

# How Well is U.S. Intrafirm Trade Measured?

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Multinational enterprises dominate international trade. Using customs records, Bernard, Jensen and Schott (2009) find that enterprises that trade with related parties accounted for 90 percent of U.S. imports and exports in 1993 and 2000. A significant fraction of this trade took place within the enterprise: In 2000, related party trade (as measured in customs records) made up 31 percent of U.S. exports and 46 percent of U.S. imports.

In addition to being a quantitatively important segment of total trade, the extent to which enterprises trade with related parties, rather than at arm's length, is central to both classical theories of foreign direct investment (e.g., Helpman 1984, Horstmann and Markusen 1992) and more recent theories that focus on contract enforceability, complexity, and the boundary of the firm (e.g., Antràs 2003, Costinot, Oldenski and Rauch 2011).

In this paper, I use two independent data sources — the intrafirm trade data from the U.S. Bureau of Economic Analysis (BEA) and the related party trade data from the U.S. Census Bureau — to assess measures of U.S. associated party trade. I use the catch-all term “associated parties” to mean two parties in a relationship, broadly defined. This is in contrast to the concepts of the “related party” from Census and the “multinational enterprise” from BEA, each of which has a specific — and not always coincident — definition.

I find that, in general, the two datasets provide similar measures of U.S. associated party trade, particularly for exports. The average difference between intrafirm exports and related party exports, as a fraction of total U.S. exports, was 2.4 percent from 1992–2012 and fell to only 1.2 percentage points of U.S. exports from 2000–2012.

For U.S. imports, BEA intrafirm trade as a share of total imports has drifted downward,

while the Census related party trade share of imports has remained roughly constant. The average difference between intrafirm imports and related party imports, as a fraction of total U.S. imports, was 7.5 percent from 1992–2012, and the largest gap, which occurred in 2012, was more than 13 percent of total U.S. imports.

I am able to decompose the aggregate data into bilateral relationships between the United States and several major trading partners at several points in time. I find that the bilateral associated party trade data are also similar across the two data sources and that the differences are stable across the 20-year period under study. In the bilateral data, it is easy to see how differences in the aggregate data are driven by a few large trade relationships. In particular, the extent of the differences in aggregate associated party trade is determined largely by differences in measured associated party trade with Canada, China, and Mexico.

The differences observed in the data raise an interesting question. To what extent does the downward trend in intrafirm trade reflect changes in firm behavior, conceptual differences across the two data sources, and potential mis-measurement? A satisfactory answer to this question will likely require study of the confidential micro data at both BEA and Census — a task outside of this paper's scope.

Another interesting aspect of the data is that intrafirm trade fell much less than total trade during the 2009 trade collapse, but related party trade fell in proportion to total trade. Prominent theories of the sharp decline in trade in this period include the disruption of credit markets (Chor and Manova 2012) and the dynamics of inventory holdings (Alessandria, Kaboski and Midrigan 2010). The smaller response of intrafirm trade is consistent with the hypothesis that, compared to arm's length shipments, intrafirm shipments are less dependent on external credit. The extent to which inventories are bought from within the firm rather than outsourced could be an important determinant of

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the differential behavior of intrafirm trade.<sup>1</sup>

### I. Data Sources

In this section I briefly discuss the two sources of U.S. associated party trade data. Further details are available in Ruhl (2013).

The first source of associated party trade data is the intrafirm trade data collected by BEA through two sets of surveys: a survey of U.S. multinational enterprises and their foreign affiliates and a survey of U.S. affiliates of foreign parents.<sup>2</sup> In the BEA methodology, in accordance with the definition of international direct investment used for balance-of-payments statistics, a business enterprise is considered an affiliate of a person — here, the parent — if the person owns at least 10 percent of the enterprise’s voting stock or its equivalent. A majority-owned affiliate is one in which ownership of its parent(s) exceeds 50 percent. The surveys collect more data from majority-owned affiliates. These surveys are conducted annually, and compliance is required under the International Investment and Trade in Services Survey Act.

The survey of U.S. multinational enterprises and their affiliates collects intrafirm trade data from both the consolidated parent and each reporting affiliate. Large and majority-owned affiliates generally have to report more-detailed intrafirm trade data, and more data is collected during benchmark surveys. The survey of U.S. affiliates of foreign enterprises collects data only from U.S. affiliates. Like the other survey, it collects more data from large and majority-owned affiliates.

Using the data from these surveys, it is possible to construct total intrafirm trade flows for 1982 onward, as well as bilateral intrafirm trade flows for several countries in benchmark years. An analysis of U.S. intrafirm trade patterns derived from these data can be found in Zeile (1997) and Zeile (2003).

The second source of associated party trade data is the related party trade data compiled by

the Census Bureau from U.S. customs documentation. The U.S. customs declaration documentation includes a mandatory, self-reported yes-no question that asks if the cross-border shipment is between related parties.

For U.S. exports, a related party transaction is “[a] transaction involving trade between a U.S. principal party in interest and an ultimate consignee where either party owns directly or indirectly 10 percent or more of the other party.”<sup>3</sup> For U.S. imports, a related-party transaction is one between two parties with (among many possibilities) “any person directly or indirectly owning, controlling or holding power to vote, 5 percent or more of the outstanding voting stock or shares of any organization.”<sup>4</sup> In addition to the related party information, the customs documents collect the value of the shipment, the product code, and the country of import or export.<sup>5</sup> These data are publicly available from 1991 onward, although more detail is available after 2001.

To summarize, both datasets offer almost complete coverage of associated party trade. In U.S. exports, the definitions of an associated party agree and coincide with the standard definition of a multinational enterprise. In U.S. imports, the Census definition is broader and includes several ways in which trade that is not conducted within a multinational enterprise may be counted as a related party transaction. These two datasets are compiled from completely different sources, but they measure very similar concepts. How well do the two line up?

### II. Total Associated Party Trade

I begin by comparing associated party trade in the aggregate. In order to compare the measures of associated party trade, two adjustments to the data are necessary. First, unlike the BEA

<sup>3</sup>Foreign Trade Regulations, 15 C.F.R. §30.1

<sup>4</sup>19 U.S.C. §1401a(g)(F)

<sup>5</sup>I do not attempt to make a comparison of the datasets across products or industries. The customs records collect detailed data about the identity of the goods being traded and reports at the 6-digit level of the North American Industry Classification System. BEA, in contrast, does not collect data on the identity of the goods being traded, but does collect information about the industry of operation of the parent and affiliate. While the industry of operation is likely related to the type of goods being traded, this is a significant conceptual difference, and it seems prudent to not push for a comparison along this dimension.

<sup>1</sup>Studies such as Eaton et al. (2011) offer the sectoral composition of trade as an explanation for the sharp fall in aggregate trade. On average, intrafirm trade shares don’t vary much across sectors, although there is significant within-sector heterogeneity (Ramondo, Rappoport and Ruhl 2011).

<sup>2</sup>An overview of these surveys can be found in Quijano (1990) and Mataloni (1995).

data, the Census data cannot distinguish trade between a U.S. parent and its foreign affiliate and a U.S. affiliate and its foreign parent, so the relevant comparison is between all U.S. intrafirm trade in the BEA data and the related party trade data.

Second, beginning in 2002, BEA collected intrafirm trade data only from majority-owned U.S. affiliates of foreign parents; prior to 2002, BEA collected intrafirm trade data from all reporting U.S. affiliates. Intrafirm trade, however, is predominately carried out by majority-owned affiliates. I estimate intrafirm trade for minority-owned affiliates from 2002–2012. The estimation details are available in Ruhl (2013).

In figure 1, I plot associated party exports and imports, as shares of total exports and imports, for 1992–2012. In the export data in panel (a), the two measures are similar. BEA-measured intrafirm trade is larger than that measured by Census in the early part of the sample, but the gap closes and remains small from 2000 on. The average absolute difference between the two series in panel (a) is 2.4 percent (of total exports), and the average from 2000–2012 falls to 1.2 percent. The largest difference between the two is 5.7 percent, occurring in 1994.

There is a larger divergence, however, in the two measures of associated party imports in panel (b). Beginning in the mid-1990s, the BEA intrafirm trade data begins a decade-long decline before leveling off at about 11 percentage points of total imports lower than the Census measure. The average difference between the two measures is 7.5 percent of total imports. The gap widens monotonically (except during 2009): The largest difference, occurring in 2012, is more than 13 percent.

The decrease in the importance of intrafirm trade in the BEA data raises several questions. The most obvious is: To what extent is this difference the result of systematic differences in measurement or of conceptual issues in the construction of the two datasets? One factor may be the more inclusive definition of a related party in the Census data. Besides the lower ownership threshold (5 percent for Census imports versus 10 percent in the BEA surveys) related parties may also be partners, employer and employee, family members, and “[t]wo or more persons directly or indirectly controlling, controlled by, or

under common control with, any person.”<sup>6</sup>

Another possibility is systematic underreporting or overreporting of associated party trade. In the BEA data, smaller affiliates are required to report less data, and the definition of a small affiliate has been increasing over the sample period.<sup>7</sup> The quantitative importance of this possibility would depend on the extent to which small affiliates increase their importance as trading partners within the multinational enterprise. In the Census data, a potential issue is the mis-coding of shipments — indicating that they occurred between related parties when they did not. Shipments to a U.S. firm from a foreign contract manufacturer, for example, may be labeled as a related party transaction when neither firm has an ownership stake in the other. The rise in contract manufacturing over this period is suggestive, but a study of the micro data that underlie both of these datasets is needed.<sup>8</sup>

The behavior of the two measures during the collapse of international trade in 2009 is also potentially instructive. In 2009, total U.S. exports fell by 18 percent and total U.S. imports fell by 24 percent. The growth rates of related party trade were almost identical to the aggregate growth rates, leaving the related party share of trade mostly unchanged. Intrafirm trade, however, fell by only 7 percent for exports and 13 percent for imports, generating the spikes in figure 1. Why did intrafirm trade fall half as much as related party trade during this period? That the spike is common to both the export and import data suggests that differences in ownership cutoff levels is not likely to be the underlying cause.

### III. Bilateral Associated Party Trade

Differences in the measures of total associated party trade reflect differences in measurement at the level of the country pair. In this section, I consider how well associated party trade

<sup>6</sup>19 U.S.C. §1401a(g)(G)

<sup>7</sup>In the 2012 benchmark, for example, a majority-owned foreign affiliate of a U.S. parent reported intrafirm trade if its total assets, sales, or net income (or loss) were greater than 60 million dollars (U.S. Bureau of Economic Analysis 2014). In the 1999 benchmark, this threshold was 7 million dollars (U.S. Bureau of Economic Analysis 2004).

<sup>8</sup>Contract manufacturing, and the “factoryless goods producer,” are difficult concepts to measure in the existing data. See Kamal, Moulton and Ribarsky (2013) for more on this subject.

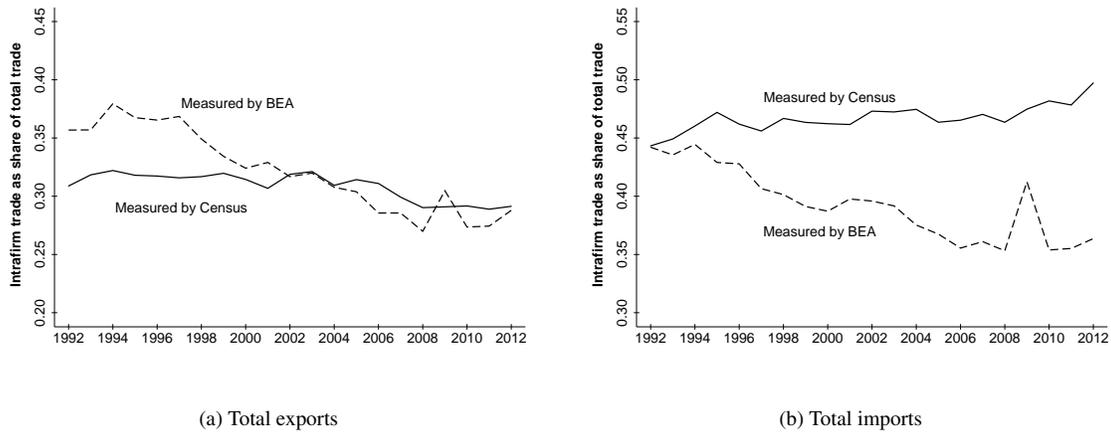


Figure 1. : Intrafirm trade and related party trade, as a share of total trade.

*Note:* The Census data are total related party trade, and the BEA data are total trade between U.S. parents and their foreign affiliates, plus total trade between U.S. affiliates and their foreign parents. The series are expressed as shares of total U.S. exports and imports. For a further description of these data, see Ruhl (2013).

is measured in U.S. bilateral trade with its major trading partners. In addition to analyzing the differences in measurement at the bilateral level, I observe the stability of the two measures over the sample. The full set of Census data is available only after 2001; for the period prior to 2001, I use the data reported in the Census press releases. These earlier press releases reported related party trade for only a limited subset of trading partners, which restricts this analysis to Canada, China, Europe (aggregate), Japan, Mexico, South Korea, and Taiwan.

In the BEA data, the analysis is limited by the availability of trade between the U.S. affiliates of foreign parents: Intrafirm trade reported by transacting countries is available only for benchmark years. This restricts my analysis to the years 1992, 1997, 2002, and 2007. As in the aggregate case, the intrafirm trade for affiliates that are not majority-owned must be estimated. The estimation details are available in Ruhl (2013).

For each country and year, I compute the share of associated party trade as a fraction of the bilateral pair's total trade. The results are reported in figure 2, where I have also plotted the 45-degree line. Points that lie below the 45-degree line are country-year observations in which the Census data measure a larger associated party share than is measured in the BEA data. Take, for example, associated party exports from the United States to Mexico, the point

marked MEX97 in panel (a). As a share of total U.S. exports to Mexico, Census related party trade is 0.44, while the BEA intrafirm trade share is 0.30. The Census-measured share is larger, but the two measures are similar.

Overall, as in the aggregate trade data, the two measures of bilateral associated party trade are similar. In the export data, the outlier is Japan: The associated party trade share in U.S. exports to Japan is almost twice as large in the BEA-measured data compared to the Census-measured data. Averaging across the observations per country pair, the differences between the two measures for Canada and Taiwan are less than 1 percent of their respective total trade flow; for China, Europe, Korea, and Mexico, the differences are less than 11 percent, while the difference for Japan is 28 percent of total exports to Japan.

In the import data, the difference between the two measures is, on average, less than 11 percent for all of the bilateral flows, except for China (13 percent) and Mexico (27 percent).

For both imports and exports, the differences in measurement are stable across time: A country's associated party trade tends to either be always larger by one measure or clustered around the 45-degree line.

Differences in measurement at the country level are most important for the aggregate measures in figure 1 when these differences occur in

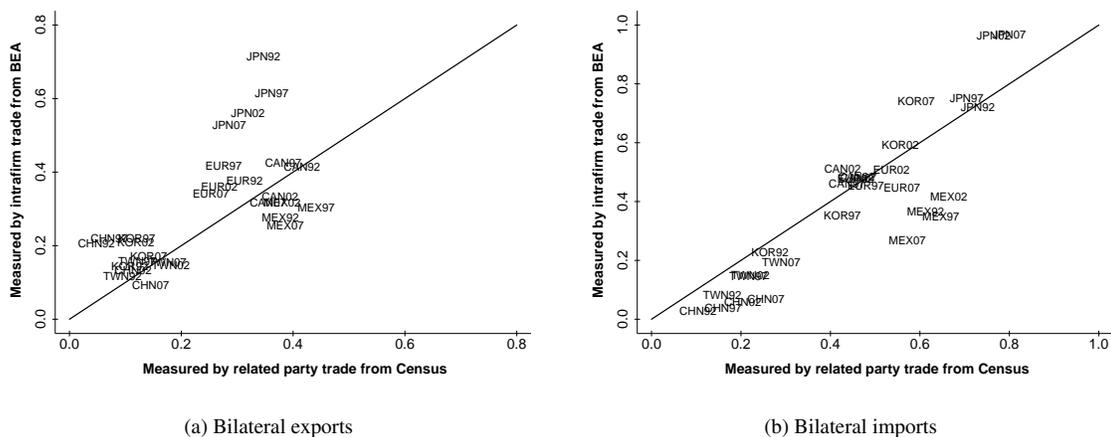


Figure 2. : Intrafirm trade and related party trade, as a share of bilateral trade.

*Note:* The Census data are total related party trade, and the BEA data are total trade between U.S. parents and their foreign affiliates, plus total trade between U.S. affiliates and their foreign parents. The series are expressed as shares of total U.S. exports and imports, and the data points are reports for the years 1992, 1997, 2002, and 2007. For a further description of these data, see Ruhl (2013)

large trade flows. For U.S. imports, which display the largest differences in the aggregate, the two trade flows with the greatest country-level discrepancies are also some of the largest: U.S. imports from China and Mexico. The timing is suggestive as well: Much of the divergence in associated party trade in imports occurred during 1996–2006, the years in which Mexico and China became important import sources for the United States.

In order to analyze the bilateral trade measures further, I focus on 2002 — a year in which both datasets report enough data — and expand the set of countries to include the United States' top 20 trading partners.<sup>9</sup> These 20 countries account for 83 percent of total (imports plus exports) U.S. trade in 2002. For exports, the 20 countries make up 89 percent of BEA-measured intrafirm trade and 80 percent of Census-measured related party trade. For imports, the top 20 countries account for 98 percent of intrafirm trade and 87 percent of related party trade. Apparently, in the BEA data, associated party trade is more concentrated in large trade relationships.

<sup>9</sup>The countries are (in order of importance): Canada, Mexico, Japan, China, Germany, United Kingdom, South Korea, Taiwan, France, Malaysia, Italy, Singapore, Ireland, Netherlands, Brazil, Belgium, Hong Kong, Thailand, Australia, and Venezuela. Data for Ireland are missing for U.S. exports, and data for Venezuela are missing for U.S. imports.

In this extended group of countries, the basic intuition from before holds: Measuring the largest trade relationships is most important for measurements in the aggregate. Further, there does not appear to be a systematic relationship between the importance of a country in U.S. trade and the difference in the two measures. The correlation coefficient between a country's share of total U.S. exports and the difference between BEA and Census measures of associated party export trade is  $-0.19$ ; for U.S. imports, the correlation coefficient is  $-0.07$ . The correlation coefficient of the country's share of exports and the absolute value of the difference in measurement is  $-0.25$  and  $-0.11$  for imports.

#### IV. Concluding Remarks

Multinational enterprises are, and will likely continue to be, extremely important parts of the global economy, and understanding how these firms operate is an important research agenda.

The U.S. data present a unique ability to examine the measurement of associated party trade using two independent data sources: measures of associated party trade drawn from the related party trade dataset compiled by the U.S. Census Bureau; and the intrafirm trade data compiled by the Bureau of Economic Analysis. Comparing the two, I find that they are in general agreement. The differences that do exist suggest that

further analysis of the micro data that underlie these datasets is needed.

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