

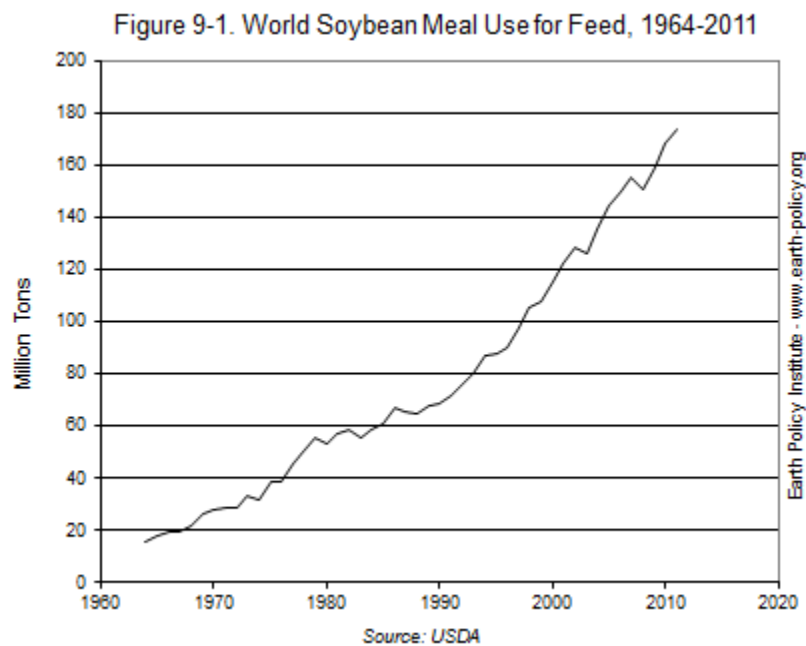
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## **Soy: A Sticky Situation**

Two hundred years ago, soybean was scarcely grown outside of Asia. Now it's one of the largest crops in the world, with almost 350 million metric tons planted worldwide in 2016-17. Most soy is processed into soy meal to feed the world's 1.4 billion cattle and 1 billion pigs. Given soy's importance in the present (and potential for the future), it is imperative to pay attention to changes in the soybean industry. And things are changing quickly. On June 2018, the Trump administration posted a 25% tariff on steel and a 10% tariff on aluminum. In retaliation, China posted a 25% tariff on American soybeans. Although many have noted the short-term effects, China's actions will impact the soybean market in the long run. Soybean farmers - especially American soybean farmers- will feel the effect of China's tariff long after the tariff itself is lifted. By comparing today's trade war with the 1980 grain embargo, we can see that Chinese tariffs will permanently lower US soy market share and economically crush most small farms and surrounding communities. Meanwhile, Brazil's market share will increase, while technology could increase profits from soy and bring new producers to the soy market in the future.

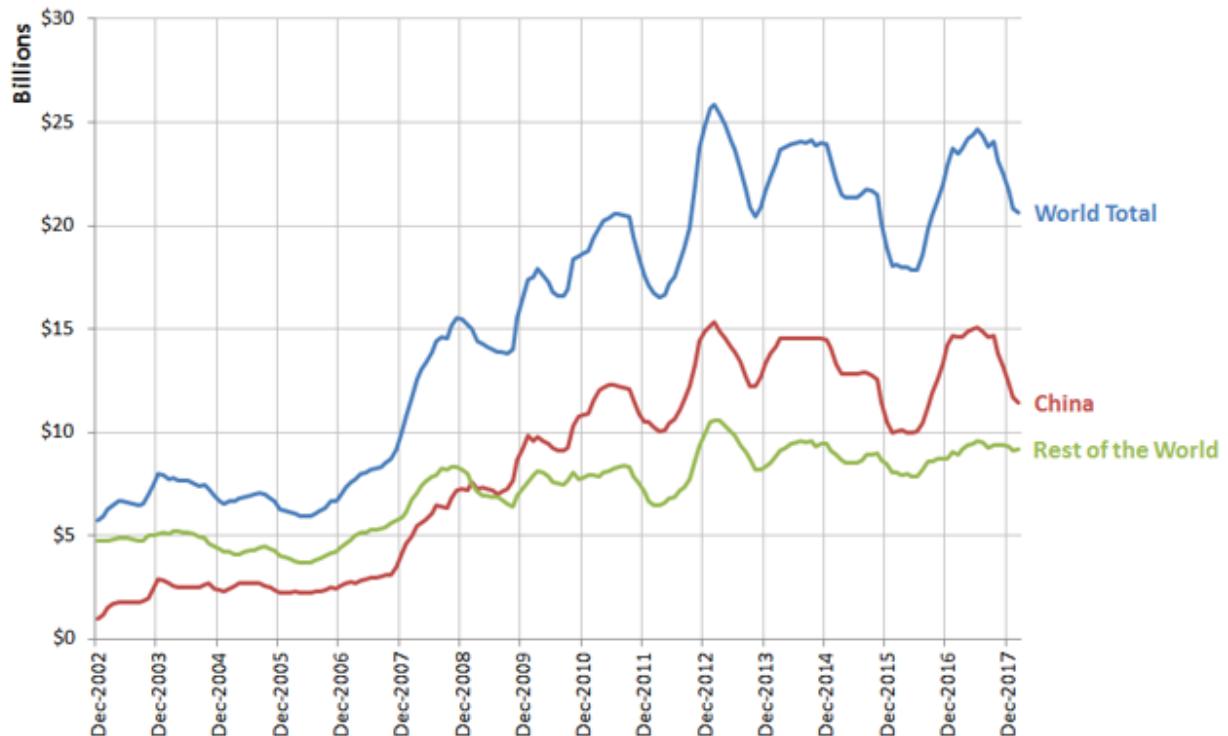
Historical studies indicate that soybean farming began in China (predominantly Manchuria) around the 12th century. By the time soybeans arrived in North America in 1765, they were mainly used to create 2 refined commodities: soy oil and soy meal. Soy oil is for human consumption, while soy meal is used to feed livestock. While cotton and corn plants receive nitrogen from the soil, soy plants receive it directly from the air. When soy is planted, the soil is able to replenish its own nitrogen unhindered. So later, the soil is more productive with crops like corn or cotton. Consequently, if farmers rotated soy with cotton or corn, their cotton or corn yields would increase. So American farmers began producing a lot more soy, but before 1907, China always produced at least 70% of the world's soy. However, the outbreak of war in Manchuria in the 1930s depleted that area's soy production. With the leading soy producer devastated by World War II, the US took the lead in soybean production throughout the 1940s.

But the real pivotal decade for soy was the 1950s. Animal nutritionists found that the most protein-packed, cost-effective feed for livestock was 20% soy and 80% wheat. This was a lot more soy than previously thought. Soon, soy meal (for animals) became a lot more important than soy oil (for humans). More importantly, soybean became a true cash crop. Demand for soy skyrocketed, and the second half of the 20th century saw constant innovation to produce soy efficiently. As a result, soy production soared, as shown by the graph.



Today, the main exporters are Brazil and US, who each accounted for roughly 40% of total soybean exports last year. The largest importer of soy, by far, is China. Alone, it accounted for 60% of all imports last year. As Chinese society has become richer in the past 25 years, consumption of meat has skyrocketed. To meet this demand, Chinese production of livestock increased from 142 million to 441 million between 1980 and 2010. Today, almost half the world's pigs are in China, and they are fed soy. From the graph, it's clear that half of all US soy exports go to China.

**Trailing Twelve Month Value of U.S. Soybean Exports to the World and to China, December 2002 through February 2018**



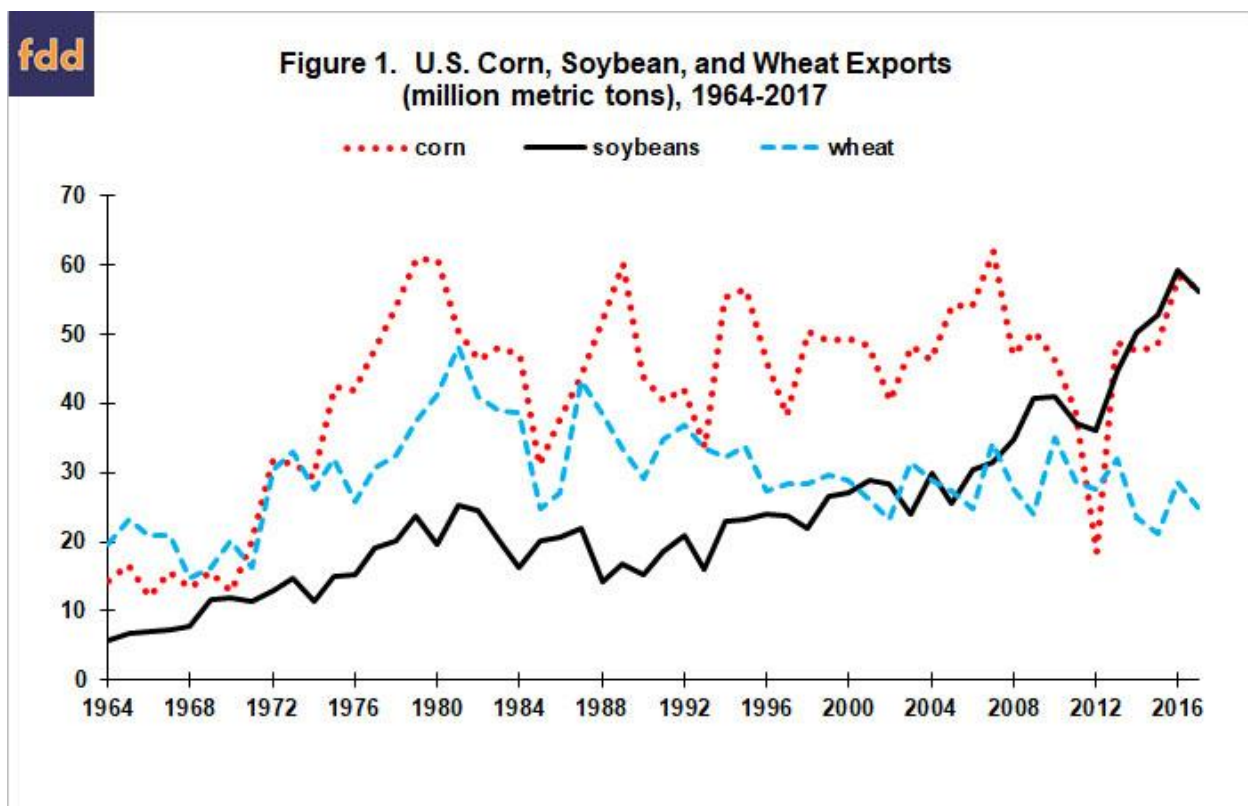
Source: U.S. Census Bureau - USA Trade Online

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Since its domestication 900 years ago, soybean has become a critical crop for meat-consuming societies. In the last century, a number of factors have caused soybean farming to shift from Manchuria to Brazil and the US. However, Chinese tariffs could inflict long-term damage on the US soy industry.

Although many compare Trump's tariffs to the Hawley-Smoot tariff of 1930, this comparison isn't useful for the soybean market. At the time of Hawley-Smoot, China was the main producer and main consumer of soy, so there wasn't much of an international trade in soy. So the 1980 soy embargo is a much better parallel. The 1980 embargo of soy led to a permanent decrease of US market share of soy, as Brazil production rose to meet the USSR demand; meanwhile, farms across the Midwest went out of business. In 1972, the US and USSR signed a multi-year contract, allowing the US to sell 440 million bushels of soy to the USSR. Farmers profited immensely from the large market in the Soviet Union. But after the 1980 Soviet invasion

of Afghanistan, President Jimmy Carter banned the sale of soy from the US to the USSR. As a result, the USSR looked within its own borders to produce soy. More importantly, Brazil, then a fringe exporter, took advantage of the Russian demand for soy. As shown by the graph, before the embargo, the US exported more than 20 million metric tons of soy. While the embargo was in effect in 1980, soy exports dropped. Around 1981, exports rebounded, but had decreased by 1984. This is because Brazil was now a big player in the market. After 1984, US soy exports never returned to pre-embargo levels until the mid 1990s. So although US soy exports rebounded shortly after the embargo was lifted, in the long run the embargo debilitated US market share of soy until the 1990s. And that was only due to the rise of a new soybean consumer- China.



Soy futures at this time also tell an interesting story. A soy future is essentially a contract for a producer to deliver a certain quantity of soy to the holder at a fixed date for a fixed price. If a future is created, and then soy prices suddenly increase, there will be high demand for that future, because the future allows a person to purchase soy at a less-than-market price. The high demand for that future pushes up the future's price. Likewise, a decrease in soy prices causes a decrease in demand for soy futures, because people would rather buy soy at the market price than

using the future. Thus, the value of soy futures is a good proxy for soy prices. Soy futures reached a high in 1972 (when the US agreed to sell soy to USSR). In fact, the next time soy futures reached the same value was in the late 1990s, when China was gorging on soy. And this had real effects domestically. Because of low prices, farmers received little revenue; as a result, they couldn't pay off the loans they had taken out to buy expensive farming equipment. Farms failed by the hundreds, and the small communities built around those farms slowly vanished. Due to the American embargo of soy in 1980, US farmers permanently lost market share and many farms suffered economically.

Of course, the world economy isn't the same as it was 50 years ago, and Trump's trade war isn't the same as the Cold War. But in certain ways the current situation in 2018 is actually a more extreme version of the soybean market in 1980. From that experience we can assert that the US market share of soy will decrease permanently; furthermore, communities centered around soy farming will suffer. In 1980, the US was the largest producer of soy. Today, the US and Brazil have roughly the same market share; therefore, American farms have less market power than they did 50 years ago. Consequently, they are more affected by market barriers than were the American farmers of 1980. Demand for soy was huge in the 1980s, and it's even more huge today. The short-term results of China's tariff are fairly clear-cut: Soy prices will be high in China and low everywhere else, and global markets will rearrange themselves. However, the long-term effects are much more bleak than short-term market inefficiencies. After the 1980 embargo, the market share of US soy farmers decreased permanently, as market share was taken by Brazil and the USSR itself. Likewise, after this tariff, US market share of soy will likely decrease again-permanently. As a result, the US will probably never be the world's top exporter of soy. The loss of market power will bring even more volatility to American farmers. The fate for farmers specifically may be worse than for farmers in the 1980s. Farming technology is even more advanced and expensive today than it was 40 years ago. Consequently, farmers today probably took out larger loans than they did a generation ago. Consequently, they will be less able to pay back their loans as a result of low prices. Although interest rates today are much lower than they were 40 years ago, the Fed has already begun to raise them, which may hinder these farmers' efforts to pay back their debts. Most small farms will be forced to auction off their property to the highest bidder. In some cases, this is a large farm, sometimes in another state. As

a result, these transactions will be handled by state banks, while the local banks (who deal with farmers a lot) will lose a significant portion of their clientele. Soon, communities built around farming and local banks will vanish, just as they did 40 years ago. While Trump's bail out of farmers elicited celebration, surely farmers know that such measure is insufficient in the long run. While Trump may get the farmers' votes during the next midterm election, his use of Depression-era tactics will not save farmers forever. Domestically, the long-term future of soybean farming is hurt by decreasing market share and increasing unemployment and shutdown within the industry.

However, the future of farming soy in America doesn't have to be this way. Technology has the capacity to change markets dramatically. Technology can benefit farmers by allowing them to cut costs or by spurring soybean demand; moreover, genetic modification and hybridization may allow soybeans to grow in countries other than Brazil and the US, resulting in soybean production in China itself or in new countries. The most clear-cut way technology can help farmers is by reducing costs. Throughout history, devices from the ox-driven plow to the modern reaper have allowed farmers to plant more and sell for less. It is possible that American farming technology or transport would improve to the point of making American soybeans cheaper than Brazilian soybeans- even after the application of the Chinese tariff. Consequently, the US market share of soybean would not decrease as much, and if the Chinese tariff is lifted, the US would increase its market share of soy. This assumes that the Chinese tariff policy remains the same. Interestingly, technology could also benefit farmers by increasing demand for soy in places other than China. For example, if a cheaper method producing biofuel from soybean oil was discovered, then demand for this biofuel would increase. As a result, demand for soy would increase. Lastly, genetic modification or hybridization could create new breeds of soy capable of growing in different climates. The soybean-producing regions of the US and Canada are roughly the same latitude as Manchuria, the original hub of soy. Thanks to hybridization, there are soybean varieties in Australia and Indonesia. Technology could allow these countries (or second-tier producers like Argentina or India) to produce soybean cheaply and increase their global market shares. As genetic modification continues to alter plants more and more, it may become economically viable to plant and produce soybeans in southern Africa. Such a development would aid the economies of such countries greatly. It's impossible to tell exactly

how technology will affect soybean in the long-run. But it is entirely possible that in the future, technology could cut costs of soybean production, increase demand for soybeans, or allow new countries to enter the international market.

Thus, while the short-term consequences of the tariff simply involve a rearrangement of the soybean trade, the long-term future is much more bleak, at least domestically. Meanwhile, technology may find ways to increase profits from soy production or open the market up for new players, from Australia to Africa. Clearly, the soybean market is important in the present, and has potential for the future. In the long run, human behavior patterns can change, altering demand. As soy becomes more expensive, meat (especially pork) prices will spike, since feed is input cost for meat. Consequently, the Chinese may consume less meat, and by force of habit, continue to consume less meat even after tariffs are lifted. Such a decrease in Chinese demand could be offset by consumers in the EU or regions' consuming a lot more meat. However, such a trend is difficult to predict. Like changes in technology, changes in human behavior are unexpected. If nothing else, the Chinese tariffs have brought about a lot of uncertainty about the long-term future of soybean markets. In the crossfire of a trade war, farmers have a lot more to worry about than the weather.

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