

Global Supply Chains Distort Trade and GDP Data

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The world’s integrated global supply system is creating havoc in trade accounts. It’s increasingly difficult to accurately measure who produces what and where. Forthcoming changes in the GDP framework will address some measurement issues, but we think it’s time for a new accounting system to monitor trade.

For more than a decade, companies have been discovering the advantages of sourcing production of parts and components around the world. The expansion of global supply chains has led to an explosion of trade in intermediate products, as some items are imported and reexported several times during a manufacturing process. This has made it extremely difficult for statisticians to properly assign the value-added of each stage of processing to the appropriate country.

Indeed, under the old trading and manufacturing model, it was easy to measure trade and the value-added from manufacturing. Many products were assembled in one country and sourced locally. Yet, when sourcing and assembly cuts across several countries, it’s much more difficult to track the value-added of processing—and especially of the intellectual capital embedded in a product. Often, a product is conceived and designed in a country that has nothing to do with its sourcing or assembly.

We think government agencies should address this issue in order to ensure the most accurate measurement of trade, bilateral trade balances and gross domestic product (GDP). Our analysis suggests that the value-added during early stages of product design in the US may be frequently attributed to other countries involved in the manufacturing process.

Understanding Global Supply Chains

To illustrate how global supply chains have increased the complexity of measuring trade flows, we created two hypothetical examples looking at the value-added from each stage of a manufacturing process. In the first example, Widgets Inc has a single country supply chain in the US (**Display 1**). In the second example, Widgets International relies on coordination of parts and materials from different countries (**Display 2**).

Under the old model, it was easy to measure how value was added to a product assembled in one country based on domestically produced inputs. The

Display 1
Widgets Inc: Easy to Measure Output

Value-Added from a Single Country Supply Chain	
Value-Added from Each Stage	USD
1. Intellectual Capital	20
2. Intermediate Products	30
3. Assembly	20
4. Distribution and Profit Margins	30
Domestic Value-Added (Stages 1, 2, 3 and 4)	100

Source: AllianceBernstein

Display 2
Widgets International: Where Does Production Happen?

Value-Added from a Global Supply Chain	
Value-Added from Each Stage	USD
1. Intellectual Capital	20
2. Intermediate Products	35
3. Assembly	45
Total Value-Added	100
Imports Value-Added (Stages 1, 2, and 3)	55
Domestic Value-Added (Stage 4)	45

Source: AllianceBernstein

initial stage involves the product conception and design, or intellectual capital. Then, the company sources the parts and components required to produce the item. During final assembly, additional value is added. Finally, distribution costs and profit margins are calculated for both the manufacturer and the retailer.

For simplicity, we assigned similar values for each step of Widgets Inc's process in the US—\$20 from the first stage, \$30 for the parts and components, \$20 for the assembly and \$30 for distribution costs and profits. In the real world, the value-added from each stage of processing might be markedly different.

In the second example, we assumed that Widgets International shifted sourcing and assembly to locations in China and Taiwan in order to reduce production costs by 30%. The company incurred a marginal increase in transportation costs from shipping the product back to the US. But even when accounting for the import costs, the product was more profitable than when it was manufactured in the US.

Country Allocation Is Complicated

What changed when Widgets went global? The first stage remained the same, with the value-added at \$20. However, the costs of parts, components and assembly dropped to \$35—a decline of \$15, or 30%. Value-added from distribution and profit margins rises by \$15 to \$45. The total value-added is still \$100—the same as when Widgets' entire process was done domestically.

The main difference between the two cases is how the value-added is allocated between countries involved in the product's design, production and distribution. Trade statistics are designed to measure the gross value of a product. So, for Widgets International, the total value of imports to the US—where the product

was initially created—would be \$55. That includes the \$35 costs for parts, components and final assembly in China and Taiwan. It also includes the \$20 assigned to intellectual capital during the first stage—even though the product's innovative component came from the US.

This is where the flaw lies in current methods of measuring trade and GDP. Trade statistics, in some cases, are capturing value-added in imports that includes a domestic content. So in this hypothetical example, the import value of \$55 is overstated by \$20. The domestic value-added includes only the distribution and profit margins and is understated by a similar amount.

Is the iPod a Chinese Product?

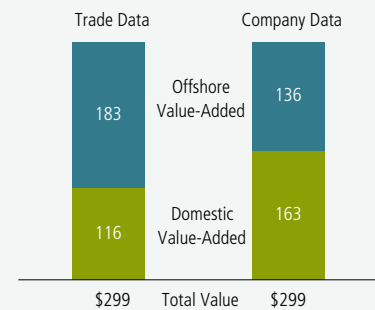
The Apple iPod is a case in point. According to a 2007 study, *Who Captures Value in a Global Innovation System? The Case of Apple's iPod*, only \$4 of the iPod's \$299 retail price is accounted for by the assembly and testing in China.¹ Yet the trade data, based on gross value, shows that every iPod imported to the US has a wholesale value of \$183 attributed to China, which includes parts sourced from Japan, Korea and the US (**Display 3**).

The authors argue that based on the role of each company in the iPod's global supply chain, the US accounts for \$163 of the product's value, while offshore entities account for \$136. However, based on official trade statistics, \$183 of the iPod's value is attributed to offshore entities and only \$116 is assigned to US GDP.

Because GDP is based on trade data, the US is getting only 39% of the value added of an iPod. But if GDP was based on company data, 55% of the product's value would be attributed to the US. It's impossible to quantify the distortion caused by the global supply chain overall on trade and GDP. Like the iPod, many high-tech imports, which are designed

Display 3
The Case of the iPod

Geographical Value-Added of Apple's iPod



Source: University of California's study *Who Captures Value in a Global Innovation System? The Case of Apple's iPod* June 2007, and AllianceBernstein

and branded in the US but produced offshore, may be causing imports to be overstated and exports to be understated.

Fixing the Accounting System

US statistical agencies are aware of the issue. We recently learned that the Bureau of Economic Analysis, the US government agency charged with measuring GDP, plans to begin capitalizing research and development (R&D) in 2013. This should help capture some of the intellectual capital missed in current estimates. However, this will only be a partial fix: categorizing R&D as a capital good and adding it to the capital stock would increase the level of investment in the US, but it would not correct the potential measurement errors in the trade data.

In our view, a new accounting system is needed to track the value added from the global supply chain, aimed at getting a more accurate country allocation of goods manufactured globally. Getting this right is not just an academic exercise, as it would have a direct impact on GDP, which is based on the country in which goods and services are created. ■

Greg Linden, Kenneth L. Kraemer and Jason Dedrick, *Who Captures Value in a Global Innovation System? The Case of Apple's iPod*, University of California, Irvine (June 2007)

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