# Contribution of Small Business Indirect Exports to U.S. International Trade

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## Executive Summary

The United States, like most countries, tracks its exports by the direct exporter, the company that reports a cross border transaction. For example, if Ford or GM sells an automobile to another country, that export's gross value is counted as a large business export because Ford and GM are large employers. However, an automobile has numerous parts in it, which have been produced by both large and small businesses before being sold to the automobile companies for assembly. By participating in the auto companies' supply chains, the small and medium size enterprises (SMEs) in the United States that supply some of those parts are also participating in the ultimate export of the automobile by contributing some portion of the value of that export. For this analysis, SMEs are businesses with fewer than 500 employees.

This study uses the same general methodology as a 2010 U.S. International Trade Commission study that analyzed data from 2002 and 2007. The analysis uses Input-Output tables for the United States to estimate the contribution that SMEs make to exports through their participation in the supply chain of companies that directly export, by evaluating the value-added by the suppliers of intermediate goods and services used in the production process, as well as the value added by the final company. The value-added by the participants in the supply chain is considered indirect export value, and the value-added by the final company that reports the transaction is considered the value-added measure of direct exports.

The estimates show that in 2007, 2012, and 2014, SMEs contributed more to export value under the value-added measure than were being allocated to them using gross export value. SMEs also contributed as much through indirect exports as they were through being a

direct exporter of goods and services. In 2014, for example, the SMEs gross exports totaled $539 billion, or about 26 percent of the total gross export value. However, using a value-added concept, SMEs total export value is about $639 billion, about 40 percent of domestic value added exports (of which 46 percent is the value added by SME direct exporters and 54 percent is added by SMEs providing goods and services to companies that are direct exporters).[1]

[1] The SMEs' direct value added total is smaller than its gross export total because some portion of the gross export value is allocated to the indirect contributions made by large and small business suppliers, and by the value of the imported inputs to the supply chain.

## 1. Introduction

Small and medium size enterprises (SMEs) account for about 97 percent of the companies that directly export goods, but they account for only about 33 percent of the known value of goods exports.[2] The United States, like most countries, tracks its exports by the direct exporter, the company that is reporting the cross border transaction. For example, if Ford or GM sells an automobile to another country, the value of that export is counted as a large business export because Ford and GM are large employers. However, an automobile has numerous parts in it, and those parts have been produced by both large and small businesses before being sold to the automobile companies for assembly into their autos. By participating in the auto companies' supply chains, the SMEs that supply some of those parts are also participating in the ultimate export of the automobile. A similar story is told throughout the economy, although at times the exporter is an SME and the indirect contribution is being made by a large business.[3] An alternative measure of exports, referred to as value-added exports, breaks down the value of the exports by analyzing the value-added at each stage of the production of the final exported good or service. The alternative measure provides more insights into the contributions of all companies to global trade because it clarifies the value added by the final exporter compared with the value added by the suppliers of goods and

[2] SMEs are defined as companies with fewer than 500 employees. (U.S. Census, 2017) The Census Bureau does not have a good measure of small businesses involved in services exports and does not include them in these counts.

[3] For example, a small wholesaler may be selling several different brands of office machines, each produced by a large manufacturer. The value of the export would be assigned to the small company, but the large manufacturer, and its suppliers, participated in that export by virtue of being part of that wholesaler's supply chain.

services that go into the production of the final export. The value added by the businesses in the supply chain is referred to as the indirect exports.

This analysis estimates the size of the indirect contributions of the SME suppliers to the gross value of exports for the years 2007, 2012, and 2014, by breaking the value of exports down to the value added by each supplier at each step on the way to the final export transaction. The total value of exports does not change. What does change is the allocation of that value by business size as the contributions of all the participating businesses become visible. The findings suggest that the overall participation of SMEs to exports is much larger than the gross export shares would suggest.

## 2. Relevant Literature

In a 2010 report, the United States International Trade Commission (USITC or ITC) estimated indirect exports by small businesses in 2002 and 2007 (U.S. International Trade Commission, 2010). SMEs directly exported about 28 percent of the gross value of exports in 2007. In contrast, the ITC found the SME share rose to 41 percent of domestic value-added exports (about half in direct exports, and half in indirect exports by supplying large and SME direct exporters).

The ITC study made extensive use of the Bureau of Economic Analysis' (BEA) Input-Output (I-O) tables. Since this study uses the underlying concepts in the ITC study, an understanding of the methodology of those tables is helpful. To that end, several BEA documents were reviewed. The main methodology document is *Concepts and Methods of the U.S. Input-Output Accounts* (Horowitz and Planting, 2006). Similar conceptual information on

the construction of I-O tables is available from Eurostat *Manual of Supply, Use and Input-Output Tables* (2008).[4] A working paper by BEA staff members Guo, Lawson and Planting (2002) entitled *From Make-Use to Symmetric I-O Tables* provides background information, and an understanding of the development and assumptions needed to produce symmetric I-O tables and the resulting total requirements tables.

Other researchers are also digging deeper into the information underlying the direct export values to better understand various relationships in the supply chain. The OECD's *Trade in Value-Added: Concepts, Methodologies and Challenges* reviews work the OECD is undertaking to disaggregate trade statistics. The OECD describes the underlying rationale for this work: "trade flows are measured gross and that the value of products that cross borders several times for further processing are counted multiple times. Policymakers are increasingly aware of the necessity of complementing existing statistics with new indicators better tuned to the reality of global manufacturing." The OECD (2012) is attempting to measure these flows between a core group of countries over time to provide policymakers with a clearer picture of exports. A study of Nordic Countries (Statistics Denmark, 2017) conducted as part of the OECD's work, had similar findings to that of the ITC in that SMEs' contribution to exports may be twice as large as traditional measures of exports might suggest.

The work of the OECD is built on past studies that have evaluated various impacts of trade flows on supply chains using I-O tables. For example, Koopman, Wang, and Wei (2014)

[4] This document provides additional information on how supply and use tables are turned into I-O tables and the steps and assumptions that are need to construct an industry by industry I-O matrix, such as the ones that are used in this analysis.

use a very similar technique to that used by the ITC to parse out direct exports into its components in order to better understand the origins of export value. For closely linked economies, this methodology allows a better understanding of what portion of export value can be attributed to intermediate inputs produced elsewhere. However, the authors were not focused on the different contributions of companies of various sizes to U.S. export value.

Hummels, Ishii, and Yi (1999) produced one of the early studies evaluating supply chains that use imported inputs to produce exports. It considers the case where each country may specialize in a specific aspect of value-added in the production process. It also means that goods in process may cross multiple borders prior to reaching their final destination. This makes for a very interconnected trading system. The authors suggest that much of the growth in international trade has come about because of a reduction in trade barriers. For goods that are crossing multiple borders, even modest changes in tariffs and transportation costs may spur trade.

The National Research Council (2006) also analyzed the content of exports and imports. Congress directed the National Research Council to perform this study to develop the data needed to better understand outsourcing.

> The committee's central task has been to assess the availability of data that can be used to estimate the foreign content of U.S. exports and the domestic content of U.S. imports. This has not been an easy task as data on actual content simply do not exist. Many exported and imported products have inputs from the United States and other countries embedded in them. Many imports to the United States have U.S. inputs in them, and many exports from the United States have inputs from other countries, perhaps even the country to which the product is being exported.

While study by the National Research Council did evaluate the usefulness of I-O tables in determining supply chain relationships, it did not study those relationships to any significant degree. It did evaluate the assumptions that would need to be made to use these data in studies on supply chains across country borders.

Very few studies have focused on the role of small business in the supply/value chains, partly due to the lack of solid data on which to base input source data in general, much less input source disaggregated by firm size.

There is recognition that SMEs do play a role in multinational supply chains, but the analysis has rarely been rigorous. For example, the Conference Board of Canada evaluated these relationships, but only in general terms (2009). Large companies have changed from an adversarial relationship with many of their suppliers to a more collaborative relationship that promotes a more stable supply chain. This provides an opportunity for small and medium size companies to access foreign markets more easily by supplying goods and services to large companies that already have foreign sales connections. However, this study focuses much more on what each side is looking for in a supply relationship, and how companies looking for such partners can connect rather than measuring existing relationships between SMEs and multinationals.

Anecdotal evidence suggests that small businesses' may be able to use new communications platforms to participate more directly in trade activities. There are a limited number of academic studies on SMEs' involvement in international trade activities through e-commerce. Many are case studies of e-commerce with only a tangential reference to

international trade (Barkley *et al*, 2007), broader studies of SMEs across countries with the U.S. included as one example (Terzi, 2011), or e-commerce companies' reviews of their customers. Pay-Pal, a U.S. payments firm, estimates that about $80 billion of exports a year are in this channel of trade (*The Economist*, 2017). However, despite the more direct reach of SMEs, large multinational companies still play a huge part in trade. Therefore, understanding the role SMEs play in overall supply chains is still important.

The Census Bureau tracks the importance of related entities in evaluating the magnitude of trade. In 2014, 31.6 percent of the value of exports was to related parties. Among the largest firms (those with 500 or more employees) the share of exports to related parties was 38 percent, while among the smallest companies (those with 1 to 49 employees) the share was less than 10 percent of the value of exports to related parties (U.S. Census Bureau, 2017). This relationship has remained relatively stable over time.

Researchers at the Bureau of Economic Analysis linked information from two BEA surveys, one on trade in services and one on multi-national companies' operations, to analyze the imports and exports of services through related parties in 2008 (Barefoot and Koncz-Bruner, 2012). This is one study that provides some information on services trade by firm size. It shows that for small U.S. parent companies (those with 500 or fewer employees), the number of companies that are exporting or importing services is less than half the number that export or import goods. In 2008, these companies exported about 36 percent more services by value than they imported. Furthermore, the value of the goods exports was about seven times the value of the services exports, and the value of the goods imports was almost eight times the value of the

services imports. However, U.S. affiliates of foreign companies in this size group show a different pattern that probably reflects their ties to their foreign parent, and their U.S. domestic sales focus. U.S. affiliates with 500 or fewer employees in 2008 imported about 75 percent more services by value than they exported and imported almost three times more goods than they exported.

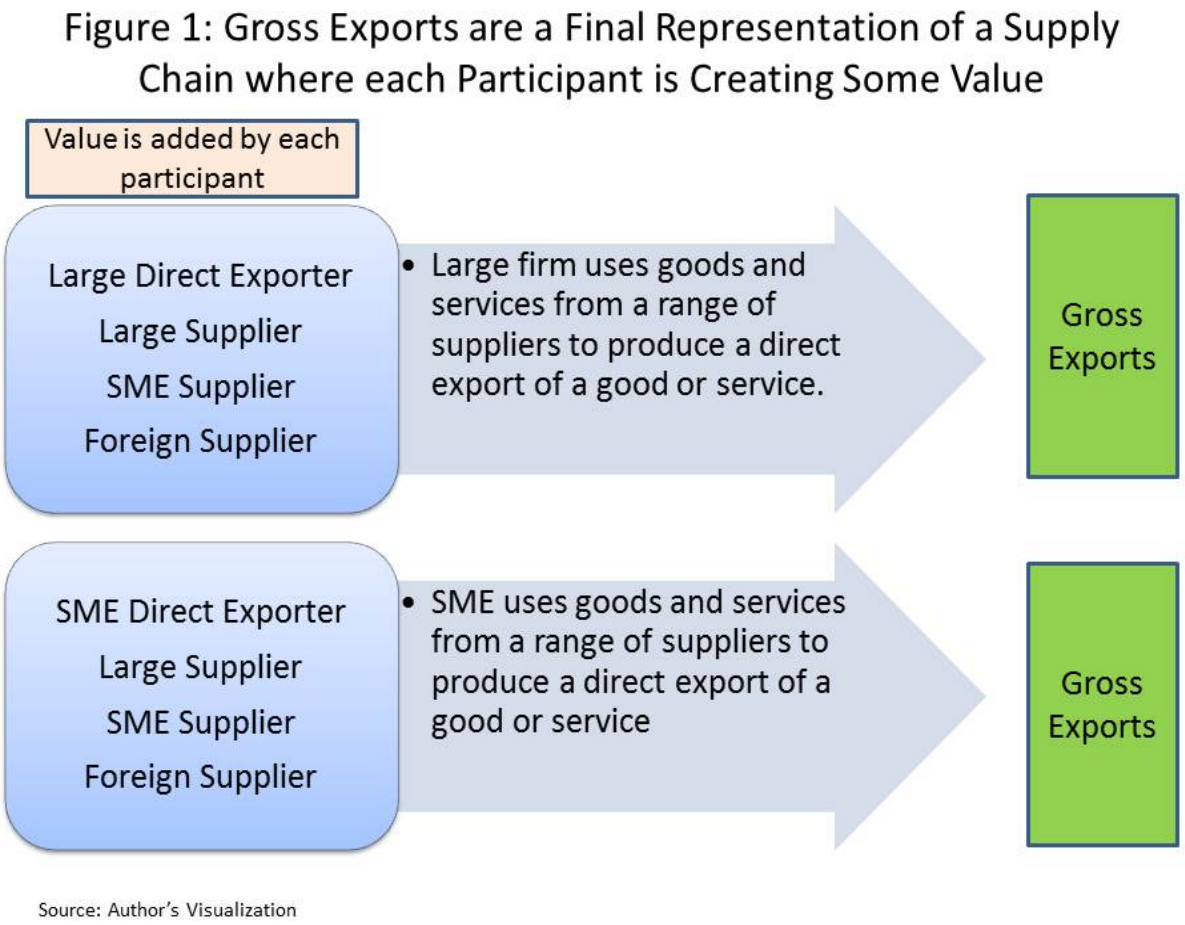
The International Trade Centre (a joint agency of the World Trade Organization and the United Nations) actively promotes the idea that SMEs can more easily be involved in international trade as part of a value chain, suppliers to other companies that are actively participating in trade. Its SME Competitiveness Outlook (2017) provides various examples and case studies on SMEs that have followed that path.

## 3. Background and Methodology

The value of each export as it leaves the United States can be considered as a stream of value-added components generated as each of the exported products is produced. The automobile example used earlier provides numerous examples of this value-added process. Steel is used to make the pistons and other components of the motor, the car body, and many of the other components. The piston manufacturer buys the steel, adds its own labor and other purchased materials to produce the pistons before selling it to the company that is manufacturing the motor. Eventually, all the components come together to be assembled into a finished automobile that is exported. **Figure 1** shows this general flow and the disaggregation of gross exports to its value-added components that this analysis will perform.

Considering this stream of value-added components makes it easier to understand how the final exporter is contributing only a portion of the final export value, and how each of its suppliers is also contributing a portion of the export value. This is the difference in evaluating

**Figure 1: Gross Exports are a Final Representation of a Supply Chain where each Participant is Creating Some Value**




Source: Author's Visualization

the gross exports compared to value added exports. The portion of value-added exports contributed by suppliers to direct exporters is referred to as indirect exports.

The general concept that was applied to this analysis was to take a standard U.S. Input-Output ("I-O") table (shown in **Figure 2**) and divide up its major components by business size.

A standard I-O table analyzes an economy by recognizing that final products, whether

consumed domestically or exported, depend on a chain of suppliers providing goods and services that are used as inputs in the production of the final products. Therefore, producing industries (shown in columns) are purchasing inputs from supplying industries (shown in the rows) and adding their own labor and capital (the value added row at the bottom of the columns) to produce their total gross output. As an example, the steel industry would be a column that is buying iron ore, coke, and electricity from various suppliers shown in the rows. The total supply available to the economy consists of the domestic industries' gross output plus imports. That supply is used either for domestic final demand or is exported.

**Figure 2: Input-Output Table**

**Figure 2: Input-Output Table**

| | | Inputs Used by Producing Industries | Domestic Final Demand (C+G+I) | Exports | Imports (neg. ) | Total supply (Gross output+ total imports) |
|---|---|---|---|---|---|---|
| | | 1,2,3,....,N Industry Sectors | | | | |
| Intermediate Inputs from Supplying Industries | 1 2 . . N | **z** | **y** | **e** | **m** | |
| **Value-Added** | | **v** | | | | |
| **Gross Output** | | **x** | | | | |

Source: Author's Visualization

Each of the producing/supplying industries in the I-O tables are made up of businesses of all sizes; however, the Bureau of Economic Analysis does not disaggregate its standard I-O tables in a way that makes that obvious. This analysis seeks to recognize those interlocking supply chains among large, medium, and small businesses. Large businesses produce output that requires intermediate inputs from SMEs and large enterprises, labor and capital supplied by large businesses, and some amount of imports. Small and medium size enterprises produce output that also requires intermediate inputs from both size groups, labor and capital supplied by small enterprises, and some portion of imports. The goal of this analysis is to produce a revised I-O table that has twice as many producing industries in the intermediate inputs portion of the table. Each industrial sector is divided between an industry where large enterprises are producing the output, and an industry in which SMEs are producing the output, each of which is calling on inputs from suppliers in each size group. Using this concept generates a reconfigured I-O table which explicitly recognizes large and SME producers shown in each column along the

top of the table, and large and SME suppliers providing the inputs for each row. This reconfiguration is shown in **Figure 3** and is described in more detail in Section 3.4.2 below.

**Figure 3: Input-Output Matrix showing the separation of SMEs from Large Businesses**

**Figure 3**
**Input-Output Matrix showing the separation of SMEs from Large Businesses**

| | | Inputs to Production Used by Large Firms (L) | Inputs to Production Used by SMEs (S) | Domestic Final Demand (C+G+I) | Exports | Imports (neg. ) | Total supply (Gross output+ total imports) |
|---|---|---|---|---|---|---|---|
| | | 1,2,3,….,N Industry Sectors | 1,2,3,….,N Industry Sectors | | | | |
| Intermediate Inputs Supplied by large firms (L) | 1<br>2<br>.<br>N | $z^{LL}$ | $z^{LS}$ | $y^{L}$ | $e^{L}$ | $m^{L}$ | |
| Intermediate Inputs Supplied by SMEs (S) | 1<br>2<br>.<br>N | $z^{SL}$ | $z^{SS}$ | $y^{S}$ | $e^{s}$ | $m^{s}$ | |
| **Value-Added** | 4 | $v^{L}$ | $v^{S}$ | | | | |
| **Gross Output** | 1 | $x^{L}$ | $x^{S}$ | | | | |

Source: Author's Visualization

While conceptually straightforward, the information needed to completely calculate an I-O table by firm size is incomplete. Because the division of gross output value and value added by business size has been well studied, the general findings of the analysis, shown in Section 4 in Table 2, are quite reasonable. However, these point estimates would change somewhat if the assumptions underlying the calculations were varied. Section 4.3 provides some sensitivity testing on the assumptions.

The underlying division between large and small businesses can only be estimated. Quite a bit of information is known about some sub-components of the I-O tables due to prior research for the Office of Advocacy (Advocacy). The *Statistics for U.S. Businesses*, supported by the Census Bureau and Advocacy, provides general information on revenues generated by large and small businesses in Census years, which provides a basis for dividing gross output in the I-O table between large businesses and SMEs. Various past studies for Advocacy have produced estimates of nonfarm private business GDP (value-added) by business size class through 2014. However, even for that value-added analysis, there are certain components for which assumptions must be made rather than precise measurements used because of a lack of certain types of information on small businesses. These GDP estimates can be used to divide the value-added components shown at the bottom of the I-O table into large and SME components for each industry.

Unfortunately, there are other sub-components of the I-O relationships for which there is no underlying information about the distribution of value by business size. One such category is imports. For imports, major assumptions must be made in order to complete this analysis.[5] Finally, there is a third set of sub-components, primarily exports, for which there is some information on business size distribution, but it is incomplete.

[5] The USITC's efforts sought to find a "better" solution, by using a quadratic optimization equation, to determining import share distributions than the initial assumptions. However, it is unclear how much this added to the accuracy of the final estimates given that there is a band of uncertainty around every set of small and large business distributions used in the modeling approach.

## 3.1. U.S. International Trade Commission Study

The research plan for this project is based on prior research done by the U.S. International Trade Commission study done in 2010, *Small and Medium-Sized Enterprises: Characteristics and Performance.* The general conceptual methodology was followed; however, some changes were made to the assumptions, and in some cases the data sources to improve their accuracy and reasonableness.

The following steps are taken to make each year's calculations.

**Step 1.** Download the BEA I-O table for each year 2007, 2012, 2014.

**Step 2.** For each year develop an industry-by-industry matrix from the commodity-by-industry matrix using the "constant sales structure" methodology.

**Step 3.** Calculate SME and large business shares for each industry for gross output, value-added, exports, and imports.

**Step 4.** Initialize the starting values for the intermediate inputs portion of the I-O matrix by firm size and the final demand vector by firm size using the identities shown in Section 3.4.1.

**Step 5.** Calculate the input-output coefficients (the A matrix) from the constructed I-O table shown in **Figure 3**. Calculate the total requirements matrix. Generate the total requirements ratios for each industry.

**Step 6.** Calculate the overall import content for each industry by calculating an industry-by-industry matrix for domestic use and comparing it with the initial industry-by-industry matrix.

**Step 7.** Reduce the export vector by the amount of the direct and indirect imports used.

**Step 8.** Calculate the contribution by business size of each industry by multiplying the total requirements matrix by the export vector that has had the imports impact removed.

Each of the steps is explained in more detail in Sections 3.2 through 3.4 below for readers that are interested in the methodology. Readers who are primarily interested in the results may choose to go directly to Section 4.

## 3.2. Input-Output Matrices

### 3.2.1. The I-O Data

The standard Input-Output tables of the United States are the starting point of this analysis. These data are constructed by the Bureau of Economic Analysis (BEA). BEA constructs a benchmark I-O table for each of the economic census years (years ending in 2 and 7) using data from those surveys to determine the primary relationships between the industries. However, additional work is required to then turn those data into an I-O table. Consequently, the completion of the benchmark tables significantly lags the Economic Census data (for example, the benchmark 2012 I-O table is scheduled for publication in Fall 2018).

Between the benchmark I-O tables, the BEA constructs annual I-O tables. These annual tables are referred to as "non-survey" tables. They rely heavily on the most recent benchmark table but take into account some annual sample survey data collected since the construction of the benchmark table. However, neither the benchmark nor annual I-O tables present information about firm size. The standard I-O table, as the BEA constructs it, shows producing industries in columns and rows of commodities supplied. Since each commodity may be supplied by both a main producing industry and by one or more secondary industries, the rows and columns do not have the same gross output totals (for example power generation may be produced by the utility industry but also by the government). However, for this analysis, all the production of each commodity is aggregated into its main producing sector. That results in the gross output of the producing industries (shown in the columns) being equal to the gross

output generated by the supplying industries shown in the rows. Therefore, the first step is to turn the standard I-O commodity-by-industry table into an industry-by-industry table.

### 3.2.2. Developing the Industry-by-Industry Matrix

The BEA's main tables show industry by commodity relationships in two forms. One is called the make table. The make table shows the industries that produce each commodity. The other is called the use table. The use table shows the goods and services that are required to produce the final output for any given industry as well as the labor and other value-added components that are required to produce that output. However, to invert the intermediate inputs matrix and calculate the direct and total requirements matrices requires a square (industry-by-industry) matrix. More than one method exists for producing this matrix from the standard commodity-by-industry matrices. In this analysis the constant sales structure was assumed.[6] That methodology assumes that that the proportions of a product sold to the respective intermediate and final users stays constant regardless of the industry that is producing the product.

Employing this methodology changes the intermediate inputs matrix into an industry-by-industry square matrix with two exceptions. The first is the use of scrap items. In the initial I-O table these items have a commodity row because they are used in production, but no industry production column since they are not being produced in the current period. For the purposes of these calculations, that row has been combined with the administrative and

[6] *See* Eurostat (2008). This method is referred to as Model D in the Eurostat methodology and is also the methodology that the USITC used to produce its industry-by-industry matrix.

business services and waste remediation industry. The second commodity row with no matching industry column is the imports that have no match in U.S. production, and the rest-of-world adjustment. In the basic I-O table, imports are shown as part of domestic supply along with the domestic production of that commodity. However, there are some imports for which there is no domestic production. These are primarily service imports, and those items are summed into an additional commodity row in the normal I-O table. For the purposes of these calculations, those items are treated as a portion of the value-added line items.

### 3.3. Small Business Share of Economic Activity by Industry Sector

BEA's I-O tables are presented in two primary industry aggregations; 1) the sector table showing 19 industry aggregates, and 2) the summary level showing 60 industry aggregations. This analysis uses a combination of these two sets of tables to produce an I-O table with 22 industry aggregations. The original USITC study used a somewhat smaller list of industry sectors. The most problematic of the USITC industry sectors is a single manufacturing industry. The aggregated manufacturing sector combined data across a number of different industries, with varying degrees of export orientation, and various degrees of participation by small businesses. The author disaggregated manufacturing into four groups of industries with similar characteristics. This allows for some of that variation to be better represented in the calculations. **Table 1** lists the industry aggregations used for this analysis.

| Table 1: Industry Aggregations Used for Analyzing Indirect Exports | |
|---|---|
| NAICS Codes | Industry Category |
| 11 | Agriculture, forestry, fishing & hunting |
| 21 | Mining |
| 22 | Utilities |
| 23 | Construction |
| 31,321-3, 337 | Manufacturing category 1: food, beverages, tobacco, textiles, apparel, paper, wood products and furniture |
| 324-327 | Manufacturing category 2: nonmetallic minerals, petroleum, chemicals, plastics, and rubber products |
| 331,332 | Manufacturing category 3: primary and fabricated metal production |
| 333-336,339 | Manufacturing category 4: machinery, computers, electrical equipment, transportation equipment and miscellaneous manufactures |
| 42 | Wholesale trade |
| 44,45 | Retail trade |
| 48,49 | Transportation |
| 51 | Information |
| 52 | Finance and insurance |
| 53 | Real Estate and leasing, housing |
| 54 | Professional and technical services/Management of companies |
| 56 | Administrative and waste remediation (with scrap) |
| 61 | Educational services |
| 62 | Health care and social assistance |
| 71 | Arts, entertainment, & recreation |
| 72 | Accommodation & food service |
| 81 | Other services, ex. Government |
| 99 | Government |
| Housing in the National Income and Product Accounts is largely imputed homeownership. Ideally this would be left out of any analysis since it is not generally a production industry, and has no imports or exports, nor does it have any firm size divisions since it is not a true industry. Because it is difficult to square the matrix when it is excluded, it has been left in the real estate industry but provides more weight than the true output of the real estate and leasing industries actually generate. | |
| Source: BEA I-O Aggregations as determined by Author | |

In addition to the I-O table for the three years in question, there are several vectors of small business shares to be used in the calculations. (See Appendix A for the specific values used for this analysis in each year). These values act as anchors when divvying up each category into its relative business size shares. One vector of small business shares is calculated for each

industry studied for each of the following: 1) gross output share; 2) value added share; and 3) share of exports.[7] The derivation of those shares is discussed below. A simple assumption about import shares is also made, although as mentioned above it is not based on a specific data source.

### 3.3.1. Small Business Gross Output Shares

Gross output is the total value of production from U.S. businesses, usually measured using their revenues or receipts. This is not equivalent to GDP. Each company's receipts include the value of the intermediate goods and services it procured to produce its output. If the receipts of all the companies in the economy were added up it would double count the value of the inputs to the next sector of production. Thus, the receipts of a piston manufacturer include the value of the raw metals, electricity, and other inputs that it used to manufacture its pistons. The engine manufacturer's receipts include the value of the pistons it purchased as well as the other goods and services it purchased to manufacture the engines; and, the car manufacturer's receipts includes the value of the pistons, the engines, and all the other goods and services it purchased to manufacture the car. To calculate GDP, that double counting is netted out so that only the value added by each industry is included in the total.

The gross output shares by business size were calculated from the *Statistics of U.S. Businesses* for the Economic Census years 2007 and 2012 along with the receipts of non-

[7] Value-added shares are generally broken down into compensation and non-compensation shares and then when those data are combined become large and small business shares of GDP. However, initially, only compensation shares are being used to separate value-added in the optimization model since that is most similar to the USITC's initial methodology.

employer businesses that are not included in the SUSB tabulations.[8] Since 2014 is not a census year, SUSB did not calculate receipts allocations by business size for 2014. However, SUSB does provide payroll shares for each year, and those were used as an indicator to adjust 2012 receipts shares to 2014. In the nomenclature of **Figure 3** (shown above), these become vectors $x_i^L, x_i^S$ where the first is the vector of large business gross output for a given year for each supplying industry *i* and the second is the equivalent vector of SME gross output for each supplying industry *i*.

A few industries have incomplete information in SUSB with which to calculate those gross output shares. For example, the agricultural sector in the SUSB includes only hunting, forestry, fishing, and some agricultural support services, and not the actual farm and livestock production in the United States. Consequently, the business size shares were calculated using some information from SUSB combined with information from the Census of Agriculture.[9] The other industries that are not covered by SUSB are owner-occupied housing (for which there is no concept of firm size for production) and government. [10] Management of companies is another industry for which the BEA definition of production and the SUSB concept of

[8] The U.S. Census Bureau conducts a census of U.S. businesses every five years, in years ending in 2 and 7. These censuses collect counts of businesses along with important economic information such as receipts and employment. Those receipts data are added to the SUSB tabulations in the census years.

[9] Farm and livestock production in the U.S. tends to be largely small business operations. Consequently, the small business share for this industry is larger than was assumed by the USITC.

[10] The USITC excluded government from its firm size analysis; but, since government is an exporter, it is represented directly in this analysis. The federal government, responsible for most of the exporting in this sector, was considered a large business in this analysis, and most local governments were allocated to the SME sector.

production differs somewhat. This industry was combined with the much larger professional and technical services sector and the gross output share is mostly that of the larger industry.

### 3.3.2. Small Business Value-Added Shares

GDP can be estimated either from the product side or the income side. Adding up final demand components such as personal consumption expenditures, investment, and exports produces the product side estimate of GDP. Adding up the value-added components for each industry produces the income side estimate of GDP. Each industry's income side components to value added are compensation, indirect business taxes, net interest, depreciation, and profits. Earlier research for Advocacy on small business GDP calculated the business size shares of the value-added components (Kobe and Schwinn, 2018).

The USITC methodology used only the business size share of wages and salaries to approximate the value-added share for each industry as an approximation for compensation. To maintain more consistency with the USITC methodology, the business size share of compensation for each industry was used (as calculated for the most recent version of small business GDP-*see* Kobe and Schwinn 2018) to divide up all value-added by business size. However, it would be more appropriate to use each industry's share of GDP since that is the true measure of value-added by firm size.[11]

Small business GDP is calculated only for private non-farm GDP. Therefore, those calculations do not cover the agriculture or government (or owner-occupied housing since it is

[11] A change in this assumption would result in a somewhat different estimate of direct and indirect exports, since the direct exports depends on the industry value added shares.

removed from the small business GDP calculations). Agriculture GDP was estimated from a combination of information from SUSB and the Agricultural Censuses, and government was estimated from information generated by the Government Censuses. The estimate of value added for the Real Estate and Leasing Industry was used for the combined industry that includes Housing.

### 3.3.3. Adjusted Exports and Small Business Export Shares

#### 3.3.3.1. Adjusting export for incorporated import value

About 56 percent of the value of imports in the U.S. economy is applicable to intermediate inputs into other goods and services.[12] Before the indirect contribution of small businesses to exports can be calculated, it is first necessary to consider what proportion of U.S. export value is produced using some of these imported intermediate inputs. Therefore, in evaluating indirect export values, one does not want to overestimate the U.S. content of exports. This requires official gross exports to be reduced by the amount of imported content, since it is only the domestic portion of the export value that is generating indirect contribution from U.S. firms. In Table 2 (Section 4.2), the import content of the exports is labeled as foreign value added. The total of the value added by business size represents domestic value-added exports.

[12] This number is very consistent between the 2007 and 2014 I-O tables; however, that is to be expected since the underlying relationships are all based on the 2007 benchmarked table. This ratio varies widely among industries. In some industries, like mining, virtually all imports are used as inputs into other production, while in other industries, like transportation, only about a third of the value of imports can be allocated to intermediate inputs.

The BEA creates a commodity-by-industry matrix of imports used as intermediate inputs as well as imports that are incorporated in personal consumption expenditures when it creates the I-O matrix.[13] If the intermediate inputs import matrix is subtracted from the total intermediate input matrix, a commodity-by-industry domestic intermediate inputs matrix is computed.[14] Once that is done, the import content in gross exports can be calculated using the following equation:

Import content in gross exports = $\mu A^M (I - A^D)^{-1}$

where $\mu$ is a vector of 1s, $A^M$ is the imported direct coefficients matrix, $A^D$ is the domestic coefficients matrix, and I is the identity matrix (Hummels, Ishii, and Yi, 1999). This calculation provides both the direct and indirect impact of imports used as intermediate inputs. For 2007, the overall import content of exports was calculated as 13.4 percent, in 2012 it was calculated as 15.2 percent, and in 2014 it was calculated as 15.4 percent. Each industry's import content was considered separately in the calculations. It is assumed that the import content flowing through the large and SME portion of each industry is equal to that calculated for the industry as a whole.[15]

[13] This is also implicitly an industry-by-industry matrix since imports are all assumed to be applicable to their primary production sector.

[14] This was also turned into an industry-by-industry matrix using the same method as was described for the original matrix.

[15] This is an area where more data are needed to understand the true relationships. There is evidence that large businesses are more active in international markets than small businesses; therefore, large businesses may tend to purchase more imports. For example, the Census data on importers and exporters show that large businesses are much more likely to be both importers and exporters than are small businesses. However, there are not good data on the purchasing patterns of all small businesses and whether they are more or less likely to make purchases of imported intermediate inputs than are large businesses in the same industry.

#### 3.3.3.2. Calculation of Small Business Export Share for Goods

The small business share of gross export value for goods (the total value of exports measured at the point of direct export) is calculated from data collected by the Census Bureau which uses data collected from Electronic Export Information (EEI) submitted through the Automated Export System.[16] The data published by the Census Bureau shows only the NAICS code of the exporter of record and the size grouping of the companies reporting. It does not provide an indicator of what is being exported. While the bulk of the exporters are either manufacturers or wholesalers, the remainder fall in a wide array of NAICS codes. However, these data are only reflecting the export of goods, even if the exporter of record is a service company. Consequently, it is not possible to obtain the small business share of service exports from this database.[17]

For 2014, the data from the International Trade Administration on exporters by firm size, NAICS of the exporter, and of the product being exported could also be used. A comparison of these data with the data published by the Census Bureau, which is aggregated only by the NAICS of the exporting company shows somewhat different shares. Exports by companies with manufacturing NAICS codes tend to be more large business dominated than are exports of commodities from those same NAICS codes. The higher percentage of small

[16] Exports to Canada are the exception. Those data are Canadian import data that are provided to the United States under a 1987 Memorandum of Understanding between the two countries.

[17] The USITC did use some of these data to reflect service export shares; however, for most industries there is no reason to believe that the value of the goods exports by a service firm would correlate with its exports of services. An exception could be logistics firms, or firms that prepare export documentation.

businesses that are involved in the export-oriented business services, such as wholesalers and customs brokers, probably accounts for this difference.

The question is raised as to the correct concept to use in generating the export shares for each industry. In the I-O table, wholesale trade is treated as a margin industry. That means that only the markup by the wholesaler shows up in the industry output. Consequently, the bulk of the value of the exports remains in the initial manufacturing sector related to the producer of the goods being exported.[18] One implication of that concept is that the share of the exports should reflect both the goods directly exported by the manufacturer as well as the goods exported by wholesalers and others.

As can be seen in **Table 2**, this can result in a significant difference in the small business export share applied to each industry. For 2014, the Census data tend to show a smaller share for the SMEs than does a commodity-based calculation derived from the ITA information that combines manufacturer and non-manufacturer exporters.

**Table 2: Small and Medium Business' Share of Gross Exports in 2014 for Selected NAICS Categories**

| | Census Data Trade Profiles | ITA Exporters-manufacturers only | ITA Exporters Database-manufacturers and non-manufacturers combined |
|---|---|---|---|
| Manufacturing Category 1 | 19.9% | 21.3% | 39.6% |
| Manufacturing Category 2 | 23.2% | 22.4% | 32.2% |
| Manufacturing Category 3 | 39.2% | 29.5% | 35.7% |
| Manufacturing Category 4 | 16.2% | 29.5% | 27.8% |
| Wholesale Trade | 60.7% | 49.1% (all non-manufacturers, predominantly wholesalers) | |
| Manufacturing Category 1 contains: food, beverages, tobacco, textiles, apparel, paper, wood products, furniture. | | | |

[18] The BEA describes this in its methodology: "transportation costs and trade margins that are required to move exports from the producer to the port of exit are included in the transportation and trade rows of the use table."

Manufacturing Category 2 contains: nonmetallic minerals, petroleum, chemicals, plastics, and rubber products.
Manufacturing Category 3 contains: primary and fabricated metal production.
Manufacturing Category 4 contains: machinery, computers, electrical equipment, transportation equipment and miscellaneous manufactures.
Source: Derived from the ITA exporters database and U.S. Census Bureau (2017)

As would be expected, the ITA shares based on manufacturers alone tend to be closer to those that are presented in the Census' Trade Profiles. The ITA data combining the manufacturers and non-manufacturers seems to be more consistent with the definition of the export value that is used in the I-O tables. Unfortunately, those data are not available for 2007 and are incomplete for 2012.[19] Therefore, 2014 is the only year for which this difference is analyzed and the results tested. The impact of this difference on the resulting estimates is discussed in Section 4.3.

#### 3.3.3.3. Calculation of Small Business Export Share for Services

Very limited information on service exports exists, and none by size of company. However, the Economic Censuses do collect information on service firms that export for selected services industries. That information shows receipts and establishment counts (and sometimes employment) for all establishments in the NAICS industry and then shows establishment counts, value of receipts (and sometimes employment counts) for the establishments that report exports in addition to the value of receipts generated by exports. In general, those data show exporters with higher than average receipts per establishment, and receipts per employee than is true for the industry as a whole.[20] Since these measures tend to

[19] One of the reviewers for this papers indicated that these ITA data are kept by ITA for earlier years. Thus, the 2014 analysis could be evaluated for earlier time periods. Time constraints did not allow for that review in this paper. I would also like to thank all the reviewers for their helpful comments on this paper.

[20] These data have been used in the past as one indicator that the most efficient firms tend to be the exporting firms.

increase as firm size increases, the above average numbers indicate that the exporters tend to be either larger businesses than is average for the industry, or more productive than average. Unfortunately, without any other indication as to the distribution of the export firms, it is not possible to calculate a small business share from this information alone.

The Census data also points to another factor that is impacting the distribution of exports. Export receipts distributed across disaggregated NAICS categories is often different than is the distribution of overall receipts. That effect can be controlled for by weighting together the small business receipts shares of each of the disaggregated categories using export receipts shares as weights. It still assumes that exporters are distributed across the sub-categories in the same manner as all the companies, but does ensure that the share data are based on the actual receipts for the service work rendered rather than just using an unreliable measure of goods shipped as a proxy. The assumption likely still overstates the small business share somewhat given that the exporters tend to have larger receipts per establishment and receipts per employee than does the average firm. However, this did provide a consistent methodology for the service industries for which the Census collected information.[21]

Among service industries, accommodation and food services is one of the largest exporters. Exports consist of lodging and food provided to foreign tourists, foreign businesspeople, and foreign students. The Census does not collect information from establishments in these industries on their exports since most establishments do not have a

[21] These industries are information, finance and insurance, and professional and technical services.

ready method for determining whether it is a foreign tourist or an U.S. resident that is eating at their restaurant or sleeping in their rooms. To estimate a business size share for these exports, the SUSB data for accommodation and food services for the ten largest MSAs serving the most foreign tourists were used as a proxy for the small business export share. Similarly, export shares by business size for education were estimated by using the percentage of foreign students attending large universities as a proxy.

#### 3.3.4. Small Business Import Shares

Data on small business import shares that correspond to the concept needed for these calculations do not exist. While the Census Bureau does collect information on small business importers, it is done based on the NAICS code of the producer/importer. For manufacturing NAICS codes, this most likely captures the share of all intermediate inputs to each industry's production process that are directly imported by the manufacturer. For non-manufacturing NAICS it is probably capturing a range of imported products that depend on the requirements of the clients of the importers. However, what is really needed in this instance is the portion of the total supply of a particular commodity that is imported. While the Census Bureau data does capture the importation, the share by firm size cannot be identified using the published tables because it would involve aggregating over all the industries that import that commodity. The USITC's initial assumption was followed in this instance, assuming the import share is similar to the export share since exporters are often importers as well.

#### 3.3.5. Small Business Shares of Intermediate Inputs

The intermediate inputs matrix, once it has been recalculated into an industry-by-industry matrix, consists of twenty-two producing industries in columns (the *j* industry sectors) and twenty-two supplying industries in rows (the *i* industry sectors). These are, of course, the same industries. The *jth* producing industry is after all also a supplying industry and appears on equivalent *ith* line of the supplying industry listing. The gross output of the *jth* industry is equal to the gross output of the matching *ith* industry. The creation of the industry-by-industry matrix described above assures that is true.

For each column, it shows the amount of the *ith* industry's output is consumed in the production of the *jth* industry's output. To make the calculations necessary for this analysis, this single matrix must be split into four matrices, (each *i* x *j* in size) which shows the various combinations of potential purchases. For example, the *jth* industry is making purchases from both large businesses and small businesses in its supply chain. Similarly, each *ith* industry has both large and small businesses supplying to both large and small businesses. No data exist that will show what share of a large businesses' inputs come from large and small businesses in each supplying industry, nor is that information known for a small business. Consequently, that split must be based on an assumption. The initialization of each of the four intermediate industry matrices is described below.

## 3.4. Initializing the Relationships and Revising the I-O Matrix

Even after estimating the share of gross output generated by large and small businesses, the share of exports by firm size, and the share of value added that can be allocated to each firm size, there is additional information that needs to be estimated in order to calculate an

estimate of the indirect exports provided by SMEs. Primarily, this is the share of imports by firm size, the distribution of the intermediate inputs by firm size, and the calculation of domestic demand by firm size, which depends on the other components.

The total value by industry for each of these is known from the I-O table. What is not known is the large business and small business proportions of each of them. As described above, some of the main values in the I-O table have been allocated to business size based on other data sources. Those are gross output by business size ($x_i^L, x_i^S$), value added by business size ($v_j^L, v_j^S$) and exports by business size ($e_i^L, e_i^S$).

Using those shares and some assumptions about import allocations by firm size, it is possible to calculate initializing values for the missing components.

### 3.4.1. Initializing Values

The following equations are used to initialize the four sub-matrices that make up the overall intermediate inputs matrix. This results in four matrices that can be summed up to the original *i* x *j* matrix of overall intermediate inputs.

$$z_{ij}^{LL} = \frac{x_i^L}{x_i}\frac{(x_j^L - v_j^L)}{(x_j - v_j)}z0_{ij}$$

$$z_{ij}^{LS} = \frac{x_i^L}{x_i}\frac{(x_j^S - v_j^S)}{(x_j - v_j)}z0_{ij}$$

$$z_{ij}^{SS} = \frac{x_i^S}{x_i}\frac{(x_j^S - v_j^S)}{(x_j - v_j)}z0_{ij}$$

$$z_{ij}^{SL} = \frac{x_i^S}{x_i}\frac{(x_j^L - v_j^L)}{(x_j - v_j)}z0_{ij}$$

Where the variables are defined as follows:

$z_{ij}^{LL}$ intermediate inputs used by large producing companies and acquired from large suppliers.

$z_{ij}^{LS}$ intermediate inputs used by SME producing companies and acquired from large suppliers.

$z0_{ij}^{SS}$ intermediate inputs used by SME producing companies and acquired from SME suppliers.

$z_{ij}^{SL}$ intermediate inputs used by large producing companies and acquired from SME suppliers.

$z0_{ij}$ initial intermediate inputs matrix in the I-O table. The prior four together must equal this total.

The initialization of the two firm-size y vectors is done with the following equations:

$$y_i^L = x_i^L - \frac{x_i^L}{x_i}\sum_{i=1}^{N} z0_{ij} - e_i^L + m_i^L$$

$$y_i^S = x_i^S - \frac{x_i^S}{x_i}\sum_{i=1}^{N} z0_{ij} - e_i^S + m_i^S$$

Once these initializations are complete, the I-O matrix has twice as many producing industries and twice as many supplying industries. There is now a large and an SME producing industry for each initial industry as well as a large and an SME industry for each supplying industry. Each row and column of the I-O table has been constructed to maintain the identities in the original I-O matrix. Since the original I-O table had been converted to an industry-by-industry table, the resulting table is also an industry-by-industry table (this is necessary to create a square matrix that can be inverted for the next set of calculations).

The USITC methodology inserted an additional step in this process. It also used an optimization model consisting of one objective function and seven constraints to maintain the

relationships between the elements of the I-O table. The goal of the objective function was to estimate new import share parameters (and thus new y vectors by firm size) that were a better representation of the unknown "true" relationships than were the initializing assumptions. However, a review of the final intermediate input shares reported by the USITC indicated that the initialization of the assumptions produced shares that for the most part were very close to the USITC's final values. Furthermore, given the number of assumptions needed to produce all the firm size variables, and the level of imprecision in those estimates, it is unclear if the optimization produces an estimate that is closer to the unknown reality.[22]

### 3.4.2. Calculating the Total Requirements Table

Once the I-O matrix has been reconfigured to include the additional supplying and producing industries (a sub-industry based on firm size for each of the initial 22 industries) it is possible to use standard I-O techniques for calculation of the total requirements matrix. The total requirements matrix, in turn, can be used to estimate the indirect contribution of the firm-size sub-industries to the total export output.

**Figure 3** is repeated below and shows the breakdown of the total intermediate inputs matrix, $z0_{ij}$ is configured so that each producing industry has its large business suppliers at the top and its SME suppliers at the bottom of the matrix. Similarly, the SME producers have their large business suppliers at the top of the matrix and their SME suppliers at the bottom.

[22] This step added considerably to the complexity of the analysis and it was decided to proceed with the calculations based on the initialized variables. However, some unknown portion of the difference between the current results for 2007 in Table 2 and those produced by the USITC may be accounted for by this step.

Therefore, each column shows a producing firm-size sub-industry with each row of the top half of rows representing the inputs coming from a large business supplier and each of the bottom half of rows showing the inputs coming from an SME supplier. This matrix is square, it has as many rows as it has columns, and it is an industry-by-industry configuration so that gross output across the row equals the gross output down the column.

**Figure 3**

**Input-Output Matrix showing the separation of SMEs from Large Businesses**

| | | Inputs to Production Used by Large Firms (L) | Inputs to Production Used by SMEs (S) | Domestic Final Demand (C+G+I) | Exports | Imports (neg. ) | Total supply (Gross output+ total imports) |
|---|---|---|---|---|---|---|---|
| | | 1,2,3,….,N Industry Sectors | 1,2,3,….,N Industry Sectors | | | | |
| Intermediate Inputs Supplied by large firms (L) | 1<br>2<br>.<br>N | $z^{LL}$ | $z^{LS}$ | $y^{L}$ | $e^{L}$ | $m^{L}$ | |
| Intermediate Inputs Supplied by SMEs (S) | 1<br>2<br>.<br>N | $z^{SL}$ | $z^{SS}$ | $y^{S}$ | $e^{s}$ | $m^{s}$ | |
| **Value-Added** | 4 | $v^{L}$ | $v^{S}$ | | | | |
| **Gross Output** | 1 | $x^{L}$ | $x^{S}$ | | | | |

Source: Author's Visualization

The next step is to take the overall z matrix and calculate a direct requirements matrix. Each cell in the matrix is divided by its corresponding gross output number. For example, the first producing sub-industry (large business agriculture) each of the cells in the column is

divided by the gross output of the large business agriculture gross output estimate. Each column is calculated in turn until there is a complete direct requirements table, which in standard I-O parlance is referred to as the A matrix. **Figure 3** shows how the general structure of the basic I-O table (shown in **Figure 2**) has been reconfigured to produce an I-O table from which the value added components by firm size can more easily be calculated.

From there the calculation proceeds to the calculation of the total requirements matrix. A total requirements matrix captures both the direct and indirect production need to support 1 unit of final demand output. For example, to produce an additional automobile requires the production not only of the steel (and other materials) that goes into that auto but also requires the production of all the items that go into the production of the extra steel. Using standard I-O techniques, the total requirements table is calculated by subtracting the A matrix from an identity matrix (I) and finding the inverse of the resulting matrix. $TR = (I-A)^{-1}$

The resulting total requirements matrix is used to calculate the overall requirements needed to satisfy a one unit increase in final demand, which in this case will be exports. Since the total requirements matrix is configured in this manner, it can also be used to separate out the value added for each industry size group in the final export values. One assumption that is implicit in these calculations is that final demand for exports is produced the same way as is final demand for domestic consumption in the same industry. That may or may not be true given the level of aggregation in the I-O table.

### 3.4.3. Calculating the Indirect Contribution of the Firm-Size Sub-Industries Implicit in the Export Values

Once the total requirements matrix is calculated, multiplying it by the export vector will produce the total supply by each firm size sub-industry that is needed to support those exports. The top half of the resulting vector will represent the supply by large companies, both those that are directly exporting and the large companies that are supporting both large and SME direct exporters. The bottom half of the vector shows the total supplied by SMEs in order to support the exports, both the amount that SMEs are exporting directly, as well as the value SMEs are supplying as inputs to both the large and SME direct exporters. To calculate the ultimate value-added components reported in **Table 3** requires that the vector be multiplied by the value-added share by firm size and industry that corresponds to the supplying firm size sub-industry. Once that is done it is straightforward to separate out the value added applicable to the direct exporter (large and SME) and the valued added to each of the sub-components (SME suppliers supporting large production, SME suppliers supporting small production, large suppliers supporting large production, and large suppliers supporting SME production). When added together, these six components will add to total exports.

As mentioned earlier, the export vector must be adjusted to remove the impact of imported intermediate inputs from the calculations. If that is not done, then the resulting analysis will produce numbers that are too high for the contribution of the large and SME domestic industries, since some of the intermediate inputs are being supplied by foreign suppliers. That calculation was described above.

# 4. Findings-Indirect Small Business Exports

## 4.1. Direct and Indirect Value-Added Exports

Breaking down the gross value of exports (the total value of the exports as they cross the border) into value-added components does not increase the value of total exports. It only evaluates that total using a different concept. The value-added exports show the value added by the direct exporter, which is smaller than the gross exports of the direct exporter because this methodology also allocates some of the value to the companies in the supply chains of the direct exporters, the indirect exports. This methodology also explicitly recognizes the foreign content of inputs to the production of exports. As can be seen from the summary results in **Table 3**, the estimates generated by this analysis continue the findings of the USITC. The combined value of the direct and indirect value-added contribution of the SMEs is larger than their gross export value. SMEs also contribute as much or more to export value indirectly as they do directly. While SME direct exporters have generated about 15-20 percent of value-added export value, their combined direct and indirect share is 30-35 percent. Conversely, the actual role of large exporters is somewhat smaller than was originally estimated. In 2014, large businesses made up 65 percent of gross export value, but their combined value-added total is about 46 percent of gross export value and about 51 percent of total value added. Foreign value added, the share of imported goods in the supply chain of direct exporters, has also increased over this period of time, increasing from about 10 percent of the total in 2002 to about 15 percent of the total in 2012 and 2014.

| Table 3: Comparison of Gross and Value-Added Exports by Firm Size (billion$) | | | | | |
|---|---|---|---|---|---|
| | ITC-2002 | ITC-2007 | 2007[1/] | 2012 | 2014 |
| Gross Exports | 907 | 1,501 | 1,510 | 1,955 | 2,107 |
| Large[2/] | 564 | 967 | 1,005 | 1,301 | 1,369 |
| SMEs | 246 | 382 | 379 | 484 | 539 |
| Second goods and ROW adj. | 97 | 153 | 126 | 170 | 200 |
| Total Value Added Exports | 809 | 1,349 | 1,384 | 1,785 | 1,907 |
| Foreign Value Added | 84 | 190 | 198 | 272 | 294 |
| Large-Direct | 204 | 350 | 342 | 456 | 491 |
| Large-Indirect | 202 | 328 | 366 | 456 | 483 |
| SME-Direct | 167 | 241 | 207 | 263 | 292 |
| SME-Indirect | 152 | 240 | 272 | 338 | 347 |

[1/]There have been revisions to the 2007 data between the time the ITC did its initial estimates and the now, including the BEA's definition of non-comparable imports and ROW adj.

[2/]The ITC considered Government separately outside its model. Therefore, the government exports from its analysis have been added to the large business exports. The current analysis includes government in the direct analysis; therefore, government is already in the totals.

Source: BEA I-O data, U.S. International Trade Commission (2010) and this research.

A breakdown of the valued-added exports by supplying industry also shows a different distribution than does the distribution of the gross exports. **Table 4** shows the difference in the distribution of SME gross exports (total value of the exports as it is exported by SMEs) and the distribution of value-added exports (the sum of the value added by direct SME exporters and the value added by SMEs supplying both large and SME exporters).

| Table 4: Distribution of SME Gross Exports vs Direct and Indirect SME Value Added Exports by Supplying Industry (percent of SME export value) | | | | | | |
|---|---|---|---|---|---|---|
| | SME Gross Exports 2007 | SME Value Added Exports 2007 | SME Gross Exports 2012 | SME Value Added Exports 2012 | SME Gross Exports 2014 | SME Value Added Exports 2014 |
| Agriculture & Mining | 10.5 | 10.5 | 12.4 | 8.1 | 11.4 | 8.1 |
| Manufacturing | 35.4 | 25.9 | 37.7 | 27.6 | 39.7 | 28.2 |
| Trade & Transportation | 23.4 | 21.1 | 19.2 | 19.8 | 18.1 | 19.4 |
| Services | 30.5 | 40.3 | 30.6 | 42.3 | 30.7 | 42.4 |
| Other Industries | 0.2 | 2.2 | 0.1 | 2.2 | 0.0 | 1.3 |
| Value in billion $ | $379 | $478 | $484 | $601 | $539 | $639 |
| Source: BEA I-O data; author's calculations. | | | | | | |

The difference in distribution comes from two sources. First, it reflects the noticeably larger share of service industry output that SMEs provide than they do in manufacturing. A very large percentage of gross export value is measured in the manufacturing sector (close to 60 percent in 2012) whereas the suppliers to the exporting companies are much more broadly distributed across industries. Secondly, the gross exports do not yet have the value of the foreign content of the intermediate materials and supplies subtracted from them, whereas the value-added exports have that correction in them. The manufacturing sectors tend to have a larger share of foreign content in them than do the other industries, since goods are imported to a greater extent than are services.

## 4.2. Findings for 2007 Compared to the USITC

The findings for 2007 are quite similar to those of the USITC, but not exactly the same for a number of reasons. First, the underlying data have been revised since 2007 and gross exports are now slightly larger than they were in the dataset that the ITC was using; in addition,

the BEA has redefined what is allocated to the rest-of-world (ROW) category. This latter change increased the size of value-added exports by somewhat more than gross exports. There have also been some changes to the underlying assumptions between the USITC version and the current version. Some of those differences will be discussed in the following sections, but a table of the differences can be found in Appendix A. Overall, the difference resulted in a slightly lower share of gross exports being allocated to SMEs (27 percent) than in the USITC's calculations (28 percent). Since the gross export numbers for each size group drive the direct export value-added, it is not surprising that a slight reduction in the gross exports of SMEs also is slightly lower than it was under the USITC's calculation.

### 4.3. Sensitivity Analysis-Findings Using Different Share Assumptions

The differences among the different sources of export data shares discussed above provided the basis for some sensitivity analysis. How sensitive are the results to using the ITA's larger small business shares for manufacturing and smaller share for wholesale? **Table 5** shows three different versions of the 2014 results incorporating those differences.

| Table 5: Comparison of Gross Export Value and Value-Added Exports (Direct and Indirect) by Firm Size in 2014 Using Different Assumptions for Export Shares (billion$) | | | |
|---|---|---|---|
| | 2014-Initial | 2014-Revised Wholesale Export Share | 2014-Revised Wholesale and Manufacturing Export Shares to ITA Basis |
| Gross Exports | 2,107 | 2,107 | 2,107 |
| Large[2/] | 1,369 | 1,335 | 1,241 |
| SMEs | 539 | 573 | 667 |
| Second goods and ROW adj. | 200 | 200 | 200 |
| Total Value Added Exports | 1,907 | 1,907 | 1,907 |
| Foreign Value Added | 294 | 294 | 294 |
| Large-Direct | 491 | 473 | 456 |
| Large-Indirect | 483 | 478 | 469 |
| SME-Direct | 292 | 319 | 351 |
| SME-Indirect | 347 | 343 | 337 |
| Source: Data from BEA's I-O tables and this research | | | |

The first column shows the initial results reported above; this assumes that wholesale trade margins are distributed similarly to its overall receipts shares (40 percent to SMEs). This assumption was made because it was similar to the assumption the USITC made for this sector and was most consistent with making a comparison to the USITC results. However, the Census data on exports by company size indicates that the small business share of exports is somewhat larger than that, around 60 percent. The second column shows the results of that change alone.[23] The third column shows the results of changing to an ITA concept. There, the wholesale

[23] The methodology calls for a change in the export share to also be a change in the import share.

share is determined by the all non-manufacturing group, and the manufacturing shares are calculated from the combination of the manufacturing and non-manufacturing groups together.

The change in assumptions raises the SME share of wholesale trade in both instances. This quite obviously changes the SME share of gross exports because the assumption of export share is directly tied to SMEs actively exporting, and the value of the goods and services exported. The change also increases the small business direct exports and reduces the large business direct exports, as expected, and for the same reason. It also reduces the indirect exports of both the SMEs and large businesses by a small amount. It also reduces the differences between the SME's contribution to gross exports and its total value-added contribution (the sum of SME's indirect and direct contribution). The SMEs' contribution to direct exports has been increased to $667 billion (in the last column of **Table 5**), while its combined direct and indirect contribution, is still larger at $688 billion, the difference between the two measures has been reduced.[24] The sensitivity analysis shows that the assumptions do matter somewhat, but the underlying finding remains the same. On a value-added basis, SMEs contribute almost as much as indirect exporters as they do as direct exporters and the combined value-added contribution to exports is larger than the SMEs' gross exports.

[24] One complication to this comparison is that the gross export value for both the SMEs and the large businesses incorporates the value of the imported inputs (which are shown separately in the value-added portion of the table.)

## 5. Conclusions

Small and medium size businesses are much more involved in global trade than is obvious from their share of gross export value. This analysis confirms the ITC's findings that SMEs provide a larger share of total export value if it is analyzed using the concept of value-added by each step in the supply chain, rather than when gross export value is allocated based on the business size of the exporter. Looking at the value-added measure, SMEs provide more indirect export value (contributions they make by being a part of direct exporters' supply chains) than they do based on the SME direct exporters' value added. In 2007, for example, the USITC found in its 2010 study that SMEs contributed $382 billion to gross export value, but $481 billion in valued added export value. The $481 billion of value-added export value from SMEs was 41 percent of the domestic value-added measure of exports (about half directly and half indirectly). This study's 2007 findings were quite similar, with SMEs contributing about $479 billion of value-added export value or 40 percent of the domestic value added measure of exports (43 percent directly and 57 percent indirectly).

This analysis shows that this general relationship has been maintained. In 2014, the SMEs' gross exports totaled $539 billion, or about 26 percent of the total gross export value. However, SMEs' value added export value is about $639 billion, about 40 percent of domestic value added exports, (of which 46 percent is the value added by SME direct exporters and 54 percent is added by SMEs providing goods and services to companies that are direct exporters. See **Table 3**). Large businesses have almost a 50/50 split, where the value-added of direct exports equals the value-added contribution of large businesses as part of the supply chains of

large and SME exporters. However, the shares between direct and indirect exports are sensitive to the assumptions that are being made as can be seen in the sensitivity analysis on **Table 5**. Consequently, while it seems clear that the value added methodology highlights the degree to which SMEs make a larger contribution to exports than is obvious from the gross export shares, the split between the direct and indirect contributions of the SMEs could be improved. Better information about the actual import and export shares of small businesses, as well as better information about the size distribution of businesses from which large and small businesses make their purchases of intermediate materials and services would improve this calculation.

This analysis also shows that the distribution of industries involved in global trade is different than is implied by gross exports. By providing service inputs to direct exporters, service industries are more involved in trade than is obvious from their direct exports alone. Clearly additional information on the patterns of SME involvement at various levels of the supply chain is needed to refine many of the assumptions used for these estimates.

## 6. Appendix A-Tables of Assumptions

| Share Assumptions Used as Primary 2007 Parameters-ITC Assumptions Compared to Current Assumptions | | | | | | | |
|---|---|---|---|---|---|---|---|
| NAICS | Industry Sector | Gross Output | | Value-Added* | | Exports | |
| | | SMEs-ITC | SMEs-Current | SMEs-ITC | SMEs-Current | SMEs-ITC | SMEs-Current |
| 11 | Agric., forestry, fishing & hunting | 0.828 | 0.984 | 0.821 | 0.985 | 0.580 | 1.000 |
| 21 | Mining | 0.234 | 0.234 | 0.353 | 0.279 | 0.184 | 0.124 |
| 22 | Utilities | 0.171 | 0.171 | 0.131 | 0.126 | 0.524 | 0.221 |
| 23 | Construction | 0.784 | 0.784 | 0.812 | 0.813 | 0.198 | 0.750 |
| 31,321-3, 337 | Manufacturing category 1 | 0.240 | 0.303 | 0.378 | 0.434 | 0.157 | 0.170 |
| 324-327 | Manufacturing category 2 | | 0.166 | | 0.319 | | 0.150 |
| 331,332 | Manufacturing category 3 | | 0.408 | | 0.558 | | 0.400 |
| 333-336,339 | Manufacturing category 4 | | 0.208 | | 0.288 | | 0.150 |
| 42 | Wholesale trade | 0.425 | 0.425 | 0.549 | 0.545 | 0.628 | 0.450 |
| 44,45 | Retail trade | 0.434 | 0.434 | 0.449 | 0.441 | 0.562 | NA |
| 48,49 | Transportation | 0.354 | 0.354 | 0.327 | 0.312 | 0.593 | 0.360 |
| 51 | Information | 0.165 | 0.165 | 0.221 | 0.214 | 0.216 | 0.231 |
| 52 | Finance and insurance | 0.184 | 0.184 | 0.273 | 0.270 | 0.366 | 0.295 |
| 53 | Real estate, leasing, housing | 0.593 | 0.555 | 0.643 | 0.643 | 0.472 | 0.374 |
| 54-55 | Professional and technical services/Man of cos. | 0.575 | 0.575 | 0.562 | 0.533 | 0.495 | 0.529 |
| 56 | Administrative and waste remediation (with scrap) | 0.458 | 0.458 | 0.374 | 0.373 | 0.634 | 0.437 |
| 61 | Educational services | 0.375 | 0.375 | 0.397 | 0.394 | 0.214 | 0.079 |
| 62 | Health care and social assistance | 0.425 | 0.425 | 0.438 | 0.479 | 0.214 | 0.053 |
| 71 | Arts, entertainment, & recreation | 0.610 | 0.610 | 0.673 | 0.669 | 0.767 | 0.870 |
| 72 | Accommodation & food service | 0.537 | 0.537 | 0.534 | 0.530 | 0.214 | 0.481 |
| 81 | Other services, except government | 0.833 | 0.833 | 0.812 | 0.807 | .0616 | 0.637 |
| 99 | Government | NA | 0.300 | NA | 0.290 | NA | 0.025 |

- The value-added shares are based on compensation share by industry.
- The ITC did not directly include the Government sector and included a single, combined Manufacturing sector.
- Management of Companies was a separate sector in the ITC model with a gross output share of 34% for SMEs.

## Share Assumptions Used as Primary 2007 Parameters

| NAICS | Industry Sector | Gross Output | | Value-Added* | | Exports | |
|---|---|---|---|---|---|---|---|
| | | SMEs | Large | SMEs | Large | SMEs | Large |
| 11 | Agric, forestry, fishing & hunting | 0.984 | 0.016 | 0.985 | 0.015 | 1.000 | 0.000 |
| 21 | Mining | 0.234 | 0.766 | 0.279 | 0.721 | 0.124 | 0.876 |
| 22 | Utilities | 0.171 | 0.829 | 0.126 | 0.874 | 0.221 | 0.779 |
| 23 | Construction | 0.784 | 0.216 | 0.813 | 0.187 | 0.750 | 0.250 |
| 31,321-3, 337 | Manufacturing category 1 | 0.303 | 0.697 | 0.434 | 0.566 | 0.170 | 0.830 |
| 324-327 | Manufacturing category 2 | 0.166 | 0.834 | 0.319 | 0.681 | 0.150 | 0.850 |
| 331,332 | Manufacturing category 3 | 0.408 | 0.592 | 0.558 | 0.442 | 0.400 | 0.600 |
| 333-336,339 | Manufacturing category 4 | 0.208 | 0.792 | 0.288 | 0.712 | 0.150 | 0.850 |
| 42 | Wholesale trade | 0.425 | 0.575 | 0.545 | 0.455 | 0.450 | 0.550 |
| 44,45 | Retail trade | 0.434 | 0.566 | 0.441 | 0.559 | NA | NA |
| 48,49 | Transportation | 0.354 | 0.646 | 0.312 | 0.688 | 0.360 | 0.640 |
| 51 | Information | 0.165 | 0.835 | 0.214 | 0.786 | 0.231 | 0.769 |
| 52 | Finance and insurance | 0.184 | 0.816 | 0.270 | 0.730 | 0.295 | 0.705 |
| 53 | Real Estate and leasing | 0.593 | 0.407 | 0.643 | 0.357 | 0.374 | 0.626 |
| 54-55 | Professional and tech. services and manage. cos. | 0.555 | 0.445 | 0.533 | 0.467 | 0.529 | 0.471 |
| 56 | Administrative and waste remediation (with scrap) | 0.458 | 0.542 | 0.373 | 0.627 | 0.437 | 0.563 |
| 61 | Educational services | 0.375 | 0.625 | 0.394 | 0.606 | 0.079 | 0.921 |
| 62 | Health care and social assistance | 0.425 | 0.575 | 0.479 | 0.521 | 0.053 | 0.947 |
| 71 | Arts, entertainment, & recreation | 0.610 | 0.390 | 0.669 | 0.331 | 0.870 | 0.130 |
| 72 | Accommodation & food service | 0.537 | 0.463 | 0.530 | 0.470 | 0.481 | 0.519 |
| 81 | Other services, except government | 0.833 | 0.167 | 0.807 | 0.193 | 0.637 | 0.363 |
| 99 | Government | 0.300 | 0.700 | 0.290 | 0.710 | 0.025 | 0.975 |

- The value-added shares are based on compensation share by industry
- Gross output shares are calculated from SUSB (exceptions are explained in the text of the report)
- Export shares are calculated from U.S. Census data (exceptions are explained in the text of the report)

| Share Assumptions Used as Primary 2012 Parameters | | | | | | | |
|---|---|---|---|---|---|---|---|
| NAICS | Industry Sector | Gross Output | | Value-Added* | | Exports (Census) | |
| | | SMEs | Large | SMEs | Large | SMEs | Large |
| 11 | Agriculture, forestry, fishing & hunting | 0.988 | 0.012 | 0.985 | 0.015 | 1.000 | 0.000 |
| 21 | Mining | 0.240 | 0.760 | 0.281 | 0.719 | 0.090 | 0.910 |
| 22 | Utilities | 0.187 | 0.813 | 0.124 | 0.876 | 0.155 | 0.845 |
| 23 | Construction | 0.789 | 0.211 | 0.783 | 0.217 | 0.750 | 0.250 |
| 31,321-3, 337 | Manufacturing category 1 | 0.290 | 0.710 | 0.427 | 0.573 | 0.202 | 0.798 |
| 324-327 | Manufacturing category 2 | 0.160 | 0.840 | 0.331 | 0.669 | 0.187 | 0.813 |
| 331,332 | Manufacturing category 3 | 0.414 | 0.586 | 0.565 | 0.435 | 0.436 | 0.564 |
| 333-336,339 | Manufacturing category 4 | 0.212 | 0.788 | 0.302 | 0.698 | 0.142 | 0.858 |
| 42 | Wholesale trade | 0.399 | 0.601 | 0.512 | 0.488 | 0.400 | 0.600 |
| 44,45 | Retail trade | 0.299 | 0.701 | 0.408 | 0.592 | NA | NA |
| 48,49 | Transportation | 0.331 | 0.669 | 0.318 | 0.682 | 0.244 | 0.756 |
| 51 | Information | 0.142 | 0.858 | 0.213 | 0.787 | 0.219 | 0.781 |
| 52 | Finance and insurance | 0.170 | 0.830 | 0.272 | 0.728 | 0.247 | 0.753 |
| 53 | Real Estate and leasing | 0.662 | 0.338 | 0.645 | 0.355 | 0.375 | 0.625 |
| 54-55 | Professional and tech services / Manage of cos. | 0.550 | 0.450 | 0.520 | 0.480 | 0.495 | 0.505 |
| 56 | Administrative and waste remediation (with scrap) | 0.470 | 0.530 | 0.337 | 0.663 | 0.494 | 0.506 |
| 61 | Educational services | 0.356 | 0.644 | 0.371 | 0.629 | 0.062 | 0.938 |
| 62 | Health care and social assistance | 0.402 | 0.598 | 0.441 | 0.559 | 0.046 | 0.954 |
| 71 | Arts, entertainment, & recreation | 0.670 | 0.330 | 0.655 | 0.345 | 0.869 | 0.131 |
| 72 | Accommodation & food service | 0.557 | 0.443 | 0.542 | 0.488 | 0.509 | 0.491 |
| 81 | Other services, except government | 0.854 | 0.146 | 0.808 | 0.192 | 0.616 | 0.384 |
| 99 | Government | 0.340 | 0.660 | 0.340 | 0.660 | 0.020 | 0.980 |

- The value-added shares are based on compensation share by industry.
- Gross output shares are calculated from SUSB (exceptions are explained in the text of the report)
- Export shares are calculated from U.S. Census data (exceptions are explained in the text of the report)

## Share Assumptions Used as Primary 2014 Parameters

| NAICS | Industry Sector | Gross Output | | Value-Added* | | Exports (Census) | | Exports (ITA) | |
|---|---|---|---|---|---|---|---|---|---|
| | | SMEs | Large | SMEs | Large | SMEs | Large | SMEs | Large |
| 11 | Agriculture, forestry, fishing & hunt | 0.988 | 0.012 | 0.985 | 0.015 | 1.000 | 0.000 | 1.000 | 0.000 |
| 21 | Mining | 0.240 | 0.760 | 0.298 | 0.722 | 0.157 | 0.843 | 0.157 | 0.843 |
| 22 | Utilities | 0.187 | 0.813 | 0.124 | 0.876 | 0.068 | 0.932 | 0.068 | 0.932 |
| 23 | Construction | 0.783 | 0.217 | 0.777 | 0.223 | 0.750 | 0.250 | 0.750 | 0.250 |
| 31,321-3, 337 | Manufacturing category 1 | 0.290 | 0.710 | 0.421 | 0.579 | 0.199 | 0.801 | 0.396 | 0.604 |
| 324-327 | Manufacturing category 2 | 0.160 | 0.840 | 0.329 | 0.671 | 0.232 | 0.768 | 0.322 | 0.678 |
| 331,332 | Manufacturing category 3 | 0.414 | 0.586 | 0.537 | 0.463 | 0.392 | 0.608 | 0.357 | 0.643 |
| 333-336,339 | Manufacturing category 4 | 0.212 | 0.788 | 0.294 | 0.706 | 0.162 | 0.838 | 0.278 | 0.722 |
| 42 | Wholesale trade | 0.399 | 0.601 | 0.497 | 0.503 | 0.400 | 0.600 | 0.490 | 0.510 |
| 44,45 | Retail trade | 0.304 | 0.696 | 0.410 | 0.590 | NA | NA | NA | NA |
| 48,49 | Transportation | 0.322 | 0.678 | 0.307 | 0.693 | 0.244 | 0.756 | 0.244 | 0.756 |
| 51 | Information | 0.142 | 0.858 | 0.201 | 0.799 | 0.219 | 0.781 | 0.219 | 0.781 |
| 52 | Finance and insurance | 0.163 | 0.837 | 0.258 | 0.742 | 0.279 | 0.721 | 0.279 | 0.721 |
| 53 | Real Estate and leasing, housing | 0.658 | 0.342 | 0.641 | 0.359 | 0.375 | 0.625 | 0.375 | 0.625 |
| 54 | Professional and technical services/ Management of companies | 0.569 | 0.431 | 0.508 | 0.492 | 0.493 | 0.507 | 0.493 | 0.507 |
| 56 | Administrative and waste remediation (with scrap) | 0.461 | 0.539 | 0.328 | 0.672 | 0.494 | 0.506 | 0.494 | 0.506 |
| 61 | Educational services | 0.353 | 0.647 | 0.368 | 0.632 | 0.062 | 0.938 | 0.062 | 0.938 |
| 62 | Health care and social assistance | 0.393 | 0.607 | 0.433 | 0.567 | 0.046 | 0.954 | 0.046 | 0.954 |
| 71 | Arts, entertainment, & recreation | 0.648 | 0.352 | 0.633 | 0.367 | 0.869 | 0.131 | 0.869 | 0.131 |
| 72 | Accommodation & food service | 0.559 | 0.442 | 0.547 | 0.453 | 0.570 | 0.430 | 0.570 | 0.430 |
| 81 | Other services, ex. government | 0.855 | 0.145 | 0.809 | 0.191 | 0.616 | 0.384 | 0.616 | 0.384 |
| 99 | Government | 0.340 | 0.660 | 0.340 | 0.660 | 0.020 | 0.980 | 0.020 | 0.980 |

- Initially the value-added shares are based on compensation share by industry.
- Gross output shares are calculated from SUSB (exceptions are explained in the text of the report)
- Export shares are calculated from U.S. Census data (exceptions are explained in the text of the report)

## 7. Bibliography


Barefoot, K. and Koncz-Bruner, J. (2012). A profile of U.S. exporters and importers of Services, *Survey of Current Business,* June 2012, pp. 66-87.

Barkley, D., Lamie, R.D., and Markley, R. (2007). Case studies of e-commerce in small and medium-sized enterprises: a review of the literature. University Center for Economic Development, Clemson University, Clemson, South Carolina. Working Paper 10-2007-01.

Conference Board of Canada. (2009). *Big Gains With Small Partners What MNCs Look for in Their SME Suppliers.* http://www.conferenceboard.ca/e-library/abstract.aspx?did=3142 (accessed April 13, 2017).

*Economist.* (2017). The retreat of the global company. January 28, 2017.

Eurostat. (2008). Eurostat Manual of Supply, Use and Input-Output Tables.

Guo, J., A. Lawson, and Planting, M. (2002). *From Make-Use to Symmetric I-O Tables:* An Assessment of Alternative Technology Assumptions. BEA Working Paper No. WP2002-03.

Horowitz, K. and Planting, M. (2006/revision 2009). *Concepts and Methods of the U.S. Input-Output Accounts.* U.S. Bureau of Economic Analysis.

Hummels,D., J. Ishii, and Yi, K. (1999). *The Nature and Growth Of Vertical Specialization in World Trade*. Federal Reserve Bank of New York. https://www.newyorkfed.org/research/staff_reports/sr72.html (accessed April 4, 2017).

International Trade Centre. (2017). *SME Competitiveness Outlook 2017-The region: A door to global trade.* http://www.intracen.org/publication/smeco2017 (accessed October 25, 2017).

Kobe, K. (Forthcoming). *Small Business Exporters and Challenges to Increasing Exports*, Small Business Administration Office of Advocacy.

Kobe, K. and Schwinn, R. (2018). *Small Business GDP 1998-2014,* Small Business Administration Office of Advocacy.

Koopman, R., Z. Wang and Wei, S. (2014). Tracing value-added and double counting in gross exports. *American Economic Review*, 104(2), 459-494.

National Research Council. (2006). Analyzing the U.S. content of imports and the foreign content of exports. Committee on Analyzing the U.S. Content of Imports and the Foreign Content of Exports. Center for Economic, Governance, and International Studies,

Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

OECD. (2012). *Trade in Value-Added: Concepts, Methodologies and Challenges*. Joint OECD-WTO Note. http://www.oecd.org/sti/ind/49894138.pdf (accessed April 17, 2017).

Statistics Denmark. (2017). *Nordic Countries in Global Value Chains.* (Chapter 2) http://www.dst.dk/Site/Dst/Udgivelser/GetPubFile.aspx?id=28140&sid=nordglobchains (accessed August 10, 2017).

Terzi, N. (2011.) The impact of e-commerce on international trade and employment, for 7th International Strategic Management Conference, *Procedia Social and Behavioral Sciences* 24, 745–753.

U.S. Census Bureau. (2017). Profiles of importing and exporting companies 2014-2015. Census Bureau News Release. https://www.census.gov/foreign-trade/Press-Release/edb/2015/edbrel.pdf (accessed April 6, 2017).

U.S. International Trade Commission. (2010). *Small and Medium-Sized Enterprises: Characteristics and Performance*. Publication No. 4189, Chapter 5 and Appendix H.