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Economic Letter

Value-Added Data Recast the U.S.–China Trade Deficit

by Michael Sposi and Janet Koech

Value-added trade data provide a needed complementary measure to conventional compilations to aid in the understanding of bilateral interdependence.

China accounts for a larger share of the overall United States trade deficit than any other country, an imbalance that has gained increasing prominence. The deficit has surged in recent years, growing by more than $200 billion since 2000 and amounting to almost 2 percent of U.S. gross domestic product (GDP), up from about 0.5 percent of GDP in 2000.

Although some view this widening gap as symptomatic of a large and growing interdependence between the two countries, these data paint an incomplete picture and don't fully take into account that production networks span multiple countries. In the past, most goods were manufactured from start to finish within a country's borders. Today, the production of a single good, such as a mobile phone or computer, typically occurs across several countries, with each specializing in a particular phase or component of the final product.

When trade flows are recorded, they reflect the value of goods at each border crossing, as noted in customs reports. The *full* value of a good is assigned to the last link in the production chain, even if the contribution of that last country is minimal. Accounting for trade in this manner fails to identify the contribution of different countries in the intermediate production of the final good and is not representative of actual interdependence.

China, often dubbed the "factory of the world," is a key link in international production chains. Although its participation is mostly toward the final stages of production, its contribution to the final value of a product is often small. Conventional trade statistics attribute all the value to China, even though the product embodies inputs from around the world. As a result, Chinese exports are inflated, impacting the size of bilateral trade balances.

Rather than assign the full value of a good to the last country from which it was shipped, trade data should ideally also track the value and source of each production step and allocate the share of value accordingly. That is, instead of a "Made in China" label, a finished good assembled in China with inputs from different countries might bear a label saying, "Made 15 percent in Canada, 20 percent in Korea, 25 percent in Japan, 30 percent in the U.S. and 10 percent in China."

In practice, tracking every country's share in the value of each good would be next to impossible. However, using recently released data, economists have applied new methods of measuring each country's contribution to the value of final items. These methods involve combining available trade flow figures with value-added data and trade composition data.[1]

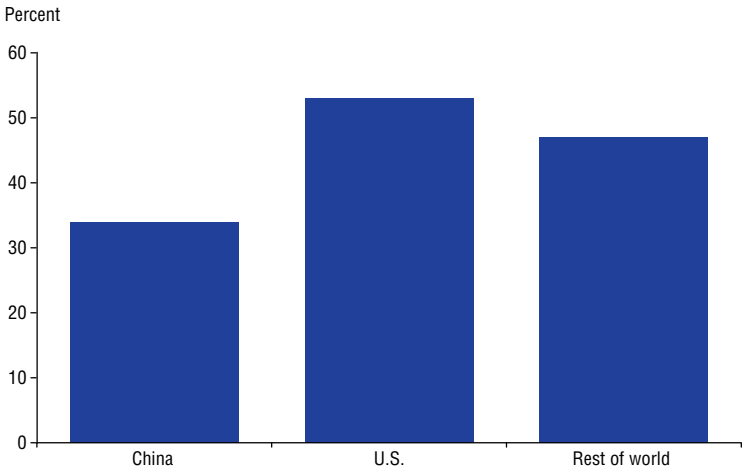
Data reveal that China engages in low value-added production, while the U.S. engages in high value-added activities.

Defining Value Added

Value added refers to the amount by which the value of a good or service increases at a specific step in a production process. Inputs (computer chips and bare circuit boards) are converted into outputs (assembled circuit boards). These are then combined with other inputs (processor, an operating system, memory and a hard drive) to become a computer. The value of total (gross) output from every stage of production can be decomposed into two parts: the value of intermediate inputs and the value added during production. The value added at each step of production is computed by taking the gross value of the output and subtracting the value of all intermediate inputs. Equivalently, value added is defined as the value of output that compensates for the factors of production (such as labor and physical capital) that transform the intermediate inputs into output.

Data reveal that China engages in low value-added production, while the U.S. engages in high value-added activities. At the most aggregate level, the share of value added in gross output in China was 34 percent in 2005, compared with the U.S. at 53 percent.[2] Meanwhile, the average proportion for the rest of the world—Organization for Economic Cooperation and Development (OECD) countries plus some non-OECD countries and excluding the U.S. and China—was 47 percent (*Chart 1*).[3] These numbers mean that for every dollar of gross output produced in China, only 34 cents is value created by Chinese factors of production, while each dollar of U.S. output attributes 53 cents of value to U.S. factors of production.

Chart 1 Share of Value-Added Output Relative to Gross Output (2005)



NOTE: Rest of world includes OECD countries plus 11 non-OECD countries, excluding U.S. and China.

SOURCE: Organization for Economic Cooperation and Development's Input-Output tables.

Trade Compositions

Another aspect of China's role in global production chains is explained by the composition of its trade. More than 75 percent of China's imports are intermediate goods, compared with 50 percent in the U.S. and an average of 60 percent for the rest of the world.[4] Final goods account for only about 25 percent of China's imports compared with 50 percent for the U.S. and an average of 40 percent for the rest of the world (*Chart 2*).

The composition of exports also varies across countries. While intermediate goods account for only 40 percent of China's exports, the share is much higher elsewhere, including in the U.S. where the average share is about 55 percent. Conversely, final goods account for 60 percent of China's total exports versus 45 percent for the U.S.

Looking at the direct trade flows between the U.S. and China reveals that intermediate goods account for 70 percent of U.S. exports to China. In the other direction, final goods account for 75 percent of Chinese exports to the U.S. China's sizeable imports of intermediate goods and exports of final goods suggest its role as an assembly hub of imported inputs into end products—it is typically at the end of the value chain in global production networks.

Understanding the Data

Combining value-added data with the trade composition figures paints an interesting picture. The U.S. engages in high value-added activities in early stages of production resulting in intermediate goods. Early stages of production of such high-tech items as computer central processing units often entail extensive use of resources on research and development and design. Production of these components requires a large share of highly skilled workers and sophisticated equipment, so the proportion of value added is high. These intermediate goods are then exported to countries such as China, where intermediate goods from various sources

are combined and converted into final goods for export. However, the assembly process involves a small share of value added. The asymmetries between the U.S. and China in value-added shares and in trade composition have distinct implications for interpreting the interdependence between the two countries vis-à-vis trade statistics.

Measuring Value-Added Trade

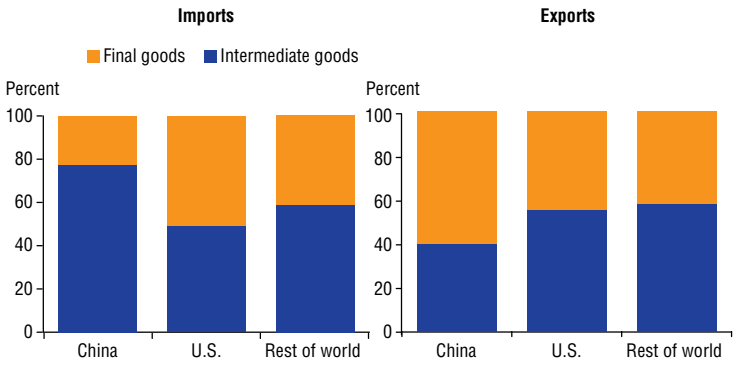
To illustrate, suppose that computer components worth $350 are produced in Japan and exported to China, and a monitor assembly worth $100 is exported by the U.S. to China. Now, assume that China puts together and packages the monitor and other computer components into a final computer, which it exports to the U.S. for $500. Under conventional trade measures, customs data will record the transaction as a U.S. import from China valued at $500, even though most of the value was created in Japan. The contribution to the bilateral trade balance between the U.S. and China will be a deficit of $400 for the U.S.

However, not all the value of the computer should be attributed to China since it imported $450 worth of intermediate components to build the computer. Its value added in the computer was only $50, not $500. Using value-added trade measures, the transaction would be split to show trade from the U.S. perspective as an import of $350 from Japan and only $50 from China—a picture very different from the one represented in customs data. In fact, when measured in value-added terms, the contribution to the bilateral trade balance between the U.S. and China will be a $50 surplus for the U.S. (*Chart 3*).

This example, while illustrating the main idea behind measuring value-added trade, masks some important details and underscores the need for further analysis. For instance, the $350 in computer components produced in Japan may incorporate parts from Germany and Korea, which may also be made from inputs from other countries, including the U.S. and China.

The World Trade Organization (WTO) and the OECD provide estimates of value-added trade based on methodology proposed by economists Robert Johnson and Guillermo Noguera.[5] These data decompose the value of a final good in a given country into the individual values contributed by all other countries. Rather than allocating the total value of a good to the last link in the production chain, as is done in customs data, value-added trade estimates the contribution of each country in the production process to the overall value of the final good.

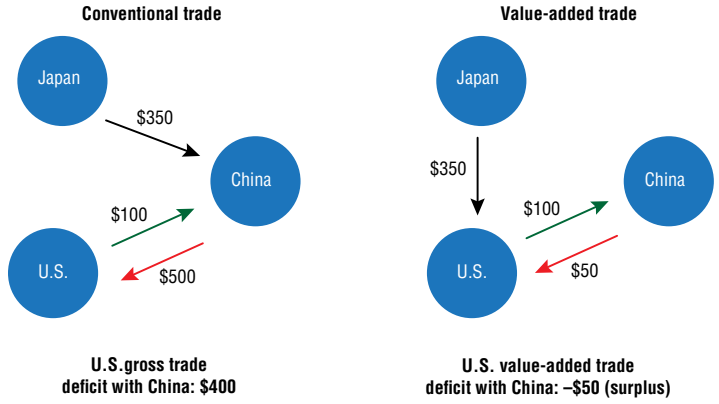
Chart 2 Composition of Imports and Exports in Total Trade (2009)



NOTE: Annual data through 2011 are available and composition shares are broadly similar to 2009 data. Rest of world includes OECD countries plus 28 non-OECD countries, excluding U.S. and China.

SOURCE: Organization for Economic Cooperation and Development's Structural Analysis (STAN) database.

Chart 3 Comparison of Gross Trade and Value-Added Trade Measures



Reinterpreting the Trade Gap

When trade is expressed in value-added terms, the U.S. trade deficit with China is far less than it would be when measured in gross terms. In 2009, U.S. imports from China were $89 billion larger in gross terms than in value-added terms. On the other hand, U.S. exports to China were only $26 billion larger in gross terms than in value-added terms. Taken together, the U.S.–China trade deficit, computed as U.S. imports from China minus U.S. exports to China, is $63 billion larger using gross rather than value-added calculations.

Measuring trade in value-added terms lowers the deficit in 2009 by 33 percent, to $126 billion from $189 billion. These data also show that the U.S. is less trade dependent on China than conventionally thought. The U.S.–China trade deficit as a percentage of U.S. GDP falls to 0.9 percent from 1.4 percent in 2009 using value-added instead of gross trade (*Chart 4*). Put another way, since 2000, China's share in the overall U.S. trade deficit on average is more than 25 percent larger when measured in *gross* terms rather than *value-added* terms.

The difference between the two measures of U.S.–China trade has clearly widened since 2000, partly because the share of value added in gross output in China has declined by a larger amount than in the U.S. and most other countries.

The disconnect between bilateral gross and value-added trade deficits is not confined to U.S.–China trade. In fact, there are instances of bilateral U.S. trade deficits that are actually larger in value-added terms than in gross terms. This happens when U.S. exports to a country are overstated by a smaller margin than are U.S. imports from that country.[6]

Complementary Measure

Conventional measures of international trade fail to capture the impact of global supply chains; thus they paint an incomplete picture of bilateral interdependence when multiple countries are involved in the production of a final good. Value-added trade data provide a needed complementary measure to conventional compilations to aid in the understanding of bilateral interdependence, the underlying factors affecting it, and the business and policy implications.

The U.S. bilateral trade deficit with China is reduced by 33 percent when trade is recalculated on a value-added basis, meaning that the two countries are less trade dependent than commonly thought.

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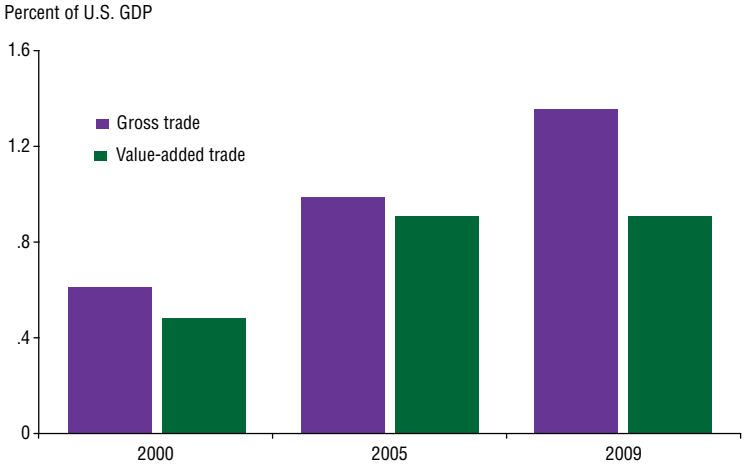
Chart 4 U.S.–China Trade Deficit Smaller Using Value-Added Measure



SOURCE: Organization for Economic Cooperation and Development and World Trade Organization's Trade in Value Added database.

Notes

[1] This analysis focuses on 2009, the most recent year for which data are available for most measures of activity discussed.

[2] 2005 is the latest year for which value-added shares are available for a large set of countries.

[3] The non-OECD countries cited are those with data reported in the OECD input-output database: Brazil, China, Cyprus, India, Indonesia, Latvia, Lithuania, Malta, Romania, South Africa, Taiwan and Thailand.

[4] Countries that make up the "rest of world" include OECD countries (excluding the United States) and the following non-OECD countries: Albania, Argentina, Bosnia and Herzegovina, Brazil, Bulgaria, Cambodia, Croatia, Cyprus, Hong Kong, India, Indonesia, Latvia, Lithuania, Macedonia, Malaysia, Malta, Moldova, Montenegro, Philippines, Romania, Russia, Saudi Arabia, Serbia, Singapore, South Africa, Taiwan, Thailand and Vietnam.

[5] See the OECD–WTO Trade in Value Added (TiVA) database and "Accounting for Intermediates: Production Sharing and Trade in Value Added," by Robert C. Johnson and Guillermo Noguera, *Journal of International Economics*, vol. 86, no. 2, 2012, pp. 224–36.

[6] One case is the U.S.–Germany trade deficit. In 2009, the U.S. ran a bilateral gross trade deficit of $24 billion with Germany (0.17 percent of GDP). However, when measured in value-added terms, that deficit becomes $32 billion (0.23 percent of GDP).

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