

Capturing Value in Global Networks: Apple's iPad and iPhone

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Abstract

This article analyzes the distribution of value from innovation in the global supply chains of the Apple iPad and iPhone. We find that Apple continues to capture the largest share of value from these innovations. While these products, including most of their components, are manufactured in China, the primary benefits go to the U.S. economy as Apple continues to keep most of its product design, software development, product management, marketing and other high-wage functions in the U.S. China's role is much smaller than most casual observers would think. A key finding for managers is that they need to beware of relying too heavily on single customers. With its control over the supply chain, Apple has the power to make and break the fortunes of many of its suppliers. A key finding for policymakers is that there is little value in electronics assembly. Bringing high-volume electronics assembly back to the U.S. is not the path to "good jobs" or economic growth.

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In an earlier article in *Communications of the ACM* [7], we conducted a micro-level economic analysis of Apple's iPod as a way of better understanding who captures the value in global innovation networks in the information and communications technology industry. Since the time when that research was conducted, however, Apple has extended its iPod approach, with notable success, into cellular handsets and tablet computing. The economics of these industries are somewhat different than that of personal entertainment devices like the iPod. In the cell phone industry, for example, the carriers play a gateway role in choosing and distributing handsets that may give them the opportunity to squeeze supplier margins. And in the case of tablet computing, Apple was trying to jump start a form factor that had proved notoriously difficult to gain acceptance in the market.

Our first task was therefore to apply our analytic methodology to Apple's iPhone and iPod supply chains to look at the distribution of value. On the basis of these and other global value chain analyses [4, 5, 7, 8] that we have conducted, we revisit our earlier findings, deepening the implications for managers and policymakers with insights from the evolution of Apple's value chains. We also use our findings to shed light on one aspect of a policy question that has gained increasing prominence in recent years: what, if anything, should be done to promote manufacturing in the United States?

Who captures the financial value?

Like the iPod, the iPad and the iPhone are big money makers for Apple. While other companies are thrilled to be part of the supply chain for these highly successful products, their benefit in dollar terms pales in comparison to Apple's. Among countries, China's economy continues to play a surprisingly small role in comparison to the U.S., Korea, Japan and Taiwan

In the case of the iPad, Apple keeps about 30% of the sales price of its low-end \$499 16GB, Wi-Fi only model (and more if the unit is sold through Apple's retail outlets or online store). We estimate that Apple keeps a healthier 58% of the sales price of the iPhone 4. In both cases, these are far greater than the amounts received by any other firms in the supply chain.

Although the iPad in our analysis was an entry-level model, with a correspondingly low margin, the estimated gross margins for all iPad models are 5-10% lower than those for the iPhone 4 [2]. This suggests that the iPad is targeting a more price sensitive consumer entertainment niche, while the iPhone inhabits a converged communications and computing niche where price is less of an object.

The iPhone also benefits from the fact that the price received by Apple, at least until the recent availability of "unlocked iPhones", is not paid directly by the consumer because of a subsidy offered by the carrier in exchange for a contract. This brings us to the question of whether carriers exert market power over handset suppliers as we anticipated. Our analysis [5] of the smartphone value chain showed that carriers in fact earn gross profits over the life of a typical 2-year contract several times those earned by handset vendors. This suggests (and industry analysis further supports) that the carrier's primary market power is exercised over its subscribers. The carrier then negotiates over the distribution of the resulting profits with handset suppliers that can help it to attract and retain subscribers.

After Apple, the next biggest beneficiaries in the iPad and iPhone supply chains are Korean companies such as LG and Samsung, who provide the display and memory chips, and whose gross profits account for 5% and 7%, respectively, of the sales price for the iPhone and iPad.³ U.S., Japanese and Taiwanese suppliers capture 1-2% each. But overall, the story remains the same, with Apple's success benefiting its shareholders, workers, and the U.S. economy more generally.

The two charts below show the breakdown in detail. In each case, we provide the geographical distribution of the gross profits received by the first-tier suppliers. We break down the remaining cost of inputs into materials and labor.

The main difference between the two charts is that the iPhone, shows no amount for "Distribution and retail" because Apple is paid directly by a cellular company, such as AT&T or Verizon, which then handles the final stage of the sale.

³ Press reports indicate that Apple also uses alternate sources from Japan and Taiwan for these components, but that LG and Samsung are the primary suppliers.

Figure 1. Distribution of value for iPhone, 2010

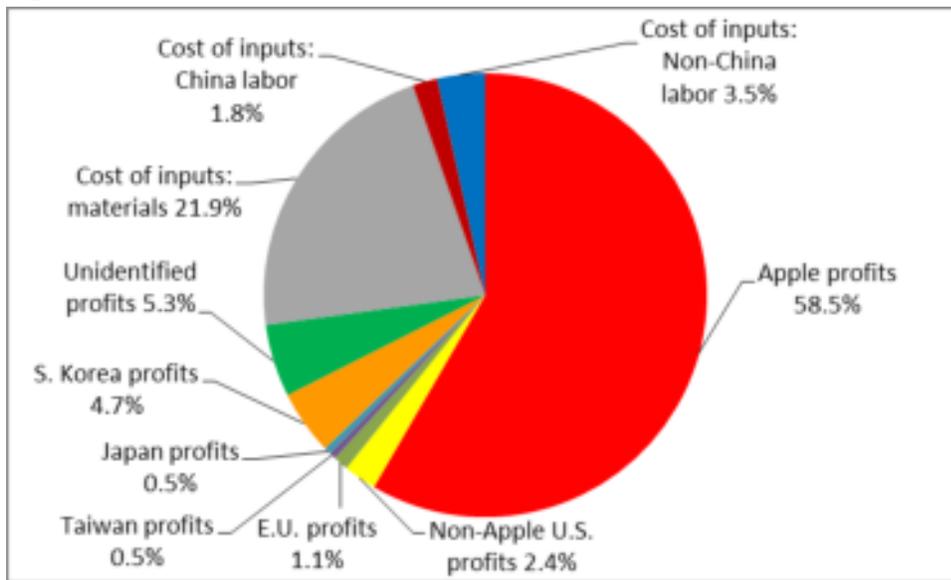
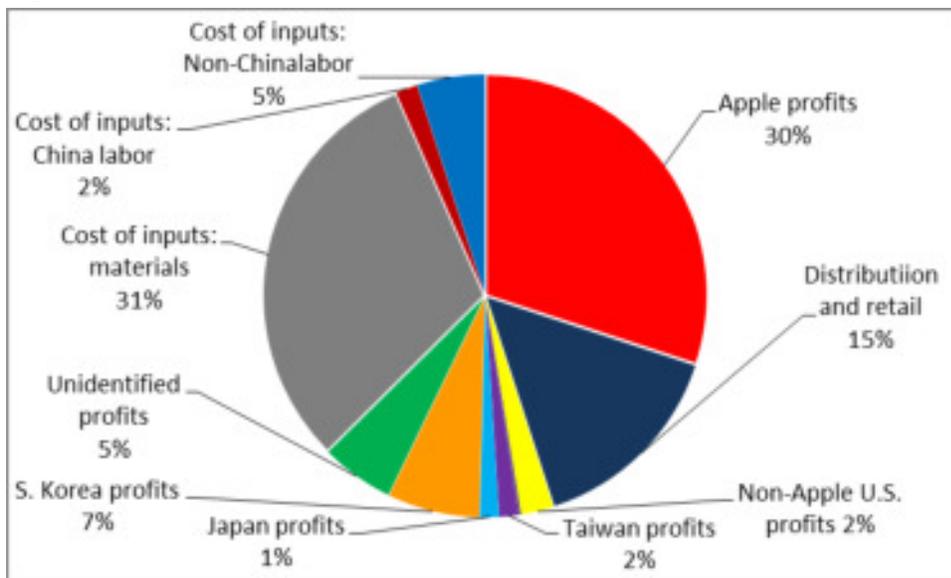


Figure 2. Distribution of value for iPad



The role of China

It is a common misconception that China, where the iPad is assembled, receives a large share of money paid for electronics goods. That is not true of any name-brand products from U.S. firms that we've studied. The breakdown of value in these two iconic Apple products shows why. First, our assignment of profits (which exclude wages paid) to first-tier suppliers is based on the location of their corporate headquarters. There are no known Chinese suppliers to the iPhone

or iPad. The iPhone and iPad are assembled in mainland China factories owned by Foxconn, a Taiwan-based firm.

That means that the main financial benefit to China takes the form of wages paid for the assembly of the product or for manufacturing of some of the inputs. Many components, such as batteries and touchscreens, receive their final processing in China in factories owned by foreign firms. Although hard facts are scarce, we estimate that only \$10 or less in direct labor wages that go into an iPhone or iPad is paid to China workers. So while each unit sold in the U.S. adds from \$229 to \$275 to the U.S.-China trade deficit (the estimated factory costs⁴ of an iPhone or iPad), the portion retained in China's economy is a tiny fraction of that amount.

Compared with our earlier analyses of the iPod value chain, the share of value captured by Korean suppliers has surpassed that for Japanese firms. We would not be surprised if China's share of value capture (e.g., the gross profits of second- or third-tier suppliers) has increased as well. But, because of the inadequate data collected by trade and other statistical agencies, we are left with educated guesses on that issue.

What these data illustrate is that the U.S.-China trade deficit reflected in the trade statistics for electronic goods is comprised of China's small direct labor input plus large inputs of parts and components (including the labor) from the U.S., the E.U. and other countries in Asia as shown below.

Conclusion

The picture of global value chains that emerges from this study and our previous work has important implications for managers and policymakers.

For managers, particularly those in supplier firms, life in the value chain can be volatile even beyond the whipsaw effect as shifts in consumer demand work their way through the supply system. In a globalized industry, most suppliers are at the mercy of decisions by the lead firms in the value chain, with powerful suppliers like Intel remaining rare exceptions. Japanese suppliers, who had the edge with early iPod models, have been largely replaced by Korean suppliers Samsung and LG in the iPhone and iPad, partly because of the shift from hard drive to flash memory storage. Apple also replaced Silicon Valley chipmaker PortalPlayer with Samsung as the supplier of a key microprocessor, and is rumored to be displacing a Samsung-produced processor in upcoming models with a combination of internal chip design and Taiwanese manufacturing.

Globalization can, of course, be equally hard on lead firms. Threats to Apple's current position in cell phones and tablets abound. The relatively brief history of the mobile electronics industry has already seen the rise and fall of Palm, Motorola and Nokia. Threats can come from valued suppliers as well as from traditional rivals. Apple has sued Samsung and filed a case with the U.S. International Trade Commission due to Samsung's recent introduction of a phone and tablet PC that allegedly infringes on Apple patents [3].

For policymakers, this study underscores our previous findings that the identity of companies continues to matter even in a highly globalized industry like electronics. While the iPhone and iPad, including most of their components, are manufactured offshore, the most value from these products goes to Apple, an American company, which in turn rewards its (predominantly American) employees and stockholders.

Apple continues to keep most of its product design, software development, product management, marketing and other high-wage functions in the U.S. In the case of the iPod, we found that Apple pays more wages to the United States than went to its entire offshore supply chain [8]. There may be many reasons that Apple and other high-tech companies keep their highest-value functions at or near their headquarters, including accidents of history, the need to protect intellectual property, the importance of the U.S. as a leading market, or the belief that creative work is best done by single-location teams. This "stickiness" is by no means guaranteed to last, and the gradual expansion of the share of offshore R&D and other corporate service functions by U.S.-based firms suggests a trend toward greater dispersion. Policymakers must recognize that they are competing for the location of these "overhead" operations just as much as for manufacturing, which we discuss below.

This study also confirms our earlier finding that trade statistics can mislead as much as inform. Earlier we found that for every \$299 iPod sold in the U.S., the U.S. trade deficit with China increased by about \$150. For the iPhone and the iPad, the increase is about \$229 and \$275 respectively. Yet the value captured from these products through assembly in China is around \$10. Statistical agencies are developing tools to gain a more accurate breakdown of the origins of traded goods by value added, which will be attributed based on the location of processing, not on the location of ownership. This will eventually provide a clearer picture of who our trading partners really are,⁵ but, while this lengthy process unfolds, countries will still be arguing based on misleading data.

⁴ Factory cost is defined as the product's bill of materials plus direct labor for assembly.

⁵ According to Branstetter and Lardy [1], China's "domestic value-added accounts for only 15 percent of the value of exported electronic and information technology products" (p.38). The advanced Apple products we have

Finally, our study also shows that “manufacturing” is not necessarily the path back to “good jobs”. The need for the U.S. to rebuild its manufacturing base has gotten greater attention lately from both pundits and policymakers, including a newly launched “Advanced Manufacturing Partnership” [11].

Those who decry the decline of U.S. manufacturing too often point at the offshoring of assembly for electronics goods like the iPhone [9]. Our analysis here and elsewhere [especially [5)] makes clear that there is simply little value in electronics assembly. The gradual concentration of electronics manufacturing in Asia over the past 30 years cannot be reversed in the short- to medium-term without undermining the relatively free flow of goods, capital, and people that provides the basis for the global economy. And even if high-volume assembly expands in North America, this will likely take place in Mexico where there is already a relatively low-cost electronics assembly infrastructure.

We do not mean to imply that there is no hope for U.S. manufacturing. Initiatives to improve education, support domestic manufacturers, and realign global currencies can slowly rebuild the U.S. manufacturing infrastructure for advanced products. Our point is that, while offshore electronics assembly makes an easy target, especially with unemployment above 9%, this is largely irrelevant to the task of enhancing U.S. competitiveness for manufacturing.

In the meantime, the best U.S. companies will continue to create tremendous value (and high-wage jobs) by mobilizing the best resources, wherever in the world they may be.

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analyzed may well understate China’s average value added in its electronics exports, but they serve to make the general point that many nations are substantially involved in the value chains behind these exports.

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Appendix A. Value Capture Details

The findings reported above are based on our value capture methodology [4, 8] with the results shown in Table 1 below. It reflects our best estimates of value added from the two Apple products. We have attempted to reconcile conflicting estimates gathered from various industry sources. Our starting point is the teardown data released by iSuppli [6, 10], to which we add our own research. The resulting estimates should not be seen as anything more than a general indication of the relative size of the reported values.

The value added breakdown is calculated for the wholesale price. The gross mark-up for distribution and retail (or a subsidy from the phone company in the case of the iPhone) is shown only to reconcile to the final prices familiar to consumers.

Value added is broken down into its two components: (1) the gross profits earned by companies (which we call Value Capture) and (2) the cost of direct labor. The remainder of the production cost is the non-labor cost for producing the inputs (the parts and components that go into these two products).

Value capture for the primary components in each product is assigned to the headquarters location of each company, where it could be identified. Direct labor value is not assigned geographically, except in the case of assembly, which is known to occur in China. Some portion of the remaining direct labor will also be attributable to China. China's economy also benefits from some unknown share of the non-labor costs for producing inputs.

We have not made any geographic apportionment of the distribution and retail value, which varies depending on the country where each unit is sold. Some portion of the distribution and retail value is attributable to Apple for units sold from Apple's physical and online retail outlets.

Table 1. Value added in value chains of iPhone 4 and iPad, by location and activity: 2010

Location/ Company	Activity	iPhone 4 (2010)		16 GB Wi-Fi iPad (2010)	
		Amount/Cost	Share of "Retail"	Amount/Cost	Share of "Retail"
	Price to consumer	\$199		\$499	
	Carrier subsidy	(\$350)		NA	
Worldwide	"Retail" price	\$549	100.0	\$499	100.0
Worldwide	Distribution and retail (Gross value)	NA	0.0	\$75	15.0
	Wholesale price (received by Apple)	\$549	100.0	\$424	85.0
Value Capture	Total value capture	\$401	73.0	\$238	47.7
U.S.	U.S. Total	\$334	60.8	\$162	32.5
Apple	Design/marketing	\$321	58.5	\$150	30.1
U.S. suppliers	Manufacturing of components	\$13	2.4	\$12	2.4
Japan	Manufacturing of components	\$3	0.5	\$7	1.4
South Korea	Manufacturing of components	\$26	4.7	\$34	6.8
Taiwan	Manufacturing of components	\$3	0.5	\$7	1.4
E.U.	Manufacturing of components	\$6	1.1	\$1	0.2
Unidentified	Manufacturing of components	\$29	5.3	\$27	5.4
Direct Labor	Total direct labor	\$29	5.3	\$33	6.6
Unidentified	Labor to manufacture components	\$19	3.5	\$25	5.0
China	Labor for components and for assembly	\$10	1.8	\$8	1.6
Worldwide	Non-labor cost of materials for inputs	\$120	21.9	\$154	30.9

Source: Authors' estimates.

NA = not applicable

TABLE NOTES: The iPhone 4 is configured with 16GB of memory. The iPad is configured with 16GB of memory and no cellular access. Value added is the amount contributed by country, firm, or other entity to value of good or service and excludes purchases of domestic and imported materials and inputs. Value capture is value added excluding the cost of direct labor, which is the same as gross profit. Some numbers do not add to their respective totals due to rounding.