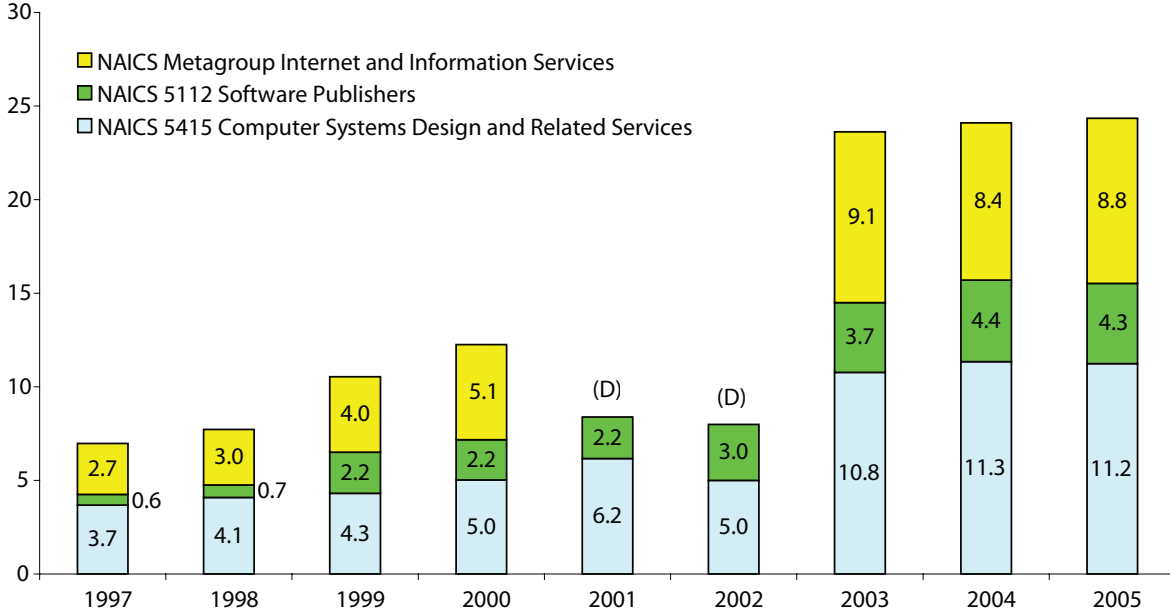


(p) = preliminary

Notes: NAICS 1997/2002 break is between 2003 and 2004. No NAICS-based data are available before 1999.

Source: Bureau of Economic Analysis, Comprehensive Financial and Operating Data, table III A2.

Figure 8 US mode-3 C&IS imports—sales of services to US persons by foreign MNCs through their nonbank MOUSAs in computer services industries, 1997–2005, by industry of affiliate
(billions of US dollars)



(D) = Data suppressed by the BEA for confidentiality reasons

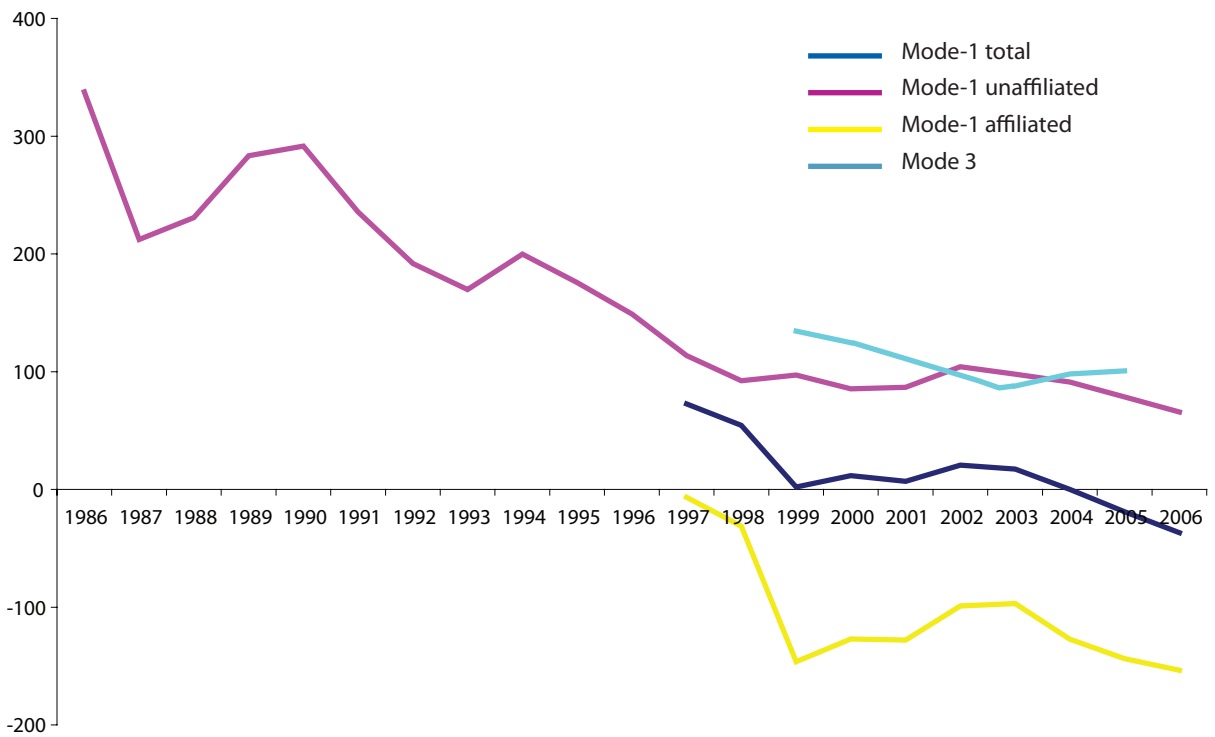
MNCs = multinational corporations

MOUSAs = majority-owned US affiliates

Notes: NAICS 1997/2002 break is between 2003 and 2004. No NAICS-based data are available before 1997.

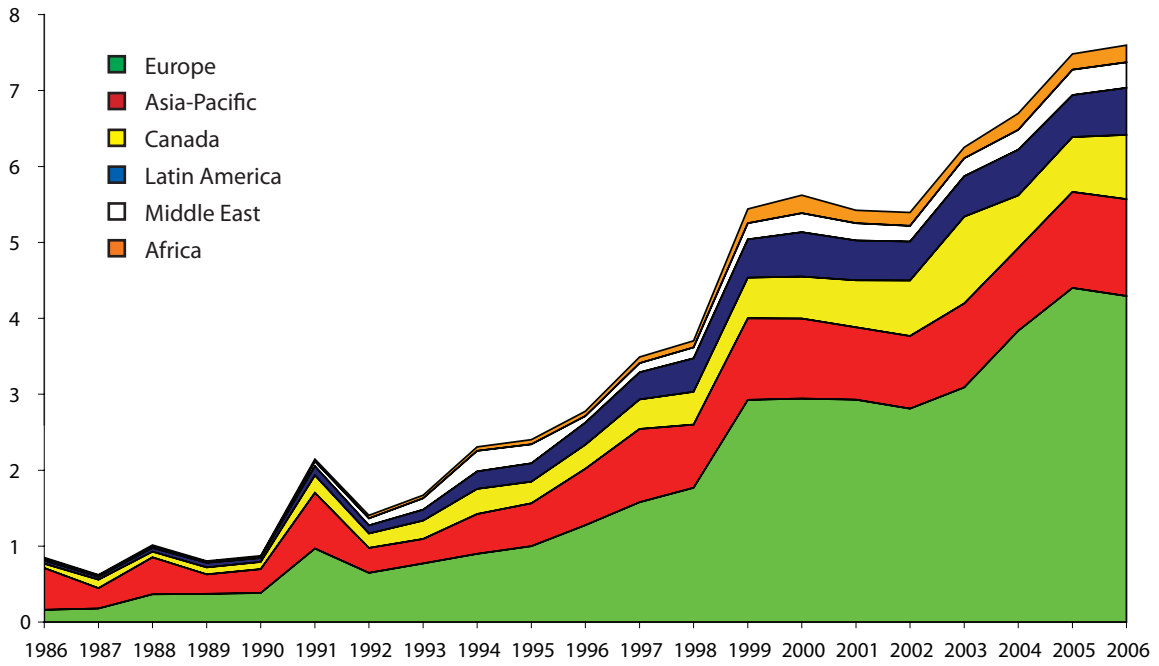
Source: Bureau of Economic Analysis, US International Services Transactions, table 11b.

Figure 9 Revealed comparative advantage in US C&IS trade, 1986–2006



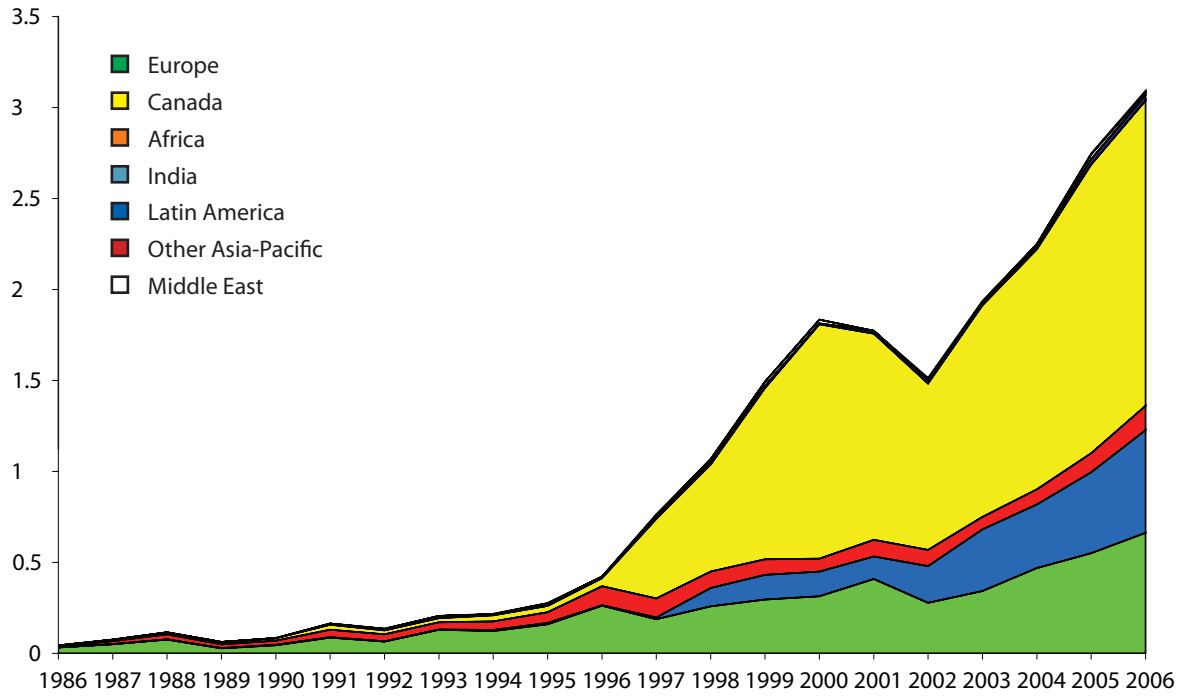
Source: Author's calculations based on Bureau of Economic Analysis data.

Figure 10 US unaffiliated mode-1 C&IS exports, by country or region, 1986–2006
(billions of US dollars)



Source: Bureau of Economic Analysis, International Trade in Services, table 7.

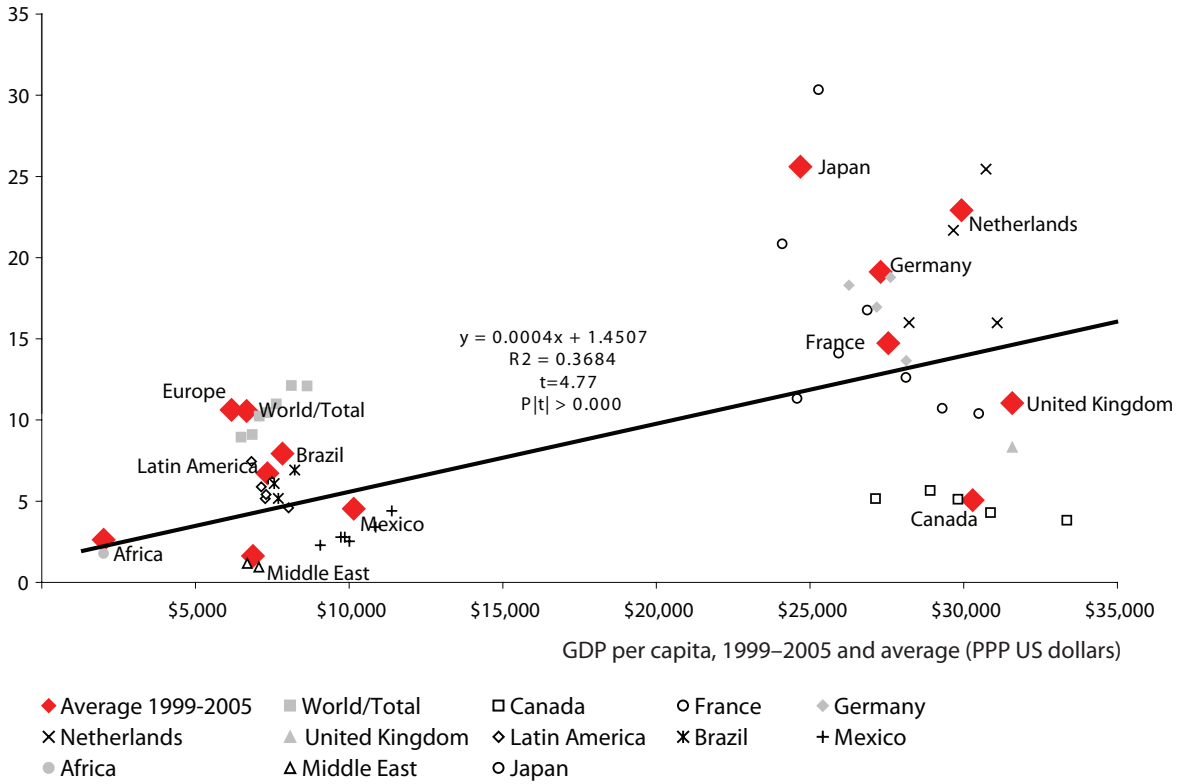
Figure 11 US unaffiliated mode-1 C&IS imports, by country or region, 1986–2006
 (billions of US dollars)



Source: Bureau of Economic Analysis, International Trade in Services, table 7.

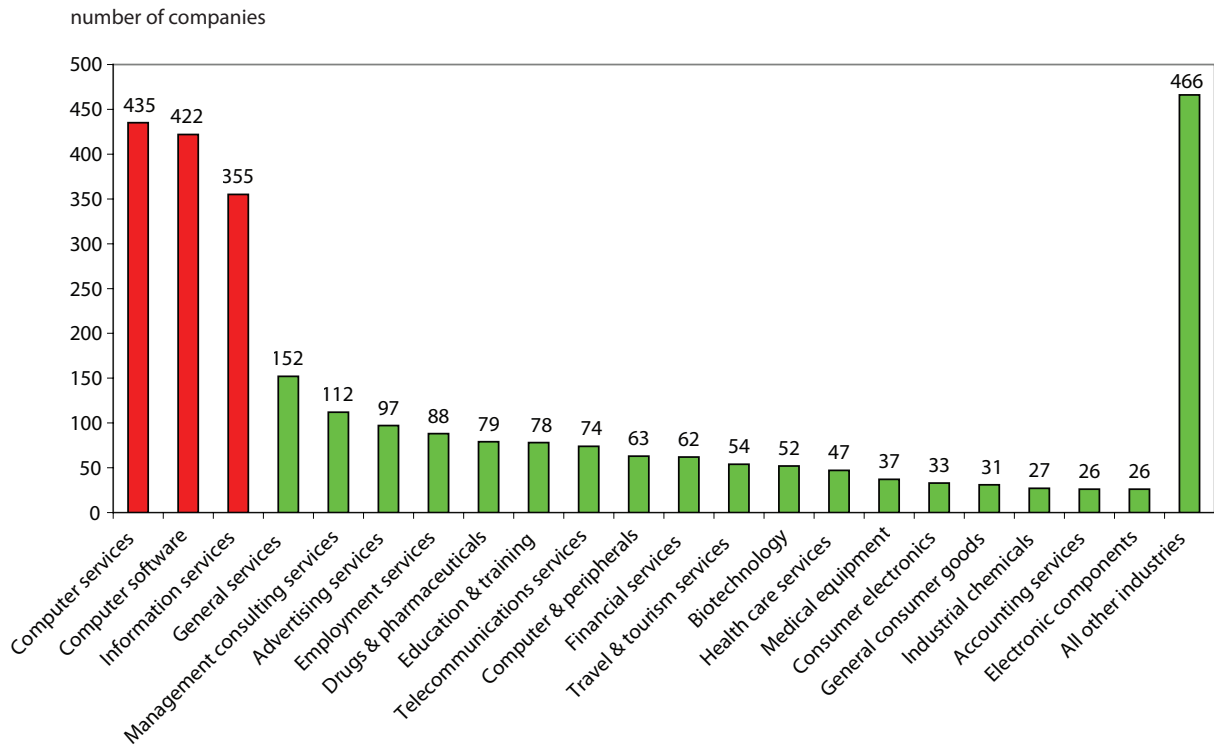
Figure 12 US C&IS exports, by mode and country, 1999–2005

ratio of US mode-3/mode-1 C&IS exports



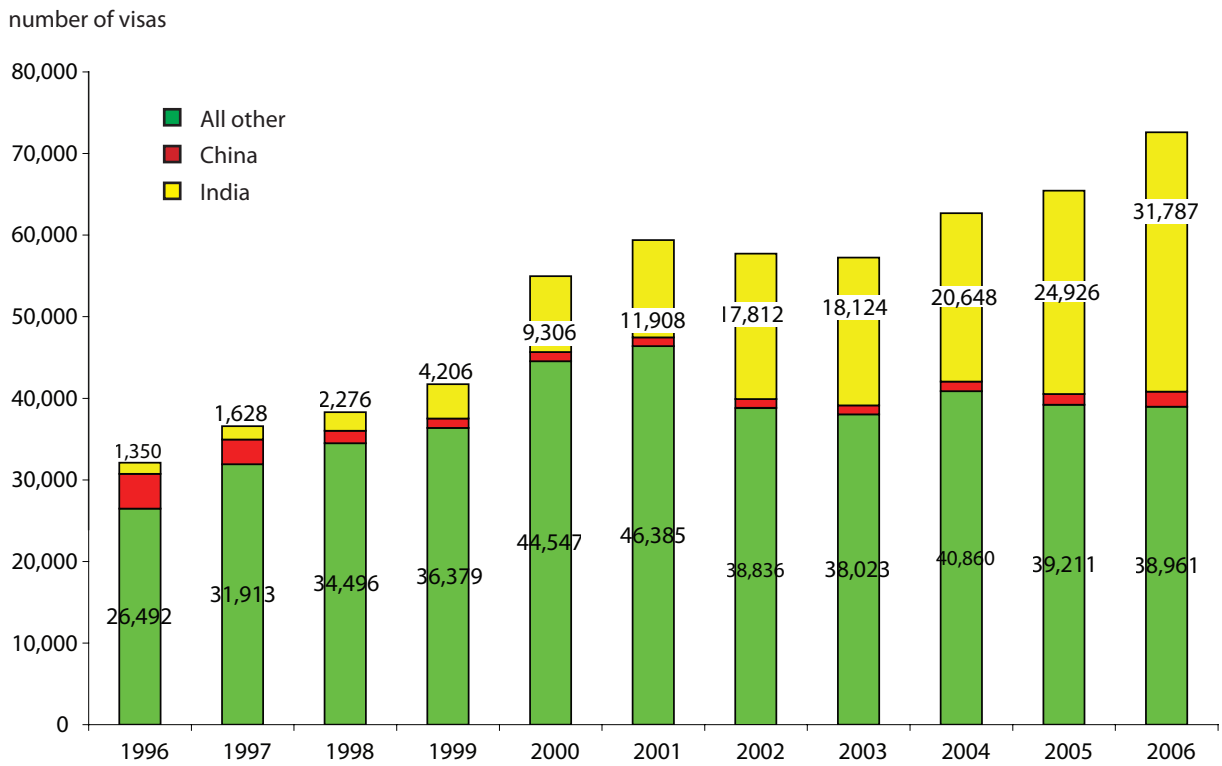
Sources: Bureau of Economic Analysis; IMF *World Economic Outlook*.

Figure 13 US companies registered with Department of Commerce safe harbor list, by top-20 industries, June 2007



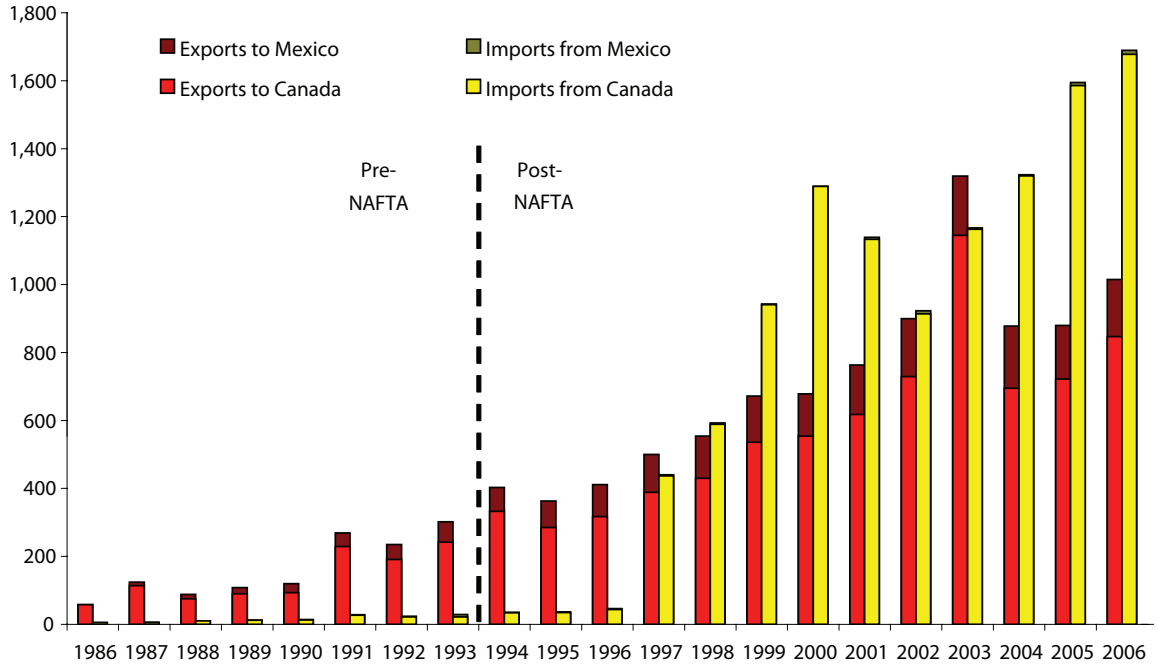
Source: US Department of Commerce (2008).

Figure 14 Issuance of L-1 visas at US consular offices, FY1996–FY2006



Sources: US Department of State, Bureau of Consular Affairs, Annual Reports of the Visa Office, 2000–06.

Figure 15 US bilateral mode-1 unaffiliated C&I trade with NAFTA members, 1986–2006
(millions of US dollars)



Source: US Bureau of Economic Analysis.