VALUE-ADDED ANALYSIS OF TRADE WITH CHINA COULD WEAKEN FAIR TRADE ENFORCEMENT AND INCREASE JOB LOSS

BY ROBERT E. SCOTT

The Organization for Economic Cooperation and Development and the World Trade Organization have proposed new measures of "value-added" (VA) trade that threaten to weaken enforcement of fair trade rules and standards. At a press conference announcing new value-added trade data, WTO Director General Pascal Lamy claimed that the new data made traditional bilateral trade balances "senseless." According to Lamy, traditional trade data (which track the gross value of final goods flowing across borders) have focused attention on enhancing competitiveness by expanding exports and shrinking imports. The new VA estimates (which attempt to account for the origin and destination of goods and services trade) show that competitors should be asking "'where do I need to import more' to benefit from globalized production systems," Lamy said (Schneider 2013).

TABLE OF CONTENTS

The accompanying press release asserted that "trade negotiations have to catch up to these new realities, and countries need to implement policies" (OECD 2013a).

Contrary to the OECD-WTO's assertions, the United States should not be making policies based on the new OECD-WTO Trade in Value-Added (TiVA) database. This report highlights that the OECD-WTO VA analysis is seriously flawed and that its flaws threaten to undermine U.S. competitiveness.

Value-added accounting adjusts bilateral trade flows, netting out intermediate trade with other countries. One simple example makes the threat posed by the OECD-WTO VA accounting clear. Relative to conventional measures, the OECD-WTO VA estimates would reduce the gross U.S. goods and services trade deficit with China "as much as 25 percent" (Schneider 2013).

Attempting to use VA trade data in antidumping and countervailing duty cases would present many problems in terms of data and practicality. VA measures could vary greatly from sector to sector, and it is possible that VA analysis is even more unfavorable to the United States in products where unfair trade has been rampant (such as steel).

Thus, VA estimates would make an end-run around enforcement of U.S. antidumping, countervailing duty, and other fair-trade enforcement efforts, because they would reduce the value of goods and services potentially subject to unfair trade duties. Reducing estimates of China's global trade deficit would also reduce pressure on that country to revalue its exchange rate.

This report identifies three critical flaws in the WTO/OECD VA accounting proposal:

- The OECD-WTO analytical framework itself, taken at face value, is seriously flawed. It fails to account for rapid technological change and the fact that China is rapidly moving up the value chain and increasing the domestic content of its exports, leading it to under-

estimate the value-added in Chinese trade: In 2009, for example, adjusting the OECD-WTO estimate to account for the increased domestic content of Chinese exports increased China's VA trade balance by $19 billion, a 14.3 percent increase. (However, while the OECD-WTO execution of value-added analysis is flawed, the concept itself has value. Analyses of the nature of production, supply chains, and the roles played by different countries highlight the degree to which multinationals have significantly offshored high-tech production.)

- China also cooks the books: It under-reports its exports and over-reports its imports, presenting a distorted picture of its overall trade balance, which the VA analysis does not correct. Estimates developed in this report show that China's global trade surplus was 117 percent to 250 percent (i.e., over two to three and one-half times) larger than reported by China in the 2005–2009 period.

- The OECD-WTO analysis does not accurately reflect how much of the goods coming into the United States from other countries actually originate in China. China became the world's largest exporter in 2006, and roughly half of its exports are intermediate products and transshipped goods. As a result, the U.S. absorbed $54.2 billion to $77.9 billion in additional, indirect imports originating in China from the rest of the world between 2005 and 2009 that were not reflected in the OECD-WTO estimates. When indirect imports are included, U.S. VA trade with China exceeds conventional measures of the gross bilateral trade deficit in each year of the study. Indirect imports more than offset VA imports from other countries identified in the OECD TiVA database. Thus, conventional trade estimates underestimate the U.S. trade deficit with China, in part because they omit indirect imports of goods containing intermediate products originating in China.

Looking separately at the policy implications of the OECD-WTO VA analysis, it would seriously undermine

the ability of U.S. firms to obtain relief from unfair trade because of how trade laws are designed. Perhaps that is the intention of the proponents: Reduce trade divisiveness by weakening the tools that can provide relief.

Thus, attempting to use the OECD-WTO VA method presents many practical problems in data collection and analysis. For all these reasons, the OECD-WTO VA analysis does not withstand close scrutiny and would not be a good basis for policymaking. In addition, the fact that China is consistently and vastly underestimating its trade surplus implies that the Chinese currency remains seriously undervalued. China needs an additional, one-time Renminbi revaluation of at least 30 to 40 percent to eliminate its very large and rapidly growing global trade surpluses within the next few years.

Background and introduction

In standard gross domestic product (GDP) accounting, "'value added' is gross output less intermediate inputs" (Benedetto 2012, 2). In economics, value added is the sum of profits, labor costs, and depreciation. In trade, VA accounting traces the origin and destination of goods and services trade, compared with conventional trade measurements, which track the gross value of final goods flowing across borders.

From a national point of view, value added is the value of all domestic work performed in production of a country's exports. Thus, if a Chinese company imports $4 of parts from Japan or Korea, assembles those parts in China and exports the final product to the United States for $5, then China's reported (or gross) output and exports are $5, but Chinese value-added exports (or net exports) are only $1.

Thus, a country's value-added exports can be less than its total exports.[1]

Some recent case studies of value-added trade flows have been used in the popular media to suggest that China "is not really performing much value added, and therefore the U.S. trade deficit with China may not be a large concern (Benedetto 2012, 2–3)." Thus, the *Wall Street Journal* "reported that some researchers claimed that traditional trade balance measures 'exaggerate' trade imbalances (Batson 2010, Benedetto 2012, 3). " One of the earliest studies in this area was by Linden, Kraemer and Dedrick (2007), who initially estimated that only 4 percent of the value of an iPod originated in China. This claim was based on the observation that Broadcom, which made the iPod microprocessor, was headquartered in Taiwan, and that suppliers of many other key iPod components were also headquartered in other countries. However, this study was widely criticized because many of the components were actually manufactured in China by foreign multinational companies. Linden, Kraemer and Dedrick (2009) showed that "the majority of the production jobs in the iPod production chain are in China," and McMillion (2011) cited a number of similar studies, as well as Broadcom's own website, which noted that "it may produce processors in China as well."

The Organization for Economic Cooperation and Development and the World Trade Organization have proposed new measures of "value-added" (VA) trade which attempt to account for the origin and destination of goods and services trade. The OECD-WTO VA analysis compares gross ("as reported") trade balances with value-added trade balances for many countries. Value-added trade balances refer to the "unmeasured trade balances

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of a country as the domestic value added in its own exports that stays in foreign markets minus the foreign value added in its imports that stays in that country" (Benedetto 2012, 3). The U.S. International Trade Commission notes an important constraint that must hold true for any such analysis: Gross "trade balances with the world must be the same on both the reported and value-added basis" (Benedetto 2012, 3).

OECD-WTO officials were quite clear about the policy implications of their research.

> It could affect analysis of how China's currency policy affects U.S. jobs—perhaps shifting emphasis towards Japan, a more direct economic competitor in the types of goods the United States produces and a country that has also intervened in its currency markets.

> It could also prompt a closer look at how anti-dumping and other trade actions are evaluated – and whether penalties sought against a final producer should be applied instead to other countries that provided unfairly priced component parts. (Schneider 2013).

Tim Grosser, trade Minister for (OECD member) New Zealand said, "This is a game changer in some respects," that should have wide influence on how officials set trade rules, their level of concern over exchange rates, and their interest in imposing import tariffs (Schneider 2013). Thus, at a minimum, OECD and WTO officials perceived that widespread adoption of their proposed VA trade data would lead to a widespread realignment of policy pressures in the world trading system, and suppression of trade divisiveness, despite the persistence of widespread and growing global trade imbalances, as shown in this report.

This paper identifies significant flaws in the new OECD-WTO Trade in Value-Added (TiVA) database that make it unfit as the basis for policymaking. The OECD VA analysis significantly underestimates the U.S. trade deficit with China, for a number of reasons: it underestimates the gross bilateral trade deficit, it employs outdated models of the Chinese economy, and it ignores much larger indirect imports of Chinese goods through third countries. Accounting for these flaws, this paper estimates that the value-added U.S. trade with China *exceeds* the gross trade deficit. These findings have clear implications for policy, especially the degree to which exchange rates should to be adjusted to stabilize global trade balances and the extent to which U.S. fair trade laws should be revised and expanded to cover dumped and subsidized goods made in China and imported through third countries.

OECD estimates of trade in value added

The OECD and the WTO have released new value-added trade data (OECD 2013d) which purports to show that the U.S. goods and services trade deficit with China is "as much as" 25 percent smaller than previously thought (Schneider 2013). The OECD-WTO TiVA database provides independent estimates of the gross goods and services trade deficit (the total, bilateral trade deficit reported by U.S. and Chinese customs officials) and the value-added deficit, which accounts for trade in intermediate products and reallocates trade to countries that generated the intermediate value added. However, the OECD-WTO VA trade estimate is flawed from the outset because it significantly underestimates the *gross* U.S. goods and services trade deficit with China. According to the TiVA database, the gross U.S. goods and services trade deficit with China in 2009 was $176 billion (OECD 2013d), $43.5 billion less than the official U.S. official goods and services trade deficit with China of $219.5 billion, as reported by the U.S. Bureau of Economic Analysis (BEA) (2013). Using these erroneous statistics on gross trade flows, the OECD and WTO attempt to analyze value-added trade flows, which redistribute trade among countries. They do not explain why

their estimate of U.S. trade differs from the published BEA estimates, but it may reflect attempts to reconcile transportation costs and other reported differences in trade flows. However, analysis of trade flows including transportation costs (referred to as "cost, insurance and freight" or CIF) is the accepted basis for international trade accounting.

There are a number of additional problems with the OECD-WTO analysis of value-added trade and these problems have implications for policymakers. First, value-added accounting merely redistributes trade from one country to another. It cannot, for example, result in reductions in measures of the overall U.S. trade deficit. Second, the OECD-WTO analysis is based, in part, on data self-reported by countries to the International Monetary Fund (IMF). Analysis developed here demonstrates that China has consistently underestimated its own global trade surplus. Thus, the OECD-WTO VA analysis appears to be based on flawed country trade data. Finally, the OECD-WTO data apparently underestimate the U.S. VA trade deficit with China, for several reasons. This report will address each of these flaws, in turn. It then concludes with a discussion of the implications of these findings for trade policy.

Value-added trade accounting merely redistributes bilateral trade from one country to another

Value-added trade measures attempt to account for flows of raw materials and intermediate goods from various countries in gross trade flows. For example, cars manufactured in the United States contain parts from Canada, Mexico, Korea, Japan, Germany, and other countries (shares of such foreign content vary across makes and models of vehicles). Value-added accounting (VA accounting) of U.S. trade flows simply attempts to net out the foreign content of U.S. exports, and the domestic and foreign content of U.S. imports. At a national level VA accounting simply reallocates trade between countries, as shown in **Figure A**. Thus, the overall U.S. goods
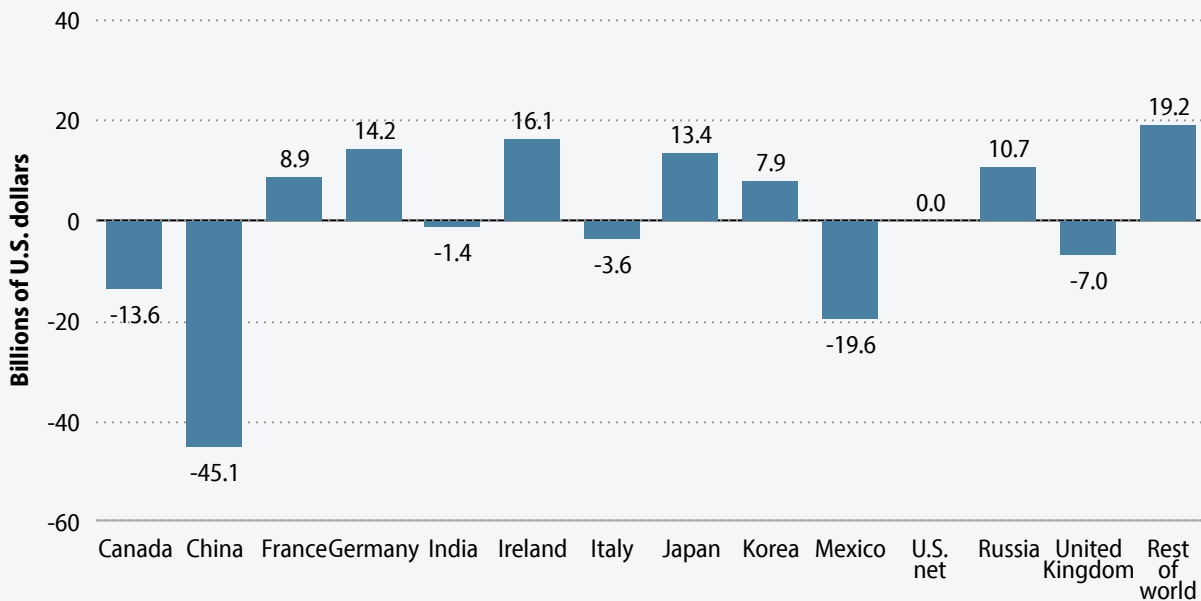
and services trade deficit (or surplus) is the same whether measured on a gross trade or a value-added basis (see also Benedetto 2012, 3).

The OECD estimates that their analysis would reduce the U.S.-China "trade deficit in…value added terms" by $45.1 billion in 2009 (20.5 percent of the official U.S. goods and services trade deficit with China, not 25 percent as claimed by the OECD). The OECD-WTO data show that reductions in U.S. bilateral deficits with each of Canada, Mexico, the United Kingdom (UK), Italy, and India would be in the range of $1.4 billion to $19.6 billion (as shown in Figure A). Value-added analysis would increase the U.S. trade deficits significantly (by between $7.9 billion and $16.1 billion) with six countries: France, Germany, Ireland, Japan, Korea, and the Russian Federation, and the U.S. value-added trade deficit with the rest of the world would rise by $19.2 billion. Overall, all reductions in the VA trade balance from some countries are counterbalanced (and exactly offset) by additions to the VA trade balance from others. Thus, as stated earlier, value-added analysis simply shifts trade flows from one group of countries to another group. The implications of the use of VA analysis for policy are unclear: Countries in both the "gross additions" and "gross subtractions" groups, for example, may well engage in currency manipulations and violate U.S. fair trade laws (in the "gross additions" group, for example, Korea, Japan, and Russia have all been shown to engage in these practices).[2] Moreover, estimates of Chinese value added in total U.S. imports are likely underestimated due to the use of faulty trade data and outdated models, as discussed in the next section.

The results in Figure A assert that, at least with respect to the United States, China is a net importer of intermediate products. The underlying model argues that China imports intermediates from countries such as Korea, Japan, and the rest of the world, and assembles them into final products shipped to the United States. This is the essence of the "iPhone example" discussed by the OECD

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Change in U.S. goods-and-services trade deficit under value-added accounting, by country, 2009

Source: Author's analysis of OECD (2013c)

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and WTO (2012, Box 2 at 7). As a result, the OECD claims that the U.S. VA trade deficit with China is less than its gross trade deficit, as shown in Figure A. Similar claims have been made about the iPhone/iPod model by Batson (2010). These claims have been challenged by McMillion (2012). Yang and Pei (2007) present academic research asserting that China is highly dependent on intermediate imports, while the United States is not. The issue of whether China is a net importer or exporter of intermediate products is discussed below.
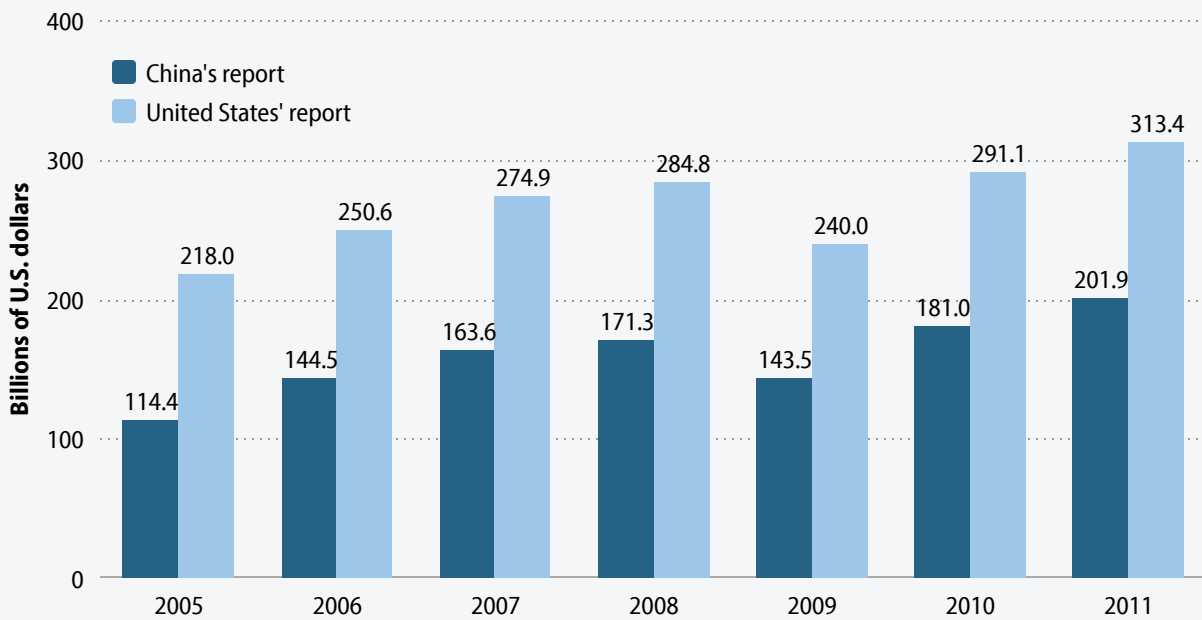
China massively underreports its bilateral and global trade surpluses

Chinese trade data chronically underestimate the value of China's trade surplus on both a bilateral and a global basis. For example, in 2009, China reported $77.8 billion in goods imports from and $221.3 billion in exports

to the United States, for a bilateral goods trade surplus of $143.5 billion. For the same period, the United States reported $69.6 billion in goods exports to and $309.5 billion in imports from China, for a bilateral goods trade deficit of $240 billion. Comparable data on the trade balance (viewed as a surplus, from China's viewpoint) are shown in **Figure B**, which reports estimates of China's bilateral goods trade surplus with the United States from 2005 through 2011. U.S. estimates of the bilateral surplus were 69 percent higher than China's, annually averaged, over this period.[3]

Using data from the United Nations, it appears that China is also substantially underreporting its *global* exports and trade surplus. In 2009 (the base year chosen by the OECD for their VA analysis), China had a reported goods trade surplus of $196.1 billion, as shown in **Figure C**. This figure, in turn, was based on $1,201.6 billion in exports and $1005.6 billion in imports (UN

China's goods trade surplus with U.S., Chinese vs. U.S. reports, 2005–2011

Source: Author's analysis of UN comtrade (2013)

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Comtrade 2013). However, using data from the same database, 161 countries reported receiving a total of $1,339.3 billion in goods imports from China (adjusted for shipping costs—see Appendix table A2, UN Comtrade 2013). A total of 154 countries reported $873.9 billion in goods exports to China in 2009. Thus, the UN trade database yields a gross China goods trade surplus of $465.3 billion, 137.3 percent more than the total reported by China in 2009.

These data are adjusted for some differences in accounting (for example, export data from the United States and other countries exclude international shipping costs under the terms of Free On Board or FOB, while Chinese imports from the U.S. and other countries includes the cost, insurance and freight or CIF. The treatment of trade with Hong Kong (some countries, including the United States, count imports that are shipped through Hong Kong as originating in China; China does not) also affects reported bilateral trade flows for some

countries. Some researchers claim that adjusting for these differences can eliminate most of the gap between U.S. and Chinese trade data (Fung and Lau 2001). However, while such factors can explain most of the gaps in data on U.S. exports to China and Chinese imports from the United States (which averaged 10.9 percent of Chinese imports in the 2005–2011 period), they cannot reconcile the much larger gap on the U.S. import side of the equation, which averaged 50.5 percent of U.S. imports between 2005 and 2011.

Differences in the treatment of shipping costs, including insurance and freight, reduce but do not eliminate this gap, as shown in the Appendix. China reported a global goods trade surplus that increased from $102.0 billion in 2005 to a peak of $298.1 billion in 2008, dropped in the recession in 2009 and continued to shrink thereafter (Appendix Table A-3). Based on trade data by between 141 and 171 importers, and a slightly smaller number of exporters (Appendix Table A-1),[4] China's trading part-

FIGURE C

China's global goods trade surplus, Chinese vs. partner country reports, 2005–2011

* Incomplete data, fewer than 142 out of 171 countries reporting in 2010 and 2011

Source: UN Comtrade (2013) and author's analysis

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ners reported that China had trade surpluses (adjusted for differences in transportation, insurance, and freight) of \$357.2 billion in 2005 increasing to \$651.0 billion in 2008, declining sharply in 2009 and recovering to \$526.3 billion in 2011 (Appendix Table A-2). Based on data reported by China's trading partners, China's global trade surplus was 117.2 percent to 250.2 percent higher (over two to three and one-half times higher) than China's own, self-reported trade surplus for the 2005–2009 period with an average underestimate of 155.2 percent (Appendix Table A-4).

These huge gaps have important implications for the measurement of China's value-added trade, for analysis of global trade imbalances, and for estimates of current and future equilibrium levels of exchange rates of the currencies of China and many of its trading partners.

Implications of underreporting for the measurement of China's value-added trade

The distortions in China's trade data shown in Figure C and the Appendix have important implications for the OECD-WTO VA analysis. A key assertion of their analysis is that a significant proportion of China's net exports to the United States consists of components imported from other countries. However, China's reported imports exceed actual Chinese imports as reported by China's trading partners: As shown in Appendix Table A-1, A-2 and A-4, China's actual imports were 12.7 percent to 18.7 percent less than what China itself reported in the 2005 to 2009 period (adjusted for CIF differences), as shown in Table A-4 (the average actual imports were 14.6 percent less than China reported between 2005 and 2009). So for example, in 2009, 154 other countries reported total exports to China (aka Chinese imports) of

$873.9 billion (including estimated CIF costs), 13.1 percent less than China's reported total imports of $1,005.6 billion that same year. If the OECD relied on Chinese data to estimate the foreign content of China's exports, the actual foreign content was likely 14.6 percent less than these estimates, for this reason alone (note that errors in import data are only one of several likely sources of error in the OECD value-added trade data). On average, the "import gap" explained about 45.4 percent of the total "trade balance" gap, but the import share rose sharply over time (Table A-5).

Data problems on the export side (the underreporting of exports touched on in the previous section) also have important implications for the OECD VA trade estimates. China's trade partners reported receiving imports from China (aka total Chinese exports) that were worth 9.9 percent to 22.5 percent more than exports as reported by China between 2005 and 2009 (adjusted for shipping costs).[5] This was a significant source of the discrepancy in China's trade surplus shown in Figure C. On average, the "export gap" explained about 54.6 percent of the total "trade balance gap." The export gap fell sharply in 2010 and 2011, as the number of reporting countries declined.[6] China became the leading exporter in the world in the middle of the last decade, as discussed later in this report. China also is a major and rapidly growing exporter of intermediate goods such as crude steel, semiconductor cells, glass, paper, electronic components, and auto parts. Hence, it is important to examine China's role as a source of indirect exports to the United States to other countries, which is explored in the next section.

The OECD underestimates China's VA trade with the United States

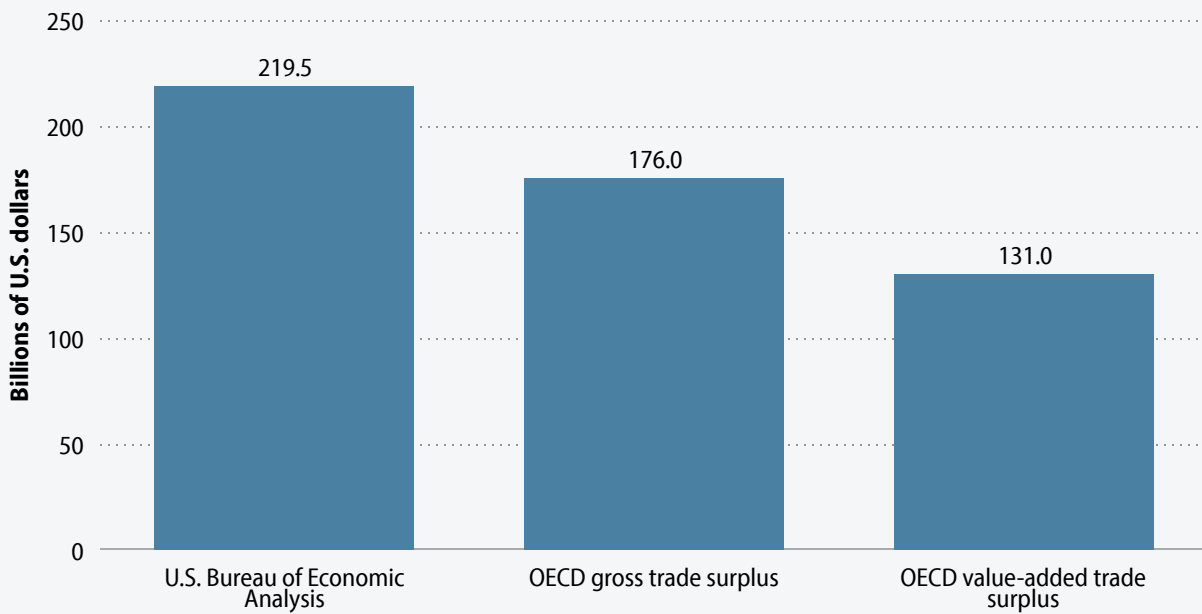The OECD underestimates China's VA trade with the United States in at least three ways.

The OECD VA analysis is based on underestimates of the gross U.S. trade deficit with China

As stated earlier, in 2009, China reported that it had a bilateral goods trade surplus with the United States of $143.5 billion, while the United States reported a goods trade deficit of $240 billion with China, 67 percent larger than the Chinese estimate (Figure B). The OECD (2013b) has acknowledged that "it is well known that the international trade statistics produced by national trade authorities are not globally consistent…" The OECD has attempted to rebalance trade data, as noted earlier. However, the authors of the OECD analysis have refused to release comprehensive estimates of "implicit bilateral gross trade flows," or their methodology for constructing the VA trade estimates, noting that such data will be released "in time." They acknowledge that "releasing the bilateral trade statistics now would unintentionally turn the spotlight onto the official gross trade statistics produced by some countries," claiming that this "is not the intention of this release" (OECD 2013b).

However, the OECD has selectively issued estimates of the gross trade balance between the United States, China, and a number of other countries (OECD 2013d, Figure 2). These estimates display a pattern of minimizing both the gross and value-added trade deficits of the United States with China, and with other countries.

The relationship between U.S. and OECD estimates of goods and services trade flows between the United States and China are shown in **Figure D**. The U.S. Department of Commerce's Bureau of Economic Analysis (BEA 2013) estimated that the United States' gross goods and services trade deficit with China was $219.5 billion in 2009. However, the OECD estimated that the gross bilateral goods and services deficit was only $176 billion, $43.5 billion or 19.8 percent less than the bilateral goods and services deficit reported by the U.S. BEA.[7] The OECD then estimated that the U.S. VA goods and services trade deficit with China was only $131 billion in

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China goods-and-services trade surplus with the U.S. in 2009—alternative measures

Source: Author's analysis of Bureau of Economic Analysis (2013) and OECD (2013d)
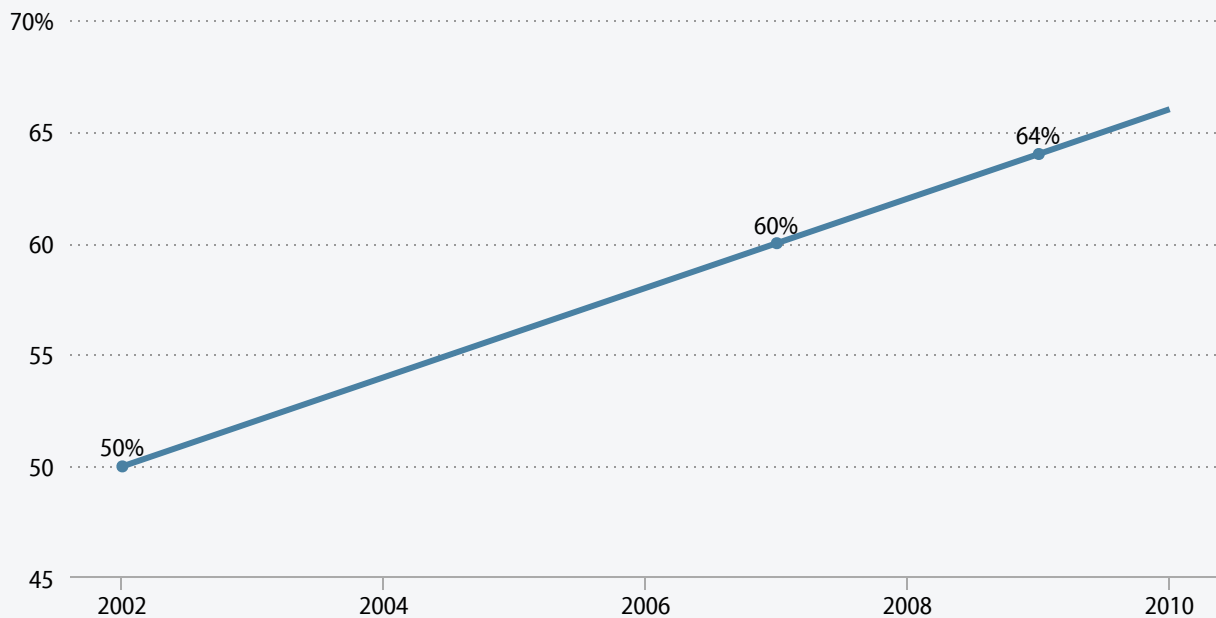
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2009, $45 billion or 25.6 percent less than the OECD estimate of the gross U.S. goods and services trade flows. However, of the $88.5 billion difference between the OECD's estimate of the bilateral VA goods and services trade deficit and the BEA estimate of the gross bilateral goods and services trade deficit (i.e., the difference between $219.5 billion and $131 billion), essentially half ($43.5 billion) is simply due to the OECD's use of a flawed starting measure of the gross trade deficit.

OECD VA Chinese exports estimates ignore the high rate of technical change in China

Estimates of the Chinese content of China's exports and imports likely are outdated and underestimate China's VA share of its exports because China is rapidly moving up the value chain and increasing the domestic content of its exports. As Benedetto (2012, 10) points out, Koopman, Wang and Wei (2008) use 2002 domestic value-

added multipliers to estimate that China added "only 50 percent of the value in its exports, and a much lower percentage in high-tech products." However, "Koopman et al. (2010) uses a higher 2007 domestic value-added multiplier of 60 percent of Chinese value added in Chinese exports." Benedetto notes that "this increase is consistent with economic literature showing that China is moving up the value chain" (Benedetto 2012, 10).

China is rapidly deepening its industrial base and reducing its reliance on imported components. If the domestic value-added share in China's exports increased from 50 percent in 2002 to 60 percent in 2007, then China's value-added share increased at a rate of 2 percentage points per year, as shown in **Figure E**, which is based on the domestic value-added multipliers estimated by Koopman, Wang and Wei (2008) and Koopman et al. (2010) for 2002 and 2007. Extrapolating their findings suggests that domestic value added in Chinese exports

Value-added share of China's exports, 2002–2010

Note: The estimated value-added share of 64 percent in 2009 is based on a linear interpolation using data points from 2002 and 2007.

Source: Author's analysis of Koopman, Wang and Wei (2008); Koopman et al. (2010); and Benedetto (2012)

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reached 64 percent by 2009. Furthermore, manufacturing productivity growth has been increasing much faster in China than in the United States and other industrial sectors.[8]

The OECD value-added trade estimates are based on a world input-output (IO) model that has been jointly developed by the OECD and WTO. That model includes national IO tables for 57 countries (OECD 2013b, 2). The most recent IO tables for most countries used in that model, including China, were for 2005. If the Chinese share of export VA is rising 2 percentage points per year, then the 2005 IO tables used by the OECD team to estimate the domestic VA share of Chinese exports likely underestimate the Chinese share in 2009 by 8 percentage points. If the OECD assumed a Chinese VA trade share of 56 percent, and China's actual domestic content in 2009 was 64 percent, then the Chinese value-added trade surplus with the United States

was $19 billion or 14.3 percent higher than estimated in the OECD study, based on conservative estimates.[9] This factor alone could increase the Chinese value-added trade surplus with the United States from $131 billion to $150 billion, holding all the other assumptions in the OECD analysis constant. But there are further problems with these assumptions, especially on the China export side of the equation as shown in the next section.

As the examples here illustrate, revisions to international trade statistics such as those proposed by the OECD in its international value-added analysis are only as reliable as the underlying data being used. There are significant problems inherent in the trade data being used by the OECD. These have not been acknowledged or addressed by the OECD.

There are also two sides to the value-added measures in trade debates. The OECD's analysis emphasizes the

role of foreign value added in direct trade with China and purports to show that China's trade surplus with the United States is reduced by VA analysis (see, for example, figure A earlier). However, China is also the largest exporter in the *world*. Thus, indirect imports from China via third countries must also be considered to develop a complete picture of total, value-added trade with China.

Imports of Chinese goods and components through third countries also increase the U.S. value-added trade deficit

The OECD VA analysis emphasizes trade in intermediate products, and claims that China is a net importer of intermediates, at least in its trade with the United States. This section examines the implications of China's role as a supplier of intermediate products and assesses the net impacts of China's overall trade in intermediate products. The circumstantial evidence indicates it is unlikely that China is a net importer of intermediates because China's overall exports have grown massively, and, as noted above, China is a major producer and exporter of a wide range of intermediate products including crude steel, semiconductor cells, glass, paper, computer equipment and electronic components, aircraft and auto parts, and many other intermediate commodities.

China's total world exports (as measured by trading partner data reported to the IMF) exceeded its self-reported world exports by $137.6 billion to $172.3 billion between 2005 and 2009 (see Table A-5 for these "export gaps"; estimated gaps for 2010 and 2011 are much smaller, but are based on reports from a smaller sample of countries). Comparing China's self-reported exports with total world exports of all countries reporting to the IMF (2013), China's share of world exports grew from 3.9 percent of total world exports in 2000 to 11.1 percent in 2010.[10] Using Chinese exports as reported by other countries (from UN Comtrade, estimated in Table A-2) adds from 0.8 percentage points to a maximum of 1.5

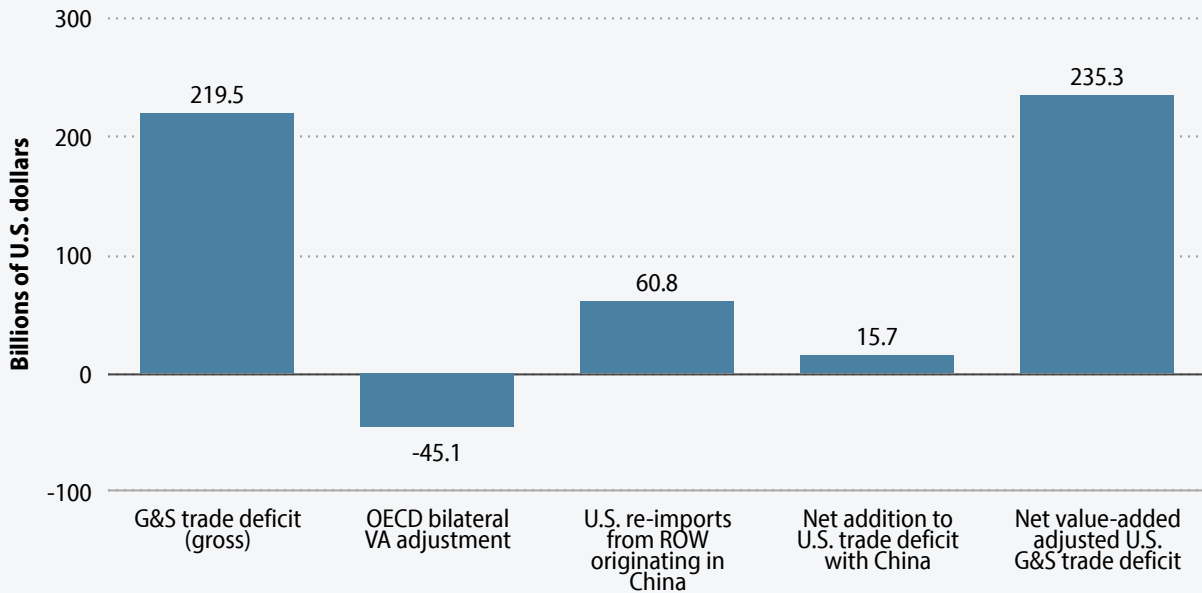percentage points to China's total world exports in every year between 2005 and 2009.[11]

Even using the data self-reported by China, China became the largest exporter in the world in 2009, and has remained so by an increasing margin over the United States and Germany, the second and third largest exporters through 2011. Using the UN Comtrade estimates from Table A-2, China became the largest exporter in the world in 2006, a full three years earlier.

Estimating China's trade in intermediates

This section seeks to more formally estimate U.S. imports of China's intermediate and final products through third countries, from 2005 through 2009. Results for 2009 will be summarized for illustration. As shown in Table A-2, in 2009, China had total exports to the world of $1,339.3 billion (UN Comtrade 2013). U.S. imports from China in 2009 were $268.1 billion, leaving China exports to the rest of the world (excluding the United States) of $1,071.2 billion. We will assume in what follows that intermediate products and transshipments of goods through other countries represented 50 percent of China's exports to the rest of the world, which equaled $535.6 billion.[12]

Next we consider China's value-added share in exports to the United States from the rest of the world excluding China. Total world exports, minus direct Chinese exports to the United States and U.S. exports to the rest of the world (i.e., excluding U.S. exports to China) totaled $11,251 billion in 2009.[13] The share of this global basket of exports accounted for by Chinese intermediate exports ($535.6 billion, from above) is 4.8 percent. U.S. imports from the rest of the world excluding China in 2009 were $1,277.6 billion. Assuming that 4.8 percent of those imports from the rest of the world constituted intermediate and transshipped products from China implies imports from China through third countries of $60.8 billion in 2009. The United States absorbed $54.2 billion

U.S. goods-and-services trade deficit with China, gross and with value-added adjustments, 2009

Note: ROW refers to "rest of world."

Source: Author's analysis of BEA (2013), OECD (2013c), IMF (2013), and UN Comtrade (2013)

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to $77.9 billion in additional, indirect imports originating in China from the ROW between 2005 and 2009.

Adding this to the OECD estimates yields the overall, revised impact of VA analysis on U.S. trade flows, illustrated in **Figure F**. The first bar represents the gross (or reported) U.S. goods and services trade deficit with China of $219.5 billion in 2009 (BEA 2013, from Figure D). The next bar represents the adjustments to value added due to intermediate trade as estimated by the OECD, which reduced the U.S. goods and services trade deficit with China by $45.1 billion in 2009 (from Figure A). The third bar is an estimate of U.S. re-imports of Chinese intermediates and transshipments from the rest of the world (i.e., the measure of imports of Chinese goods from third countries), which increased net imports by $60.8 billion. The fourth bar shows the sum of both value-added adjustments on direct imports and through

imports of Chinese goods from third countries. For 2009 this total was a positive $15.7 billion; in other words, the net result was a $15.7 billion increase in the U.S. goods and services trade deficit with China in 2009. Thus, the net, reestimated U.S. goods and services value-added trade deficit with China in 2009 was $235.3 billion, 7.2 percent more than the gross U.S. goods and services trade deficit.

Results similar to 2009 were obtained for 2005 and 2008; all three are years for which the OECD reported VA trade estimates, and shown in **Figure G**. In each year the reestimated U.S. VA trade deficit due to re-imports of Chinese goods alone ("U.S. re-imports from ROW originating in China") was significantly *larger* than the gross (reported) trade deficit.[14] The net increase in the U.S. trade deficit with China more than doubled, from $7.2 billion in 2005 to $16.7 billion in 2008 and $15.7

OECD value-added adjustments to U.S. goods-and-services trade deficit with China, 2005, 2008, and 2009

Legend:
- OECD bilateral VA adjustment
- U.S. re-imports from ROW originating in China
- Net addition to U.S. trade deficit with China

Billions of U.S. dollars

2005: 54.2, 7.2, -47.0
2008: 77.9, 16.7, -61.2
2009: 60.8, 15.7, -45.1

Note: ROW refers to "rest of world"

Source: Author's analysis of BEA (2013), OECD (2013c), IMF (2013), and UN Comtrade (2013)

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billion in 2009 (increasing the reported U.S. goods and services trade deficit by 3.6 percent, 6.4 percent, and 7.2 percent, respectively). These results reflect the rapid growth in China's exports to the rest of the world both in total dollars and as a share of world trade.

These results also show that, for U.S.-China trade, China was a *net exporter* of intermediate products. The effects of its intermediate exports and transshipments to the rest of the world more than offset net imports of intermediates in China's direct exports.

In sum, a balanced assessment of value-added trade with China that considers both China's intermediate trade flows and U.S. re-imports of Chinese intermediates and transshipments through third countries shows that, if anything, the U.S. trade deficit with China has been underestimated, not overestimated, as widely reported by the OECD and in the popular media.

These finding have important implications for policy which are considered in the next section.

Policy implications of getting trade accounting wrong

The OECD and WTO have developed new estimates of trade in value added which purport to show that the U.S. value-added trade deficit with China is as much as 25 percent smaller than its gross or reported trade deficit with that country. This paper has highlighted a number of problems with this analysis and how it may be interpreted by policymakers.

If this was just an academic dispute, there would be little real-world harm stemming from these errors. However, the OECD value-added estimates, if they become the basis for policymaking, could actually inflict real damage on the U.S. economy. The most obvious ways such estimates could lead to flawed policymaking are inappropriately lowering the targeted exchange rate adjustments needed to rebalance global trade flows and inappropriately reducing antidumping and countervailing duty penalties imposed in response to measured import surcharges.

Implications for exchange rate policy

Cline and Williamson (2011, 2012) (hereinafter CW) have developed widely cited estimates of fundamental equilibrium exchange rates (FEER) for China and a number of other countries. Their estimates are based on a target-adjustment model which adjusts exchange rates so that current account trade balances (the broadest measure of goods, services, and income flows) do not exceed plus or minus three percent of GDP. Their model relies, in part, on forecasts of future current account balances from the International Monetary Fund's 2011 and 2012 *World Economic Outlook Database.*

In 2011, CW estimated that China's current account surplus needed to decline by 5.3 percent of its projected 2016 GDP, and they estimated that the renminbi (RMB) needed to appreciate 28.5 percent against the U.S. dollar. However, In 2012, the IMF substantially reduced its estimate of China's likely current account surplus in 2017, based on the self-reported decline in China's current account balance, which declined from $237.6 billion 2010 to $201.7 billion in 2011 (IMF 2012). Thus, CW estimated that China needed to reduce its 2017 trade surplus by only 1.1 percent of its projected GDP ($13.2 trillion) to hit this target, and that the RMB needed to appreciate only 7.7 percent against the U.S. dollar to achieve this goal.

Thus, relatively large changes in China's past and projected current account surpluses have enormous implications for the amount by which China's currency needs to adjust. In its October, 2012 World Economic Outlook Database, the IMF (2012) estimated that China would have a current account surplus of $564.2 billion, 4.3 percent of its projected 2017 GDP. Data reviewed in Figure C and Appendix Table A-4 suggest that China's current account surplus could be 172.7 percent larger (or more) than the self-projected amount, yielding a projected current account surplus of $1,538.5 billion in 2017.[15] If China's GDP reaches the projected level of $13.2 trillion in 2017 (assuming that changes in trade accounting affect only the composition of China's GDP and not its level), then the current account surplus would be 11.6 percent (not 4.3 percent) of GDP. Using the CW target current-account adjustment criteria (reducing China's trade surplus to no more than 3 percent of GDP), then China's trade surplus must be reduced by 8.6 percentage points ($1,136.3 billion), 3.3 percentage points more (nearly one-third more) than was assumed by CW in 2011). Thus, it is likely that China needs an additional, one-time revaluation of 30 to 40 percent, or more, and that it must continue to revalue in the future because of its very high productivity growth.[16] These findings undercut arguments by a number of prominent economists who have recently claimed that Chinese currency manipulation is "an issue whose time has passed" (Krugman 2012).[17]

Implications for trade policy

As proposed, the OECD-WTO value-added trade analysis could be used to dramatically reduce duties on unfairly traded products from China and other developing countries that engage in extensive trade in intermediate products. This study has shown that there are serious flaws in the OECD-WTO VA methodology. It has also shown that indirect imports of Chinese goods appear to significantly increase the total U.S. goods and services trade deficit with China.

These findings have two important implications for trade law and policymaking in the United States. First, the OECD's TiVA database should not be used in its present form in antidumping, countervailing duty, or any other trade remedy proceedings. However, with better data and improvements in methodology, the model could prove helpful in identifying the nature of production, supply chains, and the roles played by different countries and how those roles have evolved over time (e.g., documenting China's rapid movement up the value chain, as shown in Figure E). More time series data of this type could be used to better document the ways in which multinational companies from different countries have offshored significant shares of high-tech production.

Second, at the present time, antidumping and countervailing duties cannot be assessed on products made from intermediates from China or other countries—even if those goods are subject to duties if directly imported into the United States—if such products are "substantially transformed" in the third country (Lewis and Liu 2012, 5-7).[18] Furthermore, there are questions about whether or how the benefits of using dumped and subsidized inputs in such third-country production could be considered in antidumping or countervailing duty proceedings in the United States. The incorporation of dumped and subsidized intermediate inputs in finished goods imported from third countries is an important area for future consideration. Policymakers should consider whether it can be addressed under current law, and/or whether international rules should be modified as needed to allow this problem to be addressed directly under antidumping and countervailing duty laws. The U.S. Department of Commerce should ensure that dumped and subsidized intermediate products from China and other subject countries are not allowed to gain unfair access to the U.S. market through transformation by third-party exporters in other countries.

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Appendix: Analysis of China's partner country trade data

This appendix details and analyzes China's bilateral trade with more than 130 nations, as reported in the United Nations Comtrade Database (2013). Data on total exports to China and total imports from China by this large group of nations are summarized in Tables A-1 through A-5.[19] These tables report total goods trade (imports, exports, and calculated global trade balance) with China as reported by this large group of countries for the period 2005–2011. These data are analyzed and compared with China's self-reported goods trade, also collected in the Comtrade database.[20]

Table A-1 reports raw statistics for world trade with China (not adjusted for shipping costs), as reported by China's trading partners. Table A-2 adjusts these raw data by correcting for costs including the cost of insurance and freight (CIF), and switches the column labels on exports and imports to present an estimate of China's trade with the world as reported by China's trading partners. Adjustments for costs including insurance and freight increased world exports to China by 10 percent to reflect average CIF adjustments to estimate China's imports from the world. For example, world exports of $523.8 billion to China in 2005 yield estimated Chinese imports of $576.2 billion. Likewise, world imports from China in Table A-1 were reduced 9.1 percent (1/(1+.10)) in Table A-2, to estimate the FOB value of Chinese exports.

Countries apparently report data to the UN with a long and variable lag. The number of reporting countries fell sharply (by 10 to 15 percent) between 2009 and the 2010 and 2011 period on both the import and export side, as shown in the last two columns of Table A-1. Thus, estimates for 2010 and 2011 should be viewed as preliminary, and subject to change.

Tables A-3, A-4 and A-5 compare these trade-partner estimated values for world trade with China to China's own reports of its total world trade in goods. The overall contrasts are stark. China's own trade data are reported in Table A-3 and their relationships to the partner reported data in Table A-2 are shown in Tables A-4 and A-5. Table A-4 reports percent differences between partner country estimates of China's total world trade flows (Table A-2) and China's own estimates of those same flows (A-3).[21]

Direct comparison of trade flows as estimated in Tables A-2 and A-3 reveals large gaps on both the import and export side that contribute to even larger gaps in the reported trade balance, as shown in Figure C. These gaps are analyzed in Tables A-4 and A-5.

Partner country estimates of China's total imports are consistently less than China's self-reported imports. Partner country exports (i.e., China imports as reported by partners) to China were (with CIF adjustment) 12.7 percent to 18.7 percent less than China's total reported imports from the world. The average gap over the 2005–2009 period was 14.6 percent as shown in Table A-4. The gap on the import side increased significantly in 2010 and 2011, which likely reflects the low number of reporting countries in these years, which tends to inflate the import gap and depress the export gap. Thus, data for 2005–2009 provide a more accurate picture of the China's trade reporting.

But the gaps on the export side are somewhat larger and more variable than those on the import side (and on a much larger base), ranging from 9.9 percent in 2008 to 22.5 percent in 2005, with an average of 14.9 percent over the 2005–2009 period. The export gap drops sharply in 2010 and 2011, which appears to reflect underreporting, as noted earlier.

Large overestimates of China's imports and underestimates of its exports have a very large impact on its estimated trade balance. While China reported a trade surplus that peaked at $298.1 billion in 2008 and declined thereafter, China's trading partners reported a (CIF-adjusted) trade deficit with China that peaked at $651.0 billion in

World goods trade with China, as reported by China's trading partners, 2005–2011 (billions of U.S. dollars)

	Exports	Imports	Trade balance	Number of reporting countries	
				Exports	Imports
2005	523.8	1026.7	-502.9	158	168
2006	629.1	1255.3	-626.3	155	169
2007	731.8	1516.2	-784.4	162	171
2008	837.5	1729.5	-892.0	157	165
2009	794.5	1473.2	-678.7	154	161
2010*	1047.6	1853.3	-805.6	139	143
2011*	1277.4	2124.6	-847.2	131	141

*Preliminary estimates, included for illustration only

Source: UN Comtrade (2013)

China goods trade with world, as reported by China's trading partners, adjusted for shipping costs*, 2005–2011 (billions of U.S. dollars)

	Imports	Exports	Trade balance
2005	576.2	933.4	357.2
2006	692.0	1141.2	449.2
2007	805.0	1378.3	573.4
2008	921.3	1572.3	651.0
2009	873.9	1339.3	465.3
2010**	1152.4	1684.8	532.4
2011**	1405.2	1931.4	526.3

* Assumes China pays 10% CIF (cost, insurance and freight) and receives 1/(1+.10) in export revenues

**Preliminary estimates, included for illustration only

Source: UN Comtrade (2013)

2008, declined in 2009, increased in 2010 and reached $526.3 billion in 2011, versus China's reported surplus in that year of $155.0 billion. The year-to-year gaps in these values are expressed in percentage terms in Table A-4 and dollar terms in Table A-5.

The import, export, and trade balance gaps between Tables A-2 (partner-country data) and Table A-3 (China's self-reported trade data) are shown in Table A-4. The import and export gaps were discussed above. The trade deficit gaps are proportionately much larger, ranging from 117.2 percent in 2007 to 250.2 percent in 2005,

China goods trade with world, as reported by China, 2005–2011 (billions of U.S. dollars)

	Imports	Exports	Trade balance
2005	660.0	762.0	102.0
2006	791.5	968.9	177.5
2007	956.1	1220.1	263.9
2008	1132.6	1430.7	298.1
2009	1005.6	1201.6	196.1
2010*	1396.0	1577.8	181.8
2011*	1743.4	1898.4	155.0

*Preliminary estimates, included for illustration only

Source: UN Comtrade (2013)

and averaging 155.9 percent over the 2005–2009 period. These data reveal that the global trade deficit with China was over two to three and one-half times larger than reported by China.

Table A-5 expresses these trade gaps in dollar terms, and as a share of the total trade balance gap. The values in table A-5 represent the difference between corresponding values in Tables A-2 and A-3. Thus, for example, China reported $660.0 billion in imports in 2005, while its trading partners reported $576.2 billion in CIF-adjusted exports to China (this report's estimates of China's imports). Thus, the measured import gap in 2006 was $83.8 billion. The export gap in 2005 was $171.4 billion and the trade balance gap was the sum of these two terms, $255.2 billion.

The last three columns of Table A-5 show the import and export share of the trade gap (the final column shows that these shares sum to 100 percent). On average, between 2005 and 2009, imports explained 45.4 percent of the trade balance gap and exports explained 54.6 percent. Those shares are reversed when 2010 and 2011 are included, because the measured export gap drops sharply in those years. It is likely that estimates of China's exports will rise significantly as more complete data are collected,

and the import gap is likely to shrink as well. Overall, it appears that underreporting of China's exports is slightly more important contributor to the trade gap than overestimates of China's imports.

World-estimated trade data vs. China-self-reported trade data (percent difference), 2005–2011

	Imports (World/China)	Exports (World/China)	Trade balance (World/China)
2005	-12.7%	22.5%	250.2%
2006	-12.6%	17.8%	153.1%
2007	-15.8%	13.0%	117.2%
2008	-18.7%	9.9%	118.4%
2009	-13.1%	11.5%	137.3%
*2010**	-17.4%	6.8%	192.9%
*2011**	-19.4%	1.7%	239.6%
Averages, 2005–2009	-14.6%	14.9%	155.2%

*Preliminary estimates, included for illustration only.

Source: UN Comtrade (2013)

Gaps between partner reports of China's goods trade with world and China's self-reports (in dollars) and share of the total, 2005–2011

	Trade gaps (Billions of dollars)			Shares of the trade-balance gap (Percent)		
	Imports	Exports	Trade balance	Imports	Exports	(sum)
2005	83.8	171.4	255.2	33%	67%	100.0%
2006	99.5	172.3	271.8	36.6%	63.4%	100.0%
2007	151.1	158.3	309.4	48.8%	51.2%	100.0%
2008	211.3	141.6	352.9	59.9%	40.1%	100.0%
2009	131.6	137.6	269.3	48.9%	51.1%	100.0%
*2010**	243.6	107.0	350.6	69.5%	30.5%	100.0%
*2011**	338.2	33.1	371.3	91.1%	8.9%	100.0%
Average, 2005–2009				45.4%	54.6%	

*Preliminary estimates, included for illustration only

Source: UN Comtrade (2013)

Endnotes

1. Note that EPI studies of trade and employment always consider the net impacts of trade, that is, exports less imports (see Scott 2012). Value-added accounting is simply another way to allocate trade to source countries. However, as noted later in the paper, total trade balances with the world (for the United States, China, and all other countries) must be the same on both a gross/reported and a value-added basis.

2. Korea, Japan, and China have each been the subject of U.S. antidumping and countervailing duty orders in numerous cases (U.S. International Trade Commission 2013). The Office of the U.S. Trade Representatives' *2012 National Trade Estimate Report on Foreign Trade Barriers* includes 34 pages of analysis of barriers to trade in China, 16 pages on barriers in Japan, and 13 pages on barriers in Russia.

3. Note that the gap between U.S. and Chinese estimates of the bilateral goods trade balance declined steadily from 90 percent of China's reported trade surplus in 2005 to 55 percent in 2011.

4. It appears from the data that countries report to the UN Comtrade (2013) program with long and variable lags. Data were downloaded in early 2013 for this report. The number of countries reporting imports from China peaked at 171 in 2007, remained above 160 in 2008 and 2009, and fell to 143 and 141 in 2010 and 2011, respectively, as shown in Appendix Table A-1. Thus, estimates of partner country trade with China for 2010 and 2011 are preliminary and likely to increase as more data are added to the system.

5. China's export surplus, as reported by its trading partners (relative to China's own estimates of its goods exports) declined to 6.8% percent of China's reported exports (world/China) in 2010 and 1.7% percent of China's reported exports in 2011, as the number of reporting countries declined, as shown in Table A-4. The gap in the preliminary estimates for these years is likely to grow as more countries report trading data over the next few years.

6. The number of reporting countries declined 10 to 15 percent between 2009 and the 2010–2011 period, as shown in Table A-1. As the number of reporting countries grows, total reported exports to China will rise (shrinking the "import gap"), as will total exports to China (expanding the "export gap"). In the 2005–2009 period, with more complete reporting, exports explained 54.6 percent of the trade gap, and imports explained 45.4 percent, as shown in Table A-5.

7. China estimated that its goods trade surplus with the United States was $143.5 billion in 2009. No comparable data on bilateral services trade were available from China. The U.S. BEA (2013) estimated that the U.S. had a services trade surplus of $7.7 billion with China in 2009, which would imply a Chinese goods and services surplus of approximately $136 billion in 2009. Thus, the OECD estimate of the bilateral, gross goods and services trade deficit ($176 billion, Figure D) roughly splits the difference between the U.S. and Chinese estimates of these gross trade flows.

8. Between 1995 and 2009 China's manufacturing productivity growth rate ranged between 6.7 percent and 9.6 percent per year (FutureofUSChinaTrade.com 2012). Over the same period, productivity growth in U.S. manufacturing averaged only 2.4 percent per year (BLS 2012).

9. Assume that China's actual VA trade balance is 0.64/0.56 = 1.143 times larger than its reported VA trade balance of $131 billion: 1.143 times $131 billion = $149.7 billion, or roughly $150 billion, $19 billion more than reported by the OECD (OECD estimates are rounded to the nearest billion dollars).

10. IMF data are available from the author on request.

11. Specifically, China's total world exports based on partner country trade data increased 1.5 percentage points in 2005 and 1.0 percentage points in 2009 (IMF 2013 and author's analysis).

12. The UN Comtrade (2013) provides data on trade in intermediates by "Broad Economic Categories" (BEC). These data show that exports of intermediates alone increased from 39.9 percent of Chinese (self-reported) exports in 2005 to 41.2 percent in 2011. Total intermediate exports more than doubled from $304.1 billion in 2005 to

$782.0 billion in 2011. These data include trade in BEC industries 111, 121, 21, 22, 31, 322, 42, and 52. In addition, it is reasonable to assume that an additional 9 percent to 10 percent of Chinese goods are transshipped through other countries, in part to avoid antidumping and countervailing duties and other restraints on Chinese imports. For example, in May 2012 the United States imposed preliminary antidumping and countervailing duties on photovoltaic cells from China (Choudhury 2012). China was the largest supplier of photovoltaic cells in 2011 and 2012. After the imposition of duties, U.S. imports of photovoltaic cells and arrays from China declined $1.1 billion between 2011 and 2012. Meanwhile, U.S. imports from Malaysia more than doubled, increasing $900 million in the same period (USITC 2013).

13. This calculation removes U.S. trade with China, on the import and export side, since that is directly addressed in the OECD VA trade calculations.

14. In other words, the chart shows that the "OECD bilateral VA adjustment" (which reduces the bilateral trade deficit) was more than offset by the "U.S. re-imports from ROW originating in China" in each of the three study years. Hence, the revised estimates of the U.S.-China VA trade deficit exceeded the gross trade deficit in 2005, 2008, and 2009.

15. For China, the goods trade and current account balances are closely related. Goods trade explains at least three quarters of total transactions on the current account. In 2011, China reported a trade surplus of $156.3 billion and a current account balance of $201.7 billion (IMF 2013). Thus, movements in the goods account are an excellent predictor of China's overall current account, and underestimates of the trade balance are used here to predict China's likely future current account balances.

16. Manufacturing productivity growth in China has increased 6.7 to 9.6 percent per year between 1995 and 2009. Over the same period, productivity growth in U.S. manufacturing averaged only 2.4 percent per year. In order to maintain a stable trade balance in the face of such a large productivity gap, China's exchange rate must continually appreciate (Scott 2012, p. 4 and note 3).

17. See also Cline and Williamson (2012), and comments by Nicholas Lardy and Eswar Prasad, as quoted in an NPR blog article (Neuman 2012).

18. For an example of a product that the Department of Commerce determined was substantially transformed see the case of steel round wire from Canada, as described by Lewis and Liu (2012, 8).

19. Data for all reporting countries were collected January 30, 2013 from UN Comtrade (2013). In the 2005–2009 period, between 154 and 162 countries reported exports to China, and 161 to 171 reported imports. The number of reporting countries dropped off for 2010 and 2011—some countries apparently report with a greater time lag (the number of reporters peaked in 2008). In 2011, the low point for observations, 131 countries reported exports and 141 countries reported imports. In each case the data include all of China's major trading partners, and are thus representative. Comtrade estimates of China's total trade for recent years will increase with the number of reporting partners. Nonetheless, China's global exports, imports, and estimated trade surplus all peaked in the last year covered in this report, 2011.

20. China issues several different sets of reports on its trade flows. The data in Tables A-1 to A-5 are all reported on an HS "as reported" basis for total, all commodities. The Chinese trade data in Table A-2 are nearly identical to the data China reports under its "Intl Transactions & Position" report (IMF 2013). These data yield a trade balance that is similar to, but substantially lower than China's balance on goods in the balance of payments data from the same report. For example, in 2011 China reported a goods trade balance of $155 million (Table A-3), and a balance on goods in the balance of payments accounts of $242.4 billion (IMF 2013).

21. World estimates of trade with China are used as the numeraire in all three columns in Table A-4.

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