

Trade wars and their implications for developing countries

David Vanzetti, Lien Huong Do and Ralf Peters

The University of Western Australia, Australian National University and UNCTAD ¹

Contributed paper at 23rd Annual Conference on Global Economic Analysis

Tokyo, 17-19th June 2020

At the risk of damaging both countries, the United States initiated a rapidly escalating tariff war with China in March 2018. Two years later, the conflict has not been resolved, and threatens to undermine the rules-based multilateral trading system, as well as sparking a global recession.

The purpose of the additional tariffs, according to the USTR, is to “address the acts, policies, and practices of China that are unreasonable or discriminatory and that burden or restrict U.S. commerce”. These include practices that “coerce American companies into transferring their technology and intellectual property to domestic Chinese enterprises”. Seemingly, the purpose is not to address the US bilateral trade deficit with China, nor to protect the jobs of manufacturing workers in the rustbelt, as previous rhetoric would suggest, but to maintain a technological advantage seen as under threat.

The United States also claims that many of China’s private firms are in fact subsidised by the Government, contrary to WTO agreements, and thus have an unfair advantage. Since much credit is provided by state-owned banks, there is merit in these arguments. According to the Administration, the Chinese economic model is based on “state capitalism”, which conflicts with WTO agreements that require members to be a market economy. These conflicts are inherently difficult to resolve.

The United States stands to gains “billions” in tariff revenue, according to Mr Trump. The costs of tariffs are generally passed on to consumers, with no national benefit, but where a country has significant buying power import prices may fall sufficiently to make the tariff profitable, depending on the relevant elasticities. The optimal tariff is an empirical issue. With the help of a multi-region CGE model, we estimate the optimal across-the-board tariffs for the USA on imports from China. In the absence of retaliation, we find the optimal tariffs are positive, and somewhere closer to the 10 additional percentage points initially imposed rather than the 25 additional percentage points. At 25 per cent, the United States is making itself worse off.

Using the eight-digit tariff increases as proposed in December 2019, we aggregate to the GTAP sector level and analyse the trade and welfare effects on the United States, China and third countries assuming the standard long run closure. Results indicate that the US may enjoy welfare gains of \$4 billion while China would lose \$21 billion. If China retaliates, the US losses

¹ Contact: david.vanzetti@uwa.edu.au.

are estimated at \$16 billion while China loses \$29 billion. Thus, China is worse off, but in retaliating it provides the United States with an incentive to negotiate.

We show that the effects of a tariff only trade war may be beneficial to third countries, especially those that can supply the products that attract significant tariffs. One example is Brazil that supplies sorghum, a specialised feed for pigs. In general, most countries benefit from the trade diversion that occurs. Developing countries gain \$14 billion in annual welfare, with Brazil, Mexico and Vietnam benefitting the most. The main sectors to benefit in developing countries are oilseeds, electronics, manufacturing and apparel. However, in absolute terms the major beneficiaries are likely to be the European Union, Korea, Japan and Canada. Annual global losses are \$26 billion, significant, but manageable. We conclude with suggestions as to how developing countries can take advantage of any opportunities from an ongoing trade war.

The trade war has been overshadowed in recent months by the corona virus pandemic, which has severely interrupted trade. Global supply chains are likely to be permanently affected. Trade tensions are likely to re-emerge once international trade starts up again.

Keywords; Tariffs, trade wars, CGE,

1. Introduction

At the risk of damaging both countries, the United States initiated a rapidly escalating tariff war with China in March 2018. Almost two years later, the conflict has not been resolved, and threatens to undermine the rules-based multilateral trading system, as well as sparking a global recession.

The US Administration has several concerns, not easily resolved. One is the “theft of intellectual property” (USTR 2018b). The purpose of the additional tariffs is to “address the acts, policies, and practices of China that are unreasonable or discriminatory and that burden or restrict U.S. commerce”. These include practices that “coerce American companies into transferring their technology and intellectual property to domestic Chinese enterprises”. Seemingly, the purpose is not to address the US bilateral trade deficit with China, nor to protect the jobs of manufacturing workers in the rustbelt, as previous rhetoric would suggest, but to maintain a technological advantage seen as under threat. The USA is not alone in making such assertions.

Another long held US concern is that China manipulates its currency to enhance exports. In August 2019 the Chinese yuan fell to seven to the dollar, a symbolically important threshold.

The US also claims that many of China’s private firms are in fact subsidised by the Government, contrary to WTO agreements, and thus have an unfair advantage. Examples include shipbuilding, steelmaking, machinery and motor vehicles, semi-conductors and renewable energy. Since much credit is provided by state-owned banks, there is merit in this argument. According to the US, the Chinese economic model is based on “state capitalism”, which conflicts with WTO agreements that require members to be a market economy. These conflicts are inherently difficult to resolve.

Finally, the US stands to gain “billions” in tariff revenue, according to Mr Trump. The costs of tariffs are generally passed on to consumers, with no national benefit, but where a country has significant buying power import prices may fall sufficiently to make the tariff profitable, depending on the relevant elasticities. The optimal tariff is an empirical issue. We estimate the optimal across the board tariffs for the USA on imports from China. In the absence of retaliation, we find the optimal tariffs are positive, and somewhere closer to the 10 additional percentage points than the 25 per cent finally imposed. This gives the US an advantage, because it means a tariff war is less damaging to the US than China.

Assuming the promised tariffs are imposed, the question remains what the likely effects on the two protagonists might be.² Furthermore, what are the impacts on third countries not

² The result of the ongoing negotiations is unclear. In December 2019 the parties agreed to a managed trade Phase 1 deal whereby China would import over two years an additional US\$200 million of US goods and services, including \$50 million of agricultural goods. How this would be implemented is vague.

involved in the dispute. This includes countries that can export to the United States or China to fill the gap left by the imposition of tariffs.

We analyse the potential impact with the aid of a general equilibrium model that is ideally suited to examine bilateral tariffs. We show the effects of a tariff only trade war may be beneficial to third countries, especially those that can supply the products that attract significant tariffs. One example is Brazil that supplies sorghum, a specialised feed for pigs. Sorghum is on the China banned list because it is produced in the regions that provide strong support for the current US president. In general, most countries benefit from the trade diversion that occurs. Globally, of course, the effect is negative, but manageable.

The strategic interaction between the countries is unclear. The success of retaliatory action depends on how the opposition reacts. Assume the USA moves first. What should China do? Imposing retaliatory tariffs could have two results. The USA may back down, and remove its tariffs, or the USA may impose further tariffs, harming both countries. China must form a conjecture as to how the USA will respond. Likewise, the USA has to make a similar judgement. One advantage is that this is a repeated game, with each country having the opportunity to deescalate the confrontation.

Third countries face a similar dilemma. They could retaliate against the US, and put pressure on it to back down. However, incentives are mixed. Third countries may gain from a US-China tariff war, assuming it doesn't lead to a global recession. While stock markets react strongly to ups and down in the negotiations, we show that the effects of the tariff themselves are manageable.

An eye for an eye

At the beginning of 2018, US tariffs on exports from China averaged around three per cent while China's tariff on US exports were around eight per cent. By September 2019, the averages were around 21 per cent. How did it get to this? After months of rhetoric, the United States imposed multilateral tariffs on solar panels and washing machines in February 2018 and the next month on steel and aluminium. After negotiation, many countries obtained exemptions, although China was not one of these. On April 2nd China retaliated with a list of 128 products for which additional 10-25 per cent tariffs would be imposed on imports from the United States, and then on April 6th the United States responded with a list of 1,333 products that would attract an additional 25 per cent tariff. This list (List 1) was subsequently revised to 818, which covered imports worth \$34 billion. These tariffs were imposed on July 6th. At that point, average tariffs started to increase noticeably, to 7 and 10 per cent for the US and China respectively. See the timeline in table 1.

Table 1 Timeline

Date	Products	USA average tariff rate	China's average tariff rate

		on China's exports (%)	on US exports (%)
January 2018		3.1	8
7 th February 2018	US Section 201 tariffs on solar panels and washing machines	3.2	
23 rd March 2018	US Section 232 tariffs on steel and aluminium	3.8	
2 nd April 2018	China's retaliation to US Section 232 tariffs		8.4
1 st May 2018	China's MFN tariff cut on pharmaceuticals		8.3
1 st July 2018	China's MFN tariff cut on consumer goods, autos, and ITA products		7.2
6 th July 2018	US Section 301 tariffs (\$34 billion) (25% on List 1) and China's retaliation (\$34 billion)	6.7	10.1
23 rd August 2018	US Section 301 tariffs (\$16 billion) (25% on List 2) and China's retaliation (\$34 billion)	8.2	14.4
21 st September 2018	US Section 301 tariffs (\$200 billion) (10% on List 3) and China's retaliation (\$60 billion)	12.0	18.3
1 st November 2018	China's MFN tariff cut on industrial goods		18.2
1 st January 2019	China suspends retaliation against US auto and parts (Section 301) and reduces MFN tariff rates for 2019		16.5
8 th February 2019	US Section 201 tariffs reduced on solar panels and washing machines in year 2 of policy		
May/June 2019	US Section 301 tariffs (10% to 25% increase on \$200 billion, announced May 10) and China's retaliation on some US products (subset of \$60 billion, June 1)	17.6	20.7
1 st July 2019	China reduces MFN tariffs on IT products.		
1 st September 2019	US Section 301 tariffs (15% on List 4A) \$300 billion) and China's retaliation on some US products (subset of \$75 billion)	21.0	21.8
17 th September 2019	China implements product exclusions less than \$2 billion of US exports.		21.1
15 th December 2019 (proposed)	US Section 301 tariffs (15% on List 4B) of \$300 billion, and China's retaliation on some US products (subset of \$75 billion) and re-	23.8	25.1

	imposition of suspended retaliatory tariffs on autos and parts		
--	--	--	--

Source: Bown (2019).

US tariffs were increased again in August 2018 with the release of a second list (List 2) of 284 products covering \$16 billion of imports. After public consultation, duties were collected on 279 products in this list from August 23rd. To this was added a third list covering \$200 billion of imports with an additional 25 per cent tariff in September. Finally, a fourth list (List 4) covering \$300 billion was proposed in May 2019, with increases to be phased in. These lists are available from the United States Trade representative (USTR).³ Currently, the US has imposed additional tariffs on \$250 billion worth of imports, although not all of these attract the maximum additional 25 per cent tariffs. Average US tariffs on Chinese exports are around 21 per cent and may go higher.

China also has two lists, with multiple batches. List 1 (Batch 1), covered 545 items (worth \$34 billion), the retaliatory tariff rate for which is 25 per cent, effective as of July 6, 2018. in addition to those 128 listed in April 2018. Items on this list would attract an additional 25 per cent tariff. This list also covered \$34 billion of trade, as a measured response to the US list of 818.

Batch 2 of List 1 covered 333 items (worth \$16 billion), the retaliatory tariff rate for which is 25 per cent, effective as of August 23, 2018. In another step up, List 2 (Batch 1), covered 2493 items, at 10 per cent as of September 24, 2018, but increased to 25 per cent as of June 1, 2019. List 2 included three more batches, covering 1078, 974 and 662 items respectively, with low rates initially, but increasing later. However, China has made some conciliatory gestures, reducing tariffs on some items, in January and July of 2019. At present, additional tariffs have been imposed on \$75 billion of imports. The average tariffs is around 21 per cent and may go higher.

These two lists are available from the Chinese Ministry of Commerce.⁴

³ The USTR's List 1 can be found here:

<https://ustr.gov/sites/default/files/enforcement/301Investigations/List%201.pdf>

and List 2 here:

<https://ustr.gov/sites/default/files/enforcement/301Investigations/List%202.pdf>

⁴ The Chinese lists can be found here:

<http://images.mofcom.gov.cn/www/201806/20180616015345014.pdf>

and here: <http://images.mofcom.gov.cn/www/201806/20180616015405568.pdf>

Coverage

The US list covers primarily industrial products such as aerospace, information technology, robotics, new machinery and automobiles, but not consumer products such as television and mobile phones. These are high tech products and reflect the US concerns about intellectual property, although it is not clear how imposing tariffs on these items helps address these concerns, since many products have little value added occurring in China. List 4 covered textiles, clothing and footwear but was notable for what it did not cover, pharmaceuticals, medical goods, rare earths and critical minerals.

The Chinese lists were of matching size, in terms of coverage, but focused more on agricultural products than industrial products. The first list of 128 products included mainly fruit and nuts and various steel pipes, which attracted additional duties of 15 per cent, and seven pork products and scrap aluminium to which a 25 per cent duty was applied. Scrap aluminium made up by far the largest item.

The second Chinese list extended to 545 products. The list includes soybeans and other agricultural products, seafood, sports utility vehicles, electric vehicles and energy products. Not on the list are aircraft and aviation equipment.

We show that, in themselves, the bilateral tariffs have only a limited impact on trade, welfare and real wages. This is because both countries can source imports from alternative sources, and likewise export to alternative destinations. Even if the bilateral tariff war escalates, the effects are likely to be manageable.

One possible exception is soya beans. China imports the bulk of its soya beans from the United States. Furthermore, there are few alternative sources of supply, with Brazil the only real exporter with the scale to replace exports from the United States. Soya beans are a major input into pig production with few close substitutes. In its revised list of [date], China removed soya beans from its list, no doubt because the potential damage to itself exceed the damage inflicted on the United States.

There would be more of a problem if the United States imposed tariff increases multilaterally. The reason for doing this might be to protect local industry from all foreign suppliers. This was the approach taken initially with steel and aluminium, although numerous exemptions were negotiated. However, imposing tariffs on imports on the 818 list from all countries would imply significant costs for little gain, and it is unlikely that the United States would do this.

Perhaps of greater concern is the negative impact of uncertainty on confidence and investment. The magnitude of this effect is somewhat speculative, although both the World Bank (Freund et al. 2018) and IMF (Hunt 2019) have suggested half a per cent drop in GDP could be expected, based on the magnitude of previous recessions.

We analyse the likely medium term impacts on the United States, China, a range of third countries, and globally if the promised tariff increases were implemented. This involves an additional 25 per centage points on \$250 billion of US imports from China and \$75 billion of Chinese imports from the United States.

To understand the incentive, we first calculate the US optimal tariff. This is the across-the-board tariff that would maximise economic welfare, assuming no response from China. The US has threatened to impose additional taxes of variously 10, 15 and 25 per cent. We find ten per cent is closer to optimal. For China, the optimal tariff is small, only one or two per cent. This gives the US an advantage in the negotiation, because the costs are not so great.

Analysing tariff reductions

The methodology to analyse tariff cuts is relatively straightforward. We obtain a list of products from USTR and the Chinese Ministry of Commerce, and implement the tariff increases in a well-known general equilibrium model, GTAP⁵, a well-documented, multiregional, multi-sector model that assumes perfect competition, constant returns to scale and imperfect substitution between foreign and domestic goods and between imports from different sources. By examining tariff changes at an industry level, it is possible to make a reasonable estimate as to their likely effects on the industry's prices and production, consumption and trade. The model is static, with no phasing in of reforms or underlying growth in the economy. The results show the impact of the policy change at a given point in time.

We use Version 10 of the GTAP database (Aguiar et al. 2019). The model's base period is 2014. To the extent that most economies have grown somewhat from 2014, we run the model forward to 2020 and perform a static analysis on the 2020 base. This effectively inflates the size of the Chinese and other economies and changes the magnitude of the welfare gains and losses.

We use a long run closure, which means capital can move between countries, reflecting the change in production of capital-intensive goods. This closure enhances the welfare gains and losses.

The tariff line increases for the United States and China are specified at the eight-digit (HS8) level. First, we aggregate to the six-digit level, for which we have matching trade and tariff data in the software package TASTE.⁶ TASTE has bilateral trade and tariff data for 239 trading regions and 5205 products at the HS6 level. In this instance, if any HS8 tariff is increased, the HS6 tariff are treated according to the fraction of HS8 tariffs that are listed. For example, if one out of four HS8 lines are listed, one quarter of the 25 per cent tariff increase is applied at the HS6 level. The next step is to convert the HS2017 tariff classification to the HS2012 classification used by GTAP using the concordance tables available from the UN

⁵ For information on GTAP, see <https://www.gtap.agecon.purdue.edu/>.

⁶ See Horridge and Laborde (2008) for documentation.

Statistical Division.⁷ TASTE is used to calculate the shocks that are fed into GTAP. For this aggregation there are 35 sectors and 20 regions. These are listed in Appendix tables A1 and A2.

The scenarios

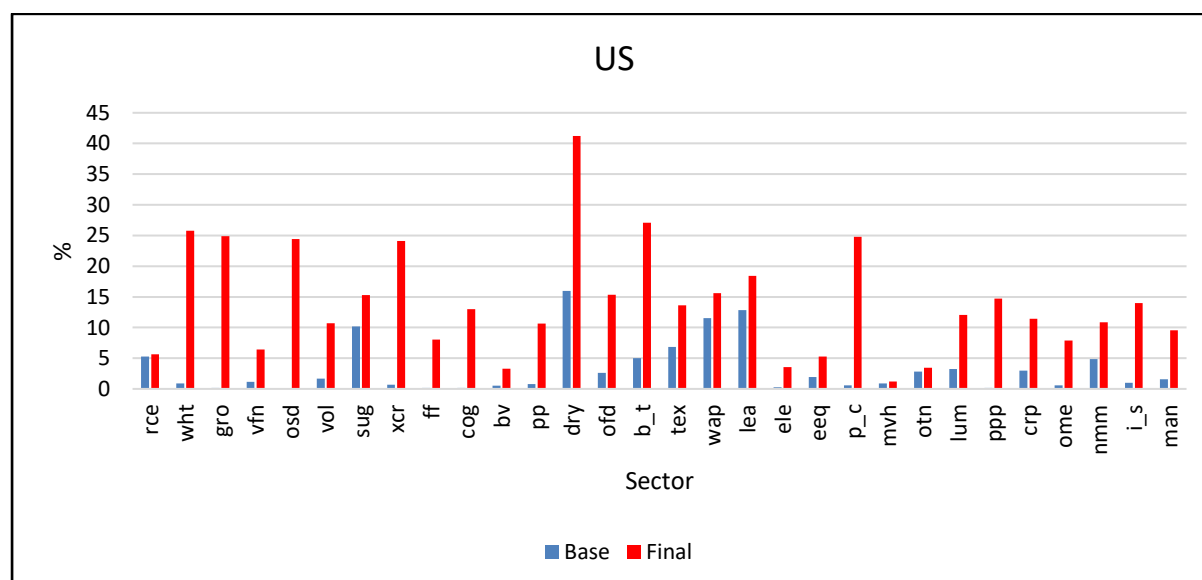
We report three scenarios to demonstrate the impact of each countries' tariffs on itself and the target country.

No	Label	Description
1	US only	USA imposes additional 25 percentage point tariffs on imports as specified by USTR
2	China only	China imposes additional 25 percentage point tariffs on imports as specified by Chinese Ministry of Commerce
3	Trade war	USA and China impose tariffs on each other. 1 and 2 combined.

The simulations show the estimated impact on trade, output, national income and real wages assuming the tariff changes have had time to work through, generally assumed to be three to five years.

The changes in tariffs are quite significant, even after taking account of products that were exempt from increases. Specifically, the US exempted textiles, clothing and footwear, for which tariffs were already significant, and electrical and electronic goods to spare domestic consumers. This can be seen in figure 1, which shows the initial and final tariffs by sector.

Figure 1 Base and final US tariffs on imports from China

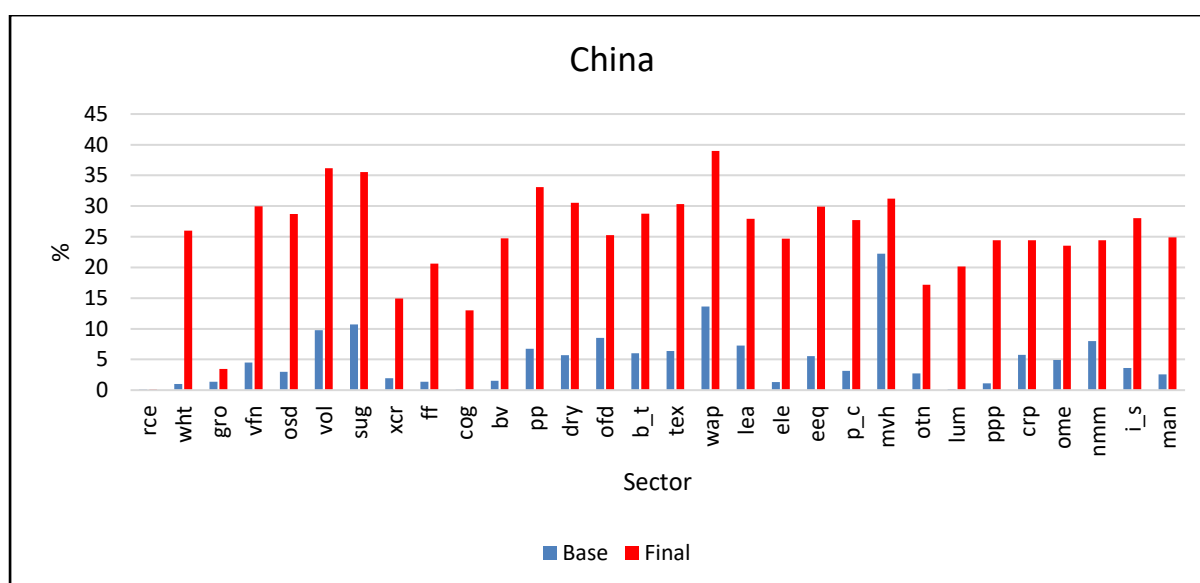


⁷ <https://unstats.un.org/unsd/trade/classifications/correspondence-tables.asp>.

Source: Derived from GTAP database and USTR

In retaliating, China was attempting to match the volume of imports. Because China imports from the US are much less than in the other direction, Chinese has had to impose tariffs on a greater range of goods. Hence, the tariff changes appear more consistent across the board, with fewer exemptions.

Figure 2 Increase in Chinese tariffs on imports from United States



Source: Derived from GTAP database and Ministry of Commerce

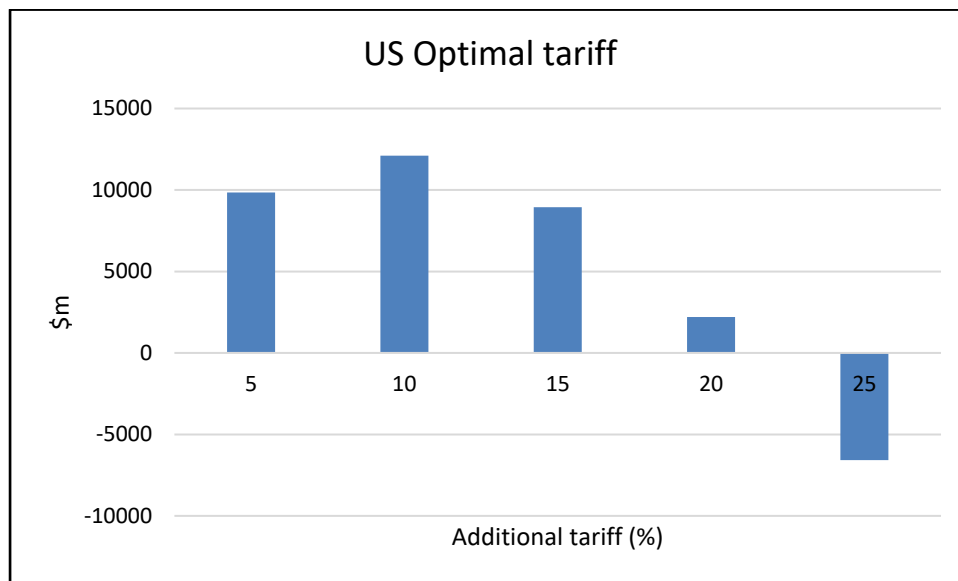
Results

First, we examine the optimal tariff argument to see whether it has any merit and whether the US got close to it in choosing a 25 per cent additional tariff. We then consider China's best response, and the impact on the US. Figure 3 shows the welfare effects on the US of imposing a permanent tariff on its listed products in the absence of retaliation. The steps are in five percentage points, as the Administration imposed across-the-board increase along these lines, for example 10, 15 and 25 per cent. This is in contrast to the approach of varying tariffs according to the elasticities, which would be better targeted to raise welfare but would be more difficult to administer.⁸ A 10 percentage point hike in tariffs would be a closer approximation to an optimal tariff than the 25 per cent favoured by the administration. This reflects how dependent Chinese exporters are on the US market. At the 10 per cent tariff, the annual welfare gains are \$12.1 billion, with terms of trade effects accounting for all of these gains.⁹ At 25 per cent, as proposed, the US tariffs have a negative welfare effect on the US itself.

⁸ The welfare measure used here is equivalent variation, an indicator of consumption, as opposed to GDP, which reflects production.

⁹ All figures are in US dollars.

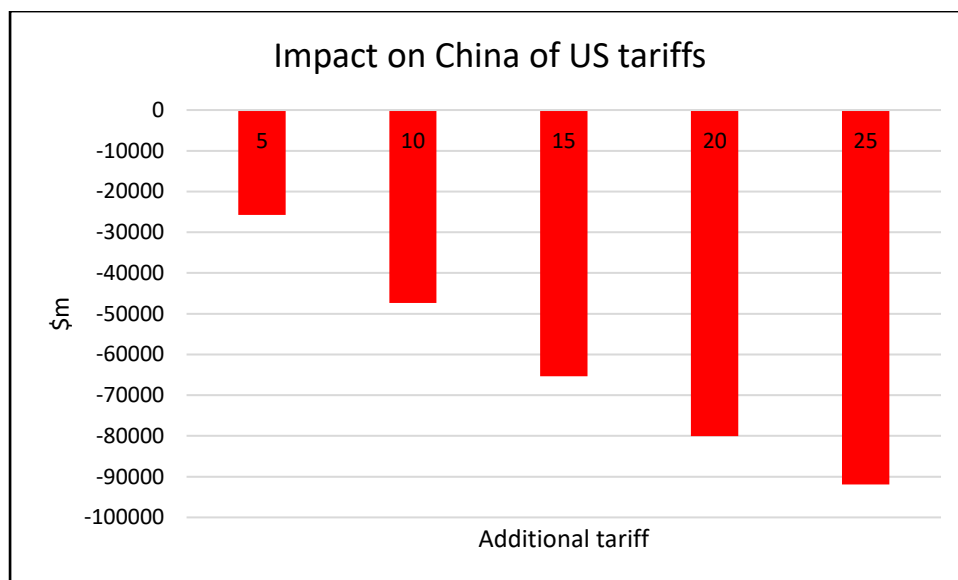
Figure 3 US optimal tariff on imports from China



Source: GTAP simulation.

Why might the US impose tariffs that are well above the optimum? One answer may be the cost imposed on China. At the 10 per centage point level the losses we estimate at \$47 billion. At 25 per cent, these losses grow to \$92 billion. The US suffers, but China suffers more.

Figure 4 Impacts on China of various US tariff



Source: GTAP simulation.

The previous analysis assumes no retaliation from China. What is the Chinese perspective? Does retaliation make it better or worse off?

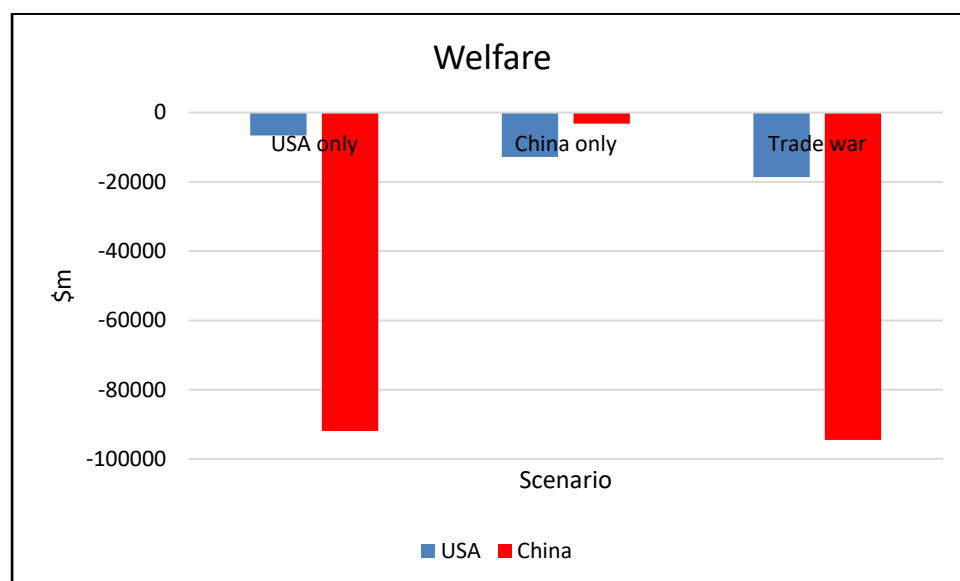
The Chinese options are quite different. Even a five per cent tariff increase on the listed imports leads to a welfare loss. This is because the US can find alternative destinations for its exports, the terms of trade effects are small, and the tariff does not lead to any decrease in import prices.

The impacts of the Chinese tariffs can be seen in the China only 25 per cent scenario (figure 5). Chinese losses are \$3 billion, and USA losses \$13 billion. While each country can impose a substantial burden on the other, the USA can impose a much greater burden.

Next, consider the progression of a trade war. If the USA alone imposes an additional 25 percentage points on Chinese imports, the losses imposed on China are quite substantial, US\$92 billion, and the USA itself loses by \$7 billion. If China initiates the tariff war, both countries would lose, in this case the US much more than China. This is the China only scenario shown in figure 5. Finally, if both countries impose additional tariffs on their listed products, the Trade war scenario in figure 5, the result is both lose, \$19 billion in the USA and \$94 billion in China. This is the most likely outcome if the proposed tariffs are implemented as threatened.

By responding, China makes itself worse off, by \$3 billion, but the impact on the United States is much greater, an additional \$12 billion. By responding, China makes itself worse off, but if there is a reasonable chance that retaliation leads the USA to back down, this would appear to be the best response. Of course, both countries would be better off if they avoided a reciprocal tariff war altogether.

Figure 5 Welfare impacts

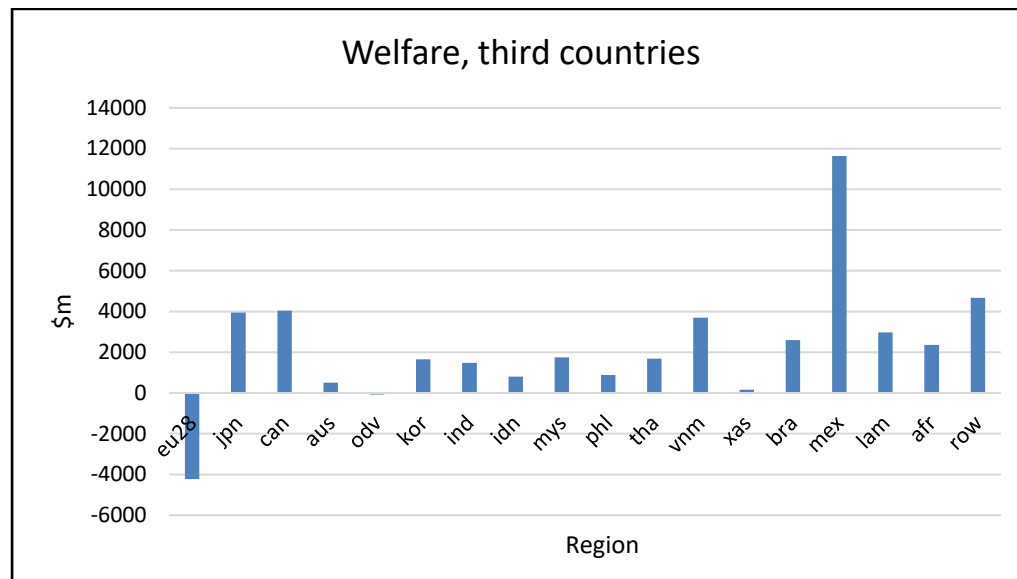


Source: GTAP simulations.

The welfare effects on third countries are positive. As shown in figure 6, while the United States and China experience welfare losses of \$19 and \$94 billion (not shown), the other regions gain. The major beneficiaries are suppliers of manufacturing goods Canada, the European Union, Japan and Korea. The benefits to Australia are minimal, \$510 million. Among developing countries, major beneficiaries are Brazil and Mexico, other developed countries and rest of Latin America. Vietnam, which competes with China in apparel and

footwear, also benefits from China being shut out of the US market. Global losses are \$73 billion.

Figure 6 Third country welfare impacts for Trade war scenario

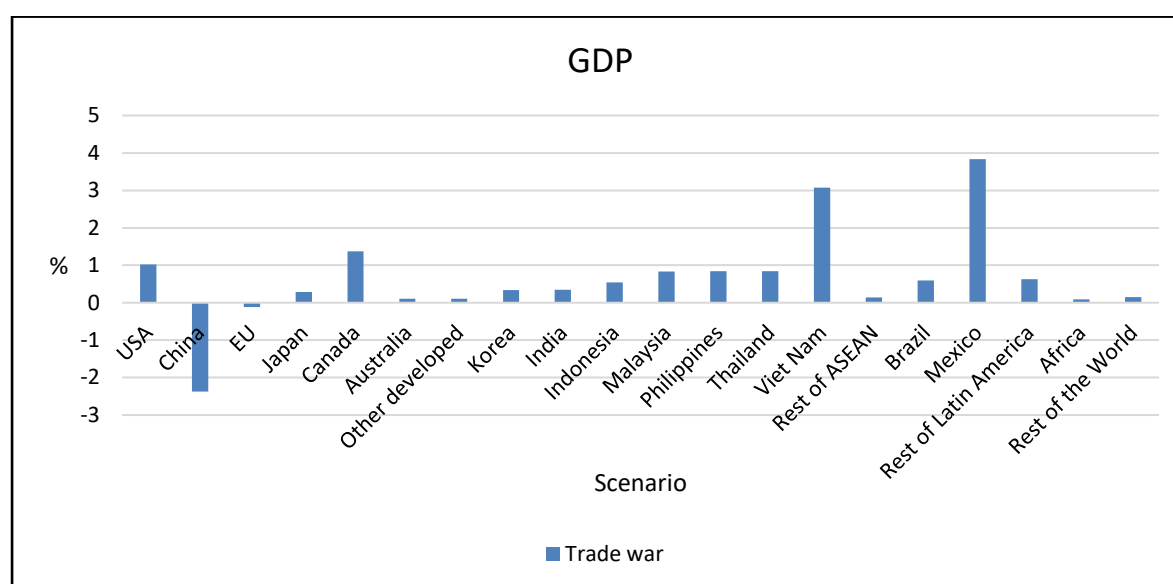


Source: GTAP simulations. See table A2 for region names.

GDP

The effects on national output are quite significant. GDP is a measure of production and is perhaps a more relevant indicator given a goal of the Trump Administration is to protect local industry, particularly manufacturing. GDP losses in China amount to 2.4 per cent in the worst case, whereas the United States gains 1.0 per cent, implying that producers are better off while consumers suffer from the higher import costs. However, all other regions gain, as much as three or four per cent in the case of Vietnam and Mexico (figure 7).

Figure 7 Third country GDP impacts for Trade war scenario



Source: GTAP simulations.

Trade

Imposing bilateral tariffs will obviously inhibit bilateral trade, but trade diversion will offset much of the fall. In the Trade war scenario, bilateral merchandise trade flows fall substantially, by \$400 billion (63 per cent) for China. China can recoup much of these losses by diverting exports to other countries. However, its national loss in exports is \$190 billion, a five per cent reduction (figure 8). Trade diversion doesn't fully offset the loss in bilateral trade.

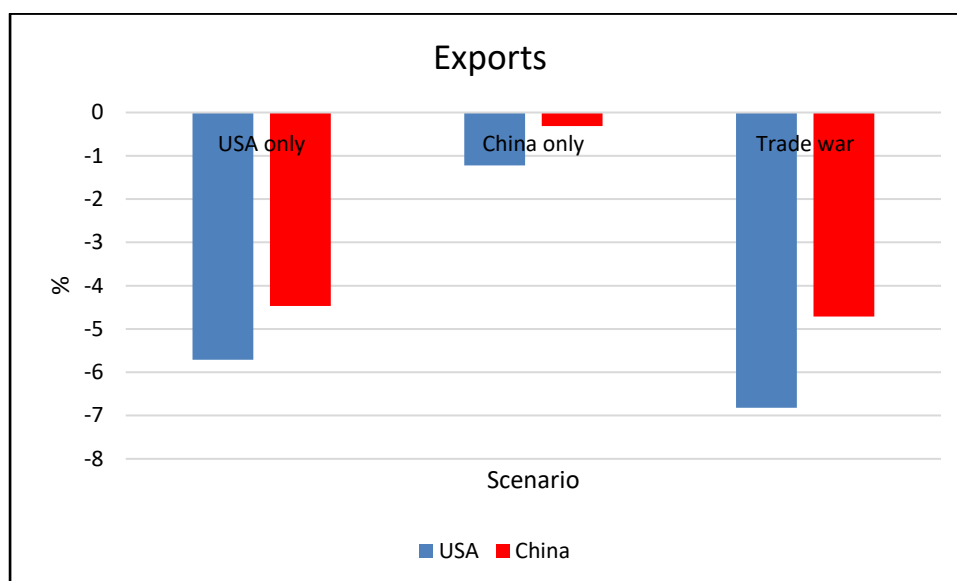
US exports to China are reduced by \$18 billion (11 per cent). Exports to the world are reduced further, to \$90 billion (seven per cent), because China is now competing in markets previously supplied by the US. The sectors most affected are Computer, electronic and optical equipment, Chemicals rubber and plastics, Machinery and equipment and Manufactured goods. Not only does trade diversion not offset the loss in bilateral trade, it makes it worse.¹⁰

US tariffs imposed on China raise tariff revenue. Tariff revenue increase from \$35 billion to \$81 billion. This is from a national average of 1.1 per cent to 2.7 per cent. Tariffs are a burden on domestic consumers, but some of the cost is borne by Chinese exporters.

Global trade falls by only 0.6 per cent.

¹⁰ More detail on sectoral effects is given in the next section.

Figure 8 Trade impacts for Trade war scenario

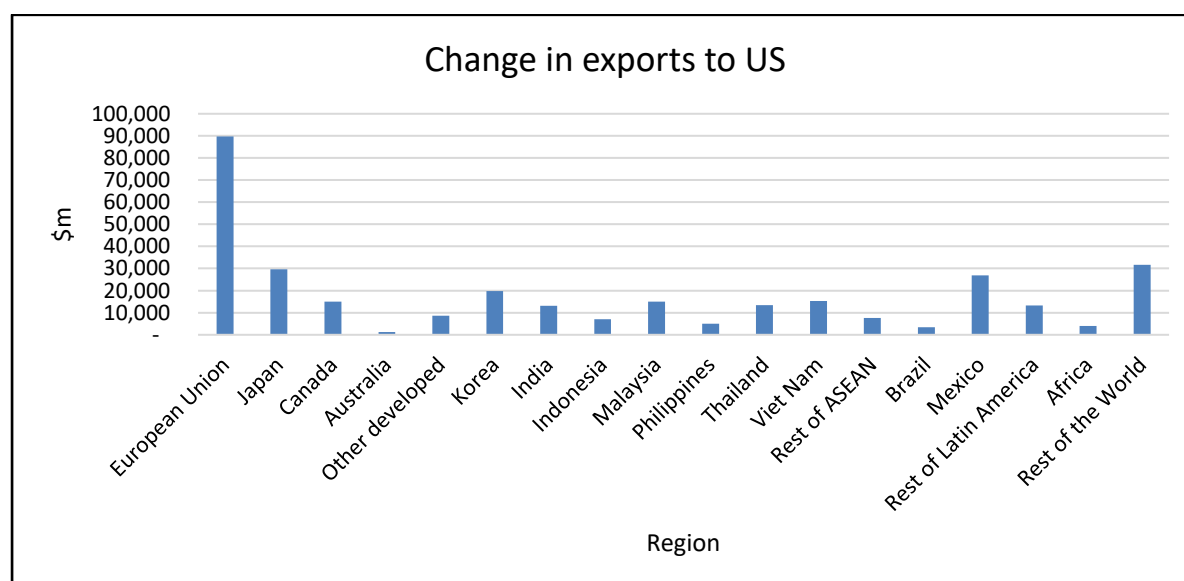


Source: GTAP simulations.

A decrease in trade between China and the United States would be expected to provide opportunities for other exporters. This is indeed the case, although at a national level the effects are marginal, mostly less than one per cent. The European Union, Japan, Latin America, Other developed countries and Korea export more motor vehicles to the United States.

In reducing imports from China, the US creates opportunities for other exporters. Most of the imports are industrial products, and that means the countries that gain the most from this opportunity are industrial countries rather than suppliers of agricultural products. This includes the European Union, Japan, Canada, Korea and Mexico (figure 9). Most developing countries also gain, although the absolute amounts are more in line with their initial exports.

Figure 9 Change in exports to US for Trade war scenario



Source: GTAP simulations.

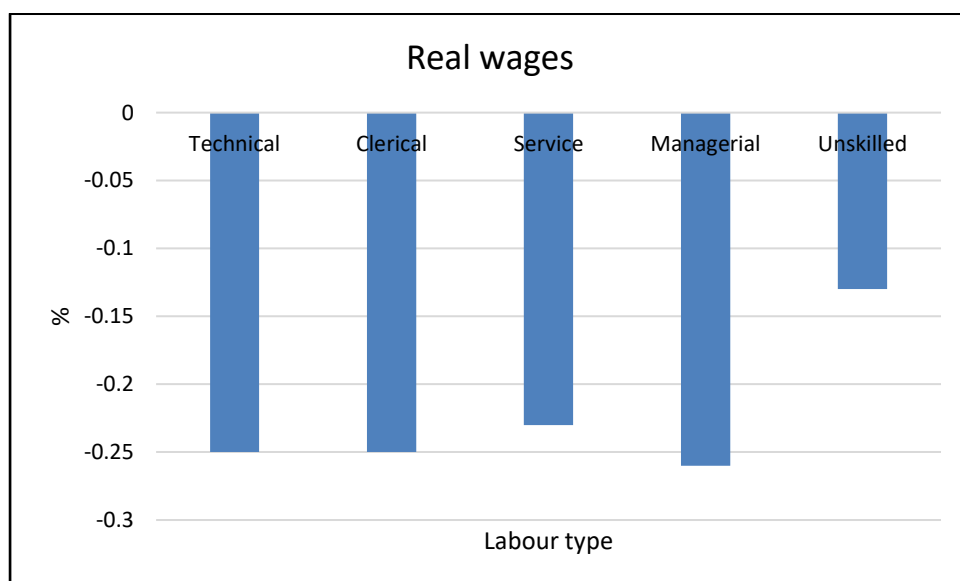
Real wages and land prices

The Trump Administration has expressed concern about stagnant real wages, particularly in the manufacturing sector. Figure 10 shows the estimated effects on real wages in the United States by five labour types. Unskilled, Service and Clerical tend to be relatively low skilled, whereas Technical and Managerial typically command higher wages. Because the level of employment of each wage type in each country is assumed fixed, all the adjustment occurs in wages, not employment levels. The simulation of the tariff war scenario shows a slight fall in real wages for all labour types, although the fall for unskilled workers is marginally less than the other labour types.

For China, the fall in real wages ranges from 0.9 to 1.1 per cent, with managerial wages falling the furthest.

More significant is the return to owners of agricultural land, farmers. Land prices are estimated to fall by 11 per cent. This reflects the fall in demand for agricultural products, the main target of the Chinese import restrictions. In China land prices rise 1.5 per cent.

Figure 10 US real wages following Trade war scenario



Source: GTAP simulations.

In summary, the macro results presented so far suggest both participating countries lose from a tariff war, \$18 billion for the United States and \$94 billion for China. Global losses are \$72 billion, so this implies that third countries gain \$40 billion.

In GDP terms the impacts are 1.0 per cent for the United States and -2.3 per cent for China.

There are large bilateral trade reductions, but these are offset substantially but not totally by switching to other sources and destinations, with national trade falling only a few per cent, and

global trade barely affected. Real wages are unlikely to increase, and land prices in the US fall dramatically.

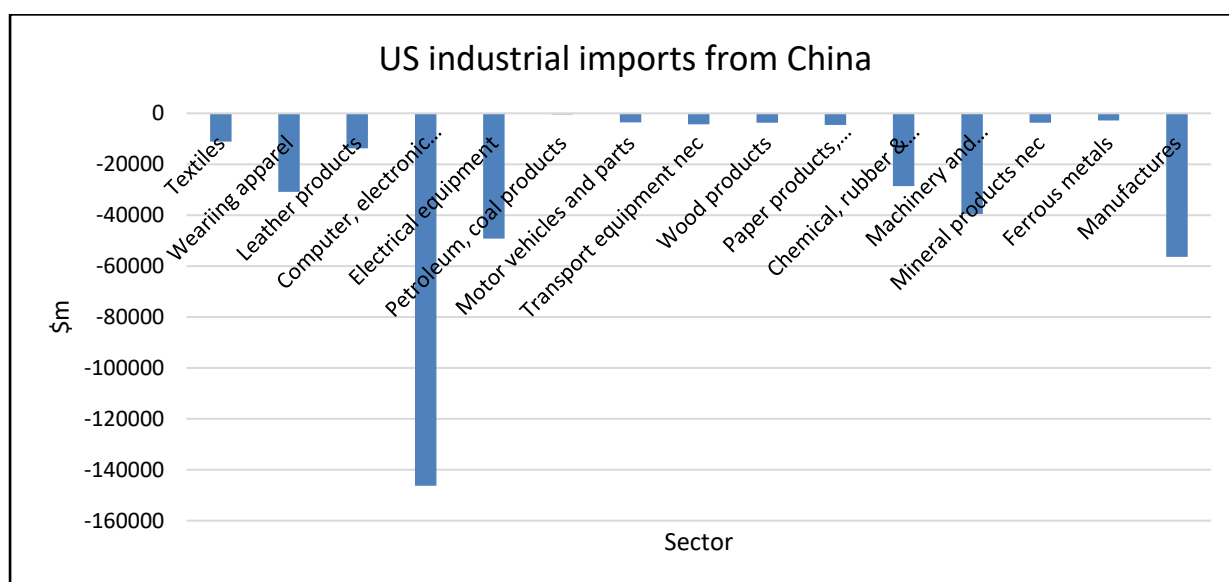
Next, we look at trade at a sectoral level.

Sectoral impacts

Following a tariff war with tariffs of an additional 25 per cent, many sectors are expected to show a decrease in bilateral imports into the US of 40-80 per cent, but in absolute terms the sectors most affected are Computer, electronic and optical equipment, Electrical equipment, Machinery and equipment nec., Manufactured goods, and Textiles, clothing and footwear (figure 11). Among agricultural goods, the most significantly affected sectors are Food products, Pork and poultry meat, and Vegetables, fruit and nuts. Appendix table A4 shows the absolute and percentage changes by sector.

Among industrial products, the Computer electronics sector is most affected. This includes items such as mobile phones, computers and television sets. This sector is sensitive because the United States raised concerns about intellectual property. The percentage change is -67 per cent, but the initial trade flows are much greater than other sectors, over \$200 billion, so the fall in imports is large, \$146 billion. Some \$110 billion is supplied by other exporters, mainly the European Union, Mexico, Japan, Korea and India. The shortfall in Computer electronics imports is \$35 billion. This is filled by an increase in domestic production. The increase in prices (2.2 per cent) due to higher tariffs on Chinese computers leads to a fall in consumption in the United States.

Figure 11 Change in US industrial imports from China following Trade war scenario



Source: GTAP simulations. Agricultural imports not shown.

Within agriculture, the most significant reductions in US bilateral imports from China to the United States are Other food products (\$2.3 billion), Vegetables, fruit and nuts (\$234 million), and Pork and poultry (\$488 million).

This import gap provides opportunities to other exporters. For Other food products, the most significant trade items are food preparations (HS 210690 and 190590), dog or cat food (HS 230990) and frozen, shrimps and prawns (HS 030617). The rise in average tariffs is from 3 to 20 per cent. The fall in trade in Other food products is from \$6,470 million to \$4,115 million, a fall of 36 per cent. Alternative suppliers are the European Union, Canada, Indonesia, Thailand and Latin America (other than Brazil and Mexico).

The major imports of Vegetables, fruit and nuts from China to the United States are garlic (HS 070320), pecans (HS 080290), berries (HS 081340), and dried beans (HS 071331). The average tariff is increased from 1 to 20 per cent. Bilateral imports of Vegetables, fruit and nuts from China fall from \$460 million to \$226 million, a drop by half. The shortfall is filled with domestic production.

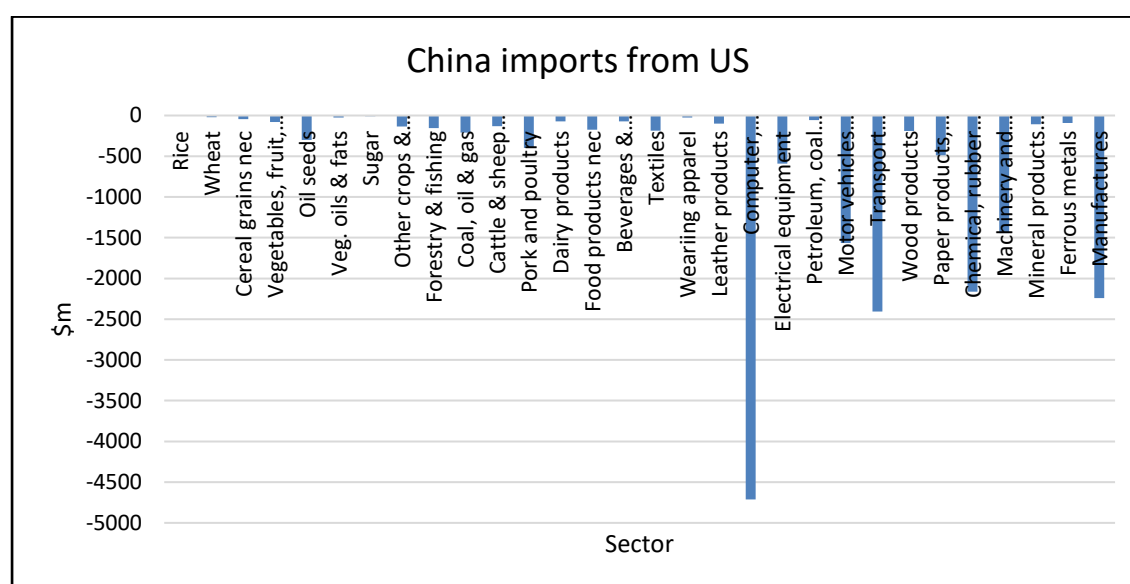
For Pork and poultry, the most significant traded items are meat and edible offal of fowls (HS020714), meat; of swine (HS020329 and 020319), and meat preparations of poultry (HS160232). The average bilateral tariff for the sector is increased from 1 to 13 per cent. Bilateral imports from China fall by \$490 million, a fall of 74 per cent. The European Union and Canada make up some of the shortfall, but two thirds of the deficiency are unfilled, leaving a gap for domestic producers.

China's imports

Whereas the change in US imports are mainly focused on industrial products, China's affected imports are more widespread and include agricultural products (figure 12). The main agricultural product is oilseeds, used to feed pigs. The main oilseeds traded are soybeans (HS 120190) The reduction in oilseeds is \$10 billion, and the alternative supplier is Brazil and to a lesser extent Other Latin America (which includes Argentina).

The main affected industrial sectors are Electronics (\$8 billion), Chemicals rubber and plastics (\$9 billion) and Manufactures, \$7 billion. The main agricultural sectors are Fish and forestry, (\$718 million) and Pork and poultry (\$1,541 million). The total decline in bilateral imports is \$69 billion. The total decline to national imports is \$127 billion. There is no trade diversion. The fall in Chinese income means that all countries exporting to China experience a decline in exports to China, with the exception of Brazil.

Figure 12 Change in Chinese imports from USA following Trade war scenario



Source: GTAP simulations.

Implications, limitations and concluding comments

It is difficult to think of a policy that has attracted more criticism than the bilateral tariffs the United States has imposed on Chinese imports. The criticisms are obvious. The United States makes itself as well as China worse off, undermines the global rules-based system of international trade overseen by the WTO, and does not achieve its stated objective of supporting American jobs. Our estimates quantify the likely trade, production and welfare effects in the USA, China and other developed and developing countries not directly involved in the dispute.

Is there anything good that can be said about the policy? The stated objectives appear to be to reduce the bilateral trade deficit with China and in this respect the policy is likely to be a success, although as the United States will merely import more from other countries the benefit of a reduced bilateral surplus is not obvious. The United States, among other countries, had claimed that China was using unfair trade tactics in promoting its exports, including an undervalued exchange rate, state-owned or state supported companies, theft of intellectual property, and limitations on foreign investment. The idea was that a tariff war would bring China into line. In terms of imposing costs in China, the tariffs appear to be sufficiently large and well directed, imposing larger cost on China than itself. To this extent at least, the magnitude of the impacts provides an incentive for China to negotiate a better outcome. Indeed, there are signs that China may relent on some of these issues. In December the US declared a new “Phase 1” deal that involved managed trade between the two countries.

Mr Trump declared that the tariff policy would raise billions of tariff revenue and this appears to be correct. We estimate the additional revenue at \$45 billion, once trade flows have been reallocated.

In terms of supporting domestic US industries, the effects are likely to be marginal, although our results show an increase in domestic production of electronic equipment. The problem, however, is that Chinese imports can be replaced by imports from other countries, such as Japan, Korea, the European Union or Mexico, but our results show a one per cent increase in domestic production.

A further problem for the United States is that many of the intermediate inputs into production of Chinese exports are sourced from the United States and other developed countries. This applies to motor vehicles as well as mobile phones and other technology intensive products. Cutting off imports stifles US exports.

The motivation for this paper was the potential effects on third countries. We find that third countries are likely to benefit from the trade war through additional exports to the USA. With the exception of Brazilian soybeans, there are no additional exports to China because the decrease in Chinese GDP leads to a decrease in demand for imports.

We have not attempted to account for the possible effects of uncertainty on investor confidence, as other (Freund et al. 2018) have attempted. It is true that speculation about the trade war leads to movements in stock markets around the world, but it is likely that speculation exaggerates the fundamentals.

The trade effects in response to a tariff change are governed by the Armington elasticities, which reflect the substitutability between imports from different sources and between domestic production and imports. These elasticities are generic across countries and hide differences in components of a sector. Although soybeans and sunflowers seeds are oilseeds, they are not as substitutable as the elasticities suggest. This may cause an overestimate of the trade effects.

We quantify the potential effects as listed in the published schedules and conclude the effect on the global economy is manageable, and the effects on developing countries may be positive. Brazil, Mexico and Vietnam are the most notable beneficiaries.

References

- Aguiar, A., Chepeliev, M., Corong, E. L., McDougall, R., & van der Mensbrugghe, D. (2019). The GTAP Data Base: Version 10. *Journal of Global Economic Analysis*, 4(1), 1-27. <http://dx.doi.org/10.21642/JGEA.040101AF>
- Burfisher, M. E. (2011) *Introduction to General Equilibrium Models*, Cambridge University Press.
- Freund, Caroline; Ferrantino, Michael Joseph; Maliszewska, Maryla; Ruta, Michele. (2018). *Impacts on Global Trade and Income of Current Trade Disputes (English)*. MTI practice note; No. 2. Washington, D.C.: World Bank Group. (<http://documents.worldbank.org/curated/en/685941532023153019/Impacts-on-Global-Trade-and-Income-of-Current-Trade-Disputes>)

- Narayanan, G., Badri, Angel Aguiar and Robert McDougall, Eds. (2015). *Global Trade, Assistance, and Production: The GTAP 9 Data Base*, Center for Global Trade Analysis, Purdue University. Available online at: http://www.gtap.agecon.purdue.edu/databases/v8/v8_doco.asp
- Hertel, T.W. (1997) (Ed.), *Global Trade Analysis: Modeling and Applications*, Cambridge University Press.
- Horridge, M. and Laborde, D. (2008) *TASTE: A program to adapt detailed trade and tariff data to GTAP-related purposes*, unpublished conference paper, <https://www.gtap.agecon.purdue.edu/resources/download/4938.pdf>.
- USTR (2018a) “USTR Issues Tariffs on Chinese Products in Response to Unfair Trade Practices”, Washington, D.C. (<https://ustr.gov/about-us/policy-offices/press-office/press-releases/2018/june/ustr-issues-tariffs-chinese-products>)
- USTR (2018b) “2018 Special 301 Report” Washington, D.C. (<https://ustr.gov/about-us/policy-offices/press-office/reports-and-publications/2018/2018-special-301-report-0>)
- Chad P. Bown. (2019). The Trade War Is Suddenly Getting Worse. PIIE Chart, Peterson Institute for International Economics (August 29). (<https://www.piie.com/research/piie-charts/trade-war-suddenly-getting-worse>)

Table A1 Sectors

No.	Label	Description
1	rce	Rice
2	wht	Wheat
3	gro	Oil seeds
4	vfn	Vegetables, fruit, nuts
5	osd	Oil seeds.
6	vol	Veg. oils & fats
7	sug	Sugar
8	xcr	Other crops & cotton
9	ff	Forestry & fishing
10	cog	Coal, oil & gas
11	omn	Minerals
12	bv	Cattle & sheep products
13	pp	Pork and poultry
14	dry	Dairy products
15	ofd	Food products nec
16	b_t	Beverages & tobacco
17	tcf	Textiles, clothing & footwear
18	ele	Electronics
19	p_c	Petroleum, coal products
20	mvt	Motor vehicle & trans equip
21	lum	Wood products
22	ppp	Paper products, publishing
23	crp	Chemical, rubber & plastics
24	ome	Machinery and equipment nec
25	nmm	Mineral products nec
26	i_s	Ferrous metals
27	man	Manufactures
28	utl	Utilities
29	tcm	Transport services
30	trd	Retail & wholesale trade
31	bss	Business services nec
32	svc	Other services

Table A2 Regions

No	Label	Description
1	usa	United States of America
2	china	China
3	eu28	European Union
4	jpn	Japan
5	aus	Australia
6	odv	Other developed
7	kor	Korea
8	ind	India
9	vnm	Viet Nam
10	idn	Indonesia
11	mys	Malaysia
12	phl	Philippines
13	tha	Thailand
14	xas	Rest of ASEAN
15	bra	Brazil
16	lam	Latin America
17	afr	Africa
18	row	Rest of the World

Table A3 Initial and final bilateral tariffs

	<i>US tariffs on imports from China</i>		<i>China tariffs on imports from USA</i>	
	Base %	Final %	Base %	Final %
Rice	5.30	5.61	0.13	0.13
Wheat	0.91	25.77	0.99	26.00
Cereal grains nec	0.15	24.87	1.36	3.44
Vegetables, fruit, nuts	1.14	6.42	4.52	29.98
Oil seeds	0.01	24.40	3.01	28.72
Veg. oils & fats	1.70	10.68	9.75	36.15
Sugar	10.20	15.29	10.72	35.52
Other crops & cotton	0.69	24.10	1.92	14.94
Forestry & fishing	0.15	8.03	1.38	20.63
Coal, oil & gas	0.18	12.98	0.13	13.00
Cattle & sheep products	0.51	3.28	1.53	24.76
Pork and poultry	0.81	10.67	6.73	33.09
Dairy products	15.95	41.24	5.70	30.52
Food products nec	2.62	15.36	8.53	25.25
Beverages & tobacco	5.02	27.09	6.04	28.74
Textiles	6.83	13.61	6.40	30.33
Wearing apparel	11.54	15.61	13.62	38.97
Leather products	12.84	18.44	7.28	27.94
Computer, electronic and optic	0.27	3.58	1.31	24.67
Electrical equipment	1.91	5.28	5.57	29.90
Petroleum, coal products	0.60	24.77	3.14	27.70
Motor vehicles and parts	0.91	1.20	22.23	31.24
Transport equipment nec	2.82	3.46	2.74	17.20
Wood products	3.22	12.05	0.17	20.18
Paper products, publishing	0.15	14.70	1.09	24.41
Chemical, rubber & plastics	2.99	11.42	5.73	24.43
Machinery and equipment nec	0.56	7.87	4.90	23.57
Mineral products nec	4.84	10.83	8.00	24.45
Ferrous metals	1.01	13.99	3.59	28.02
Manufactures	1.57	9.56	2.59	24.88
Machinery and equipment nec	0.56	7.87	0.13	0.13

Table A4 Change in exports to the US, Trade war scenario

	<i>Change in exports to USA</i>	<i>Change in national exports</i>
	\$m	%
USA	-	-6.82
China	-392,384	-4.71
European Union	89,678	0.80
Japan	29,638	0.72
Canada	15,035	1.87
Australia	1,234	0.23
Other developed	8,613	0.22
Korea	19,834	0.51
India	13,069	0.72
Indonesia	7,079	1.09
Malaysia	15,015	1.09
Philippines	4,990	1.17
Thailand	13,467	1.18
Viet Nam	15,364	2.40
Rest of ASEAN	7,549	0.19
Brazil	3,485	1.27
Mexico	26,921	4.05
Rest of Latin America	13,275	0.99
Africa	4,035	0.23
Rest of the World	31,662	0.30
Total	-72,442	0.30

Table A5 Bilateral merchandise trade impacts of trade war

	<i>US imports from China</i>		<i>China imports from USA</i>	
	Change \$m	%	Change \$m	%
Rice	4	10	0	-7
Wheat	-1	-84	-23	-84
Cereal grains nec	0	-1	-45	-35
Vegetables, fruit, nuts	-234	-51	-80	-17
Oil seeds	-60	-65	-298	-47
Veg. oils & fats	-70	-75	-24	-39
Sugar	-16	-60	-9	-26
Other crops & cotton	-176	-47	-137	-67
Forestry & fishing	-47	-42	-154	-24
Coal, oil & gas	-326	-79	-208	-79
Cattle & sheep products	-186	-75	-130	-23
Pork and poultry	-488	-74	-399	-50
Dairy products	-23	-75	-72	-78
Food products nec	-2,355	-36	-173	-39
Beverages & tobacco	-56	-32	-72	-35
Textiles	-11,133	-65	-184	-46
Wearing apparel	-30,898	-63	-26	-36
Leather products	-13,817	-46	-98	-47
Computer, electronic and optic	-146,301	-67	-4,711	-42
Electrical equipment	-49,178	-71	-592	-38
Petroleum, coal products	-438	-59	-56	-59
Motor vehicles and parts	-3,560	-22	-1,566	-11
Transport equipment nec	-4,270	-60	-2,408	-16
Wood products	-3,673	-61	-188	-47
Paper products, publishing	-4,571	-62	-489	-57
Chemical, rubber & plastics	-28,577	-58	-2,161	-45
Machinery and equipment nec	-39,588	-62	-1,443	-51
Total	-402,904	-63	18,188	-11

