

**Estimated Impacts of Proposed Tariffs on Imports from China:
Connected Devices and Printed Circuit Assemblies**

Prepared for

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President Donald Trump has proposed that the United States impose tariffs of between 10 percent and 25 percent on imports of \$200 billion in goods imported from China. We assess those impacts below for printed circuit assemblies and connected devices.

We have employed a model, described in Appendix A, to estimate the ultimate impacts on U.S. consumers of the imposition of 10 percent tariffs and 25 percent tariffs on imports of products in these categories from China. The model identifies the shifts that will occur from China to other sources of supply. The products are: (i)(HTS 8517.62.00), Machines for the reception, conversion and transmission or regeneration of voice, images or other data, including switching and routing apparatus, referred to in this study as "connected devices;" and (ii) (HTS 8473.30.11) Printed circuit assemblies, not incorporating a cathode ray tube, of the machines of 8471, referred to in this study as "printed circuit assemblies."

The results show that even accounting for alternative sources of supply, the proposed tariffs will have a substantial negative impact on American consumers (downstream producers in the case of the first product, and American households and other purchasers in the case of the second).

Printed Circuit Assemblies (HTS 8473.30.11)

This Harmonized Tariff System (HTS) product category targeted for tariffs includes printed circuit assemblies, an input into the production of countless products in today's economy. Imposition of the tariffs causes some sourcing of U.S. imports from China of printed circuit assemblies to shift to U.S. producers and other countries such as Mexico, Malaysia, Thailand and Taiwan. U.S. purchasers of printed circuit assemblies will see prices of Chinese products jump by 9 to 23 percent (for the 10 percent and 25 percent tariffs, respectively); costs of alternative supply from U.S. manufacturers will also be higher by 2 to 3 percent. As a result of

higher costs, totaling \$900 million to \$1.8 billion more, American manufacturers of products that contain printed circuit assemblies will purchase between 6 and 12 percent less from suppliers overall.

Overall, considering U.S. producer gains, increased tariff revenues, and losses incurred by consumers and the economy generally, tariffs will cost the economy anywhere between \$110 million to \$613 million annually.

	10% Tariffs	25% Tariffs
Change in Price of Chinese Imports	+9.0%	+23.0%
Change in Chinese Production	-2.2%	-3.9%
Change in U.S. Production	+1.5%	+2.9%
Change in Prices of U.S.-Made PC Assemblies	+2.0%	+3.9%
Change in Prices to U.S. Consumers	+3.3%	+6.3%
Impact on Consumption	-6.4%	-11.8%
Reduction in Purchaser Spending Power	-\$899.9 mill.	-\$1.8 bill.
Net Impact on U.S. Economy	-\$109.6 mill.	-\$612.8 mill.

Connected Devices (HTS 8517.62.00)

This HTS product category, also targeted for tariffs, includes products across the ecosystem of the “Internet of things” (IoT). This single tariff line captures products needed by data centers to make the internet work, networking equipment that most businesses need to connect to the internet and operate office networks, as well as products that consumers need to access the web and enjoy its content. The products captured include gateways, modems, wi-fi routers, portable cellular access points, portable and smart Bluetooth speakers, Bluetooth wireless headsets, fitness trackers, smartwatches and other Bluetooth enabled smart technologies such as whole-home controls.

Due to the imposition of tariffs on U.S. imports from China of these connected devices, sourcing will shift to a number of other countries, but only marginally to U.S. producers. Although alternative supply is available from countries such as Korea, the Philippines, Taiwan and Malaysia, prices for these products from all sources rise overall by between 3.2 and 6.2 percent (for the 10 percent and 25 percent tariffs, respectively). The price of Chinese goods will increase by between 8.5 and 22 percent. As a result, U.S. consumers (businesses and households) will purchase 6 to 12 percent fewer wireless telecommunications products in this HTS category.

In addition, American consumers will have to spend more due to higher prices on products affected by tariffs, between \$1.6 billion and \$3.2 billion more. Overall, considering U.S.

producer gains, increased tariff revenues, and losses incurred by consumers and the economy generally, tariffs will cost the economy anywhere between \$110 million to \$613 million annually.

	10% Tariffs	25% Tariffs
Change in Price of Chinese Imports	+8.5%	+22.0%
Change in Chinese Production	-3.3%	-5.9%
Change in U.S. Production	+0.4%	+0.9%
Change in Prices of U.S.-Made Connected Devices	+0.5%	+1.2%
Change in Prices to U.S. Consumers	+3.2%	+6.2%
Impact on Consumption	-6.2%	-11.6%
Reduction in Consumer Spending Power	-\$1.6 bill.	-\$3.2 bill.
Net Impact on U.S. Economy	-\$411.2 mill.	-\$1.8 bill.

A variety of consumer technology products are imported under HTS code 8517.62.00, many of which play a part in the connected home and IoT ecosystem. To better illustrate the effects of the proposed tariffs, we have applied price and sales volume impacts, as predicted by the model, to specific products covered by this code. The baseline values in the chart below represent forecasted 2019 factory sales to U.S. dealers, as published in the Consumer Technology Association's *U.S. Consumer Technology Sales and Forecasts (July 2018)*.

Factory Sales to U.S. Dealers, Wholesale Values, 2019 Forecast (CTA)	CTA Current Forecast, 2019		
	Units (Thousands)	Revenue (\$ Millions)	Average Wholesale Price
Product Imported Under HTS 8517.62.00			
Fitness Activity Trackers	20,114	\$1,465	\$73
Smartwatches	17,256	\$3,934	\$228
Wireless Headphones (except earbuds)	10,397	\$1,066	\$103
Modems / Broadband Gateways	25,134	\$2,296	\$91
Wireless Earbuds	14,196	\$1,351	\$95
Smart Speakers	44,352	\$3,797	\$86

Factory Sales to U.S. Dealers, Wholesale Values, 2019 Forecast	10 Percent Tariff Scenario				
	Units (Thousands)	Change in Units (Thousands)	Revenue (\$ Millions)	Change in Revenue (\$ Millions)	Average Wholesale Price
Product Imported Under HTS 8517.62.00					
Fitness Activity Trackers	18,907	-1,207	\$1,421	-\$44	\$75
Smartwatches	16,221	-1,035	\$3,817	-\$118	\$235
Wireless Headphones (except earbuds)	9,773	-624	\$1,034	-\$32	\$106
Modems / Broadband Gateways	23,626	-1,508	\$2,227	-\$69	\$94
Wireless Earbuds	13,345	-852	\$1,311	-\$40	\$98
Smart Speakers	41,691	-2,661	\$3,683	-\$114	\$88

Factory Sales to U.S. Dealers, Wholesale Values, 2019 Forecast	25 Percent Tariff Scenario				
	Units (Thousands)	Change in Units (Thousands)	Revenue (\$ Millions)	Change in Revenue (\$ Millions)	Average Wholesale Price
Product Imported Under HTS 8517.62.00					
Fitness Activity Trackers	17,700	-2,414	\$1,369	-\$96	\$77
Smartwatches	15,186	-2,071	\$3,677	-\$257	\$242
Wireless Headphones (except earbuds)	9,149	-1,248	\$996	-\$70	\$109
Modems / Broadband Gateways	22,118	-3,016	\$2,146	-\$150	\$97
Wireless Earbuds	12,493	-1,704	\$1,263	-\$88	\$101
Smart Speakers	39,030	-5,322	\$3,548	-\$248	\$91

Appendix A Methodology

We employed a modeling strategy for industry-focused globally-linked partial equilibrium analysis of tariff policy.

Based on the Harmonized Tariff Schedule (HTS) items identified in the *Federal Register* notice as proposed for tariffs of 10 percent, or 25 percent, when imported from China, we have built a set of product-specific models based on the “global simulation model” framework (GSIM). Francois and Hall (2007) developed GSIM to allow detailed analysis of tariff scenarios across individual products and potentially all major trading countries and blocks. The World Bank and the United Nations adopted the GSIM framework, integrating it into the joint World Bank-UNCTAD trade data portal known as the “World Integrated Trade Solution,” or WITS (see <http://wits.worldbank.org/wits/>).^[1] The basic framework employed here can be implemented with a spreadsheet-based interface. We should stress that, in implementation, this set of models is structurally consistent with the recent class of Eaton-Kortum based structural trade models (see Bekkers *et al*, 2015; Costinot and Rodriguez-Clare, 2014 for example).

The basic approach involves specifying global supply and demand for each set of goods produced by a particular country as the sum of individual (national) sources of supply and demand. This is done for goods produced in all regions in the model. We are then able to reduce the solution set of the model to those global prices that clear global markets. Once we have a global set of equilibrium prices, we can obtain national results (changes in prices and quantities). Based on price and quantity changes, we in turn obtain estimates of changes in production, trade, consumer and producer surplus, and real national income that result from the imposition of tariffs on imports from China. Within this context, we work with a non-linear representation of import demand, combined with generic export-supply equations (see Francois and Hall 2007).

Data Sources

Trade data and tariffs are from “World Integrated Trade Solution,” or WITS (see <http://wits.worldbank.org/wits/>) and the U.S. Census Bureau.

Production data (domestic sales) are from country input/output tables and from the Census Bureau’s Annual Survey of Manufacturers. The latest data from that resource is 2016, so all import data are also for 2016.

Trade elasticities are from the Global Trade Analysis Project (GTAP).

Country Disaggregation

Canada (CAN)

China (CHN)

European Union (EUN)

Israel (ISR)

Japan (JPN)

Korea (KOR)

Mexico (MEX)

Malaysia (MYS)

Philippines (PHL)

Singapore (SGP)

Taiwan (TWN)

Rest of World (ROW)

Vietnam (VNM)

United States (USA)

[1] Another application, the MRPE model, is a specialized, scalable extension of the GSIM framework for strategic trade policy assessments at the detailed sector level, developed for the European Commission.