Tariff wars and their implications for agricultural exporters

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In July 2018 the Trump Administration initiated a tariff war by imposing additional duties of 25 percentage points on selected imports from China. As promised, China responded with bilateral tariffs of its own. As a result, both countries are worse off. Not so obvious is the impact on third countries, including exporters competing with the USA, such as Australia or Brazil, or exporters competing with China to supply the US market, such as Korea and Japan.

Analysis using a global computable general equilibrium model suggests that a bilateral tariff war does not make every country worse off. Indeed, if the effects are confined to tariff cuts, as opposed to investment flows, most countries gain. This is because most imports between the USA and China have substitutes, albeit imperfect. This means that most imports can be obtained elsewhere. Conversely, both the USA and China can export to alternative markets. Trade and welfare effects are presented.

Keywords; Tariffs, trade wars

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1. Introduction

Tit for tat

The United States has initiated a rapidly escalating tariff war with China. After months of rhetoric, the United States imposed multilateral tariffs on steel and aluminium in March 2018. 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 was subsequently revised to 818, which covered imports worth $34 billion. These tariffs were imposed on July 6th. An additional list of 284 products covering $16 billion of imports may be applied later after public consultation. Duties will be collected on 279 products in this list from August 23rd. The US lists are available from the United States Trade representative (USTR)[2].

China responded on June 16th by proposing a list of 545 items in addition to those 128 listed in April. 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. These two lists are available from the Chinese Ministry of Commerce.[3]

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 Administration's concern with "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

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[2] 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

[3] 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

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 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.

To date, each country has imposed tariff on imports worth $34 billion, although further tariff increases on imports worth $200 billion are under consideration. 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. Australia does not export soya beans. Soya beans are a major input into pig production with few close substitutes. In its revised list, China removed soya beans, no doubt because the potential damage to itself exceeded 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 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 $200 billion of US imports from China and $60 billion of Chinese imports from the United States.

What we did

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, GTAP[4], a well-documented, static, 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 (Narayanan et al. 2015). The model's base period is 2014. To the extent that most economies have grown somewhat from 2014, we underestimate the absolute magnitude of the trade and welfare effects. However, the relative effects are the same.

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.[5] 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 Statistical Division.[6] TASTE is used to calculate the shocks that are fed into GTAP. For this aggregation there are 32 sectors and 18 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	USA	USA imposes additional 25 percentage point tariffs on $200 billion imports from China as specified by USTR
2	China	China imposes additional 25 percentage point tariffs on $60 billion imports from USA as specified by Chinese Ministry of Commerce
3	Trade war	Both USA and China impose tariffs on each other

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[4] For information on GTAP, see https://www.gtap.agecon.purdue.edu/.
[5] See Horridge and Laborde (2008) for documentation.
[6] https://unstats.un.org/unsd/trade/classifications/correspondence-tables.asp.

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. We use the standard closure, which implies the labour market adjusts through changes in real wages and the trade deficit may change, although any variation in the current account must be offset by a change in the capital account. An increase in the deficit must be paid for by a net inflow of capital.

Figure 1 Increase in US tariffs on imports from China

Source: Derived from GTAP database and USTR

Figure 2 Increase in Chinese tariffs on imports from United States
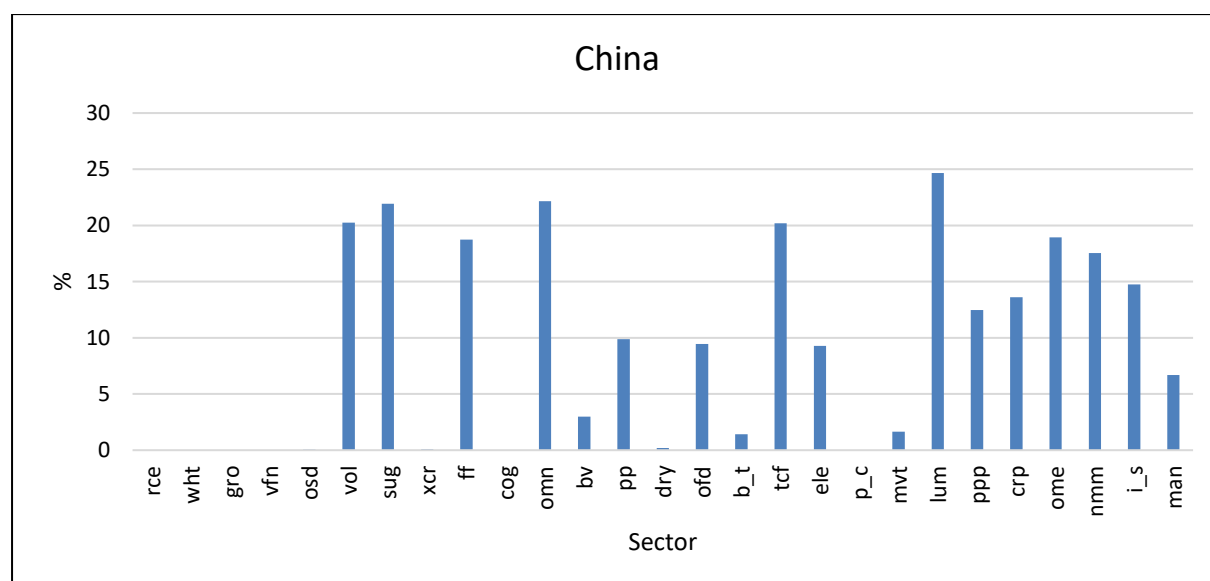
Source: Derived from GTAP database and Ministry of Commerce

Results

We first look at macro variables, welfare, GDP, trade and real wages. We next look at sectoral impacts.

Welfare

The impacts on welfare for the three scenarios are shown in figure 3.[7] If the USA alone imposes tariffs on $200 billion of Chinese imports, the losses imposed on China are quite substantial, US$50 billion, but the USA itself suffers by $9 billion.[8] What is noticeable here is that the losses to China are much greater than to the USA, so in this sense the US tariffs are quite effective.

Figure 3 Welfare impacts
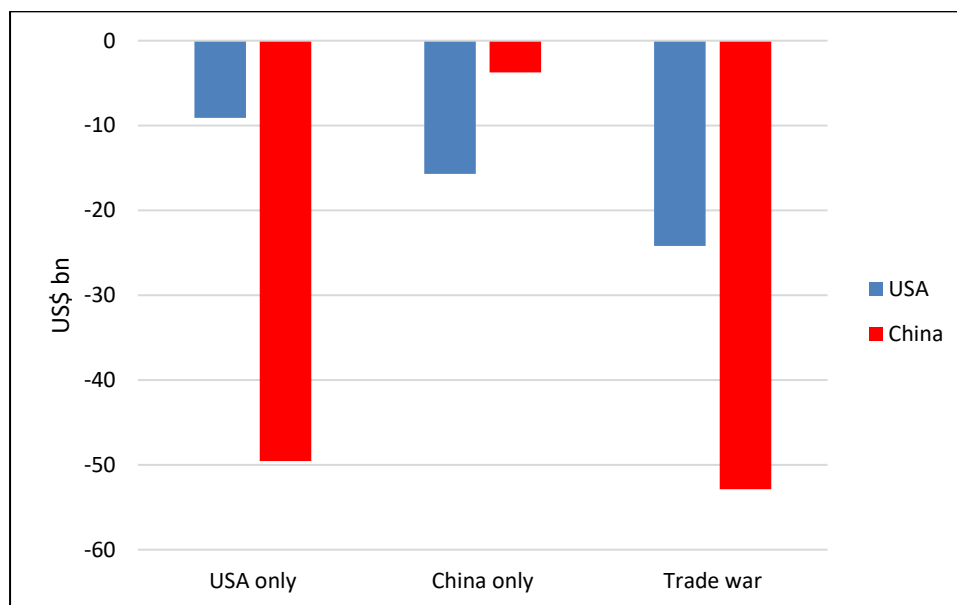
Source: GTAP simulations.

If China responds with tariffs on $60 billion imports, as represented by the scenario "Trade war" in figure 3, we see the US losses are $24 billion while Chinese losses are $53 billion. By responding, China makes itself worse off, by $3.3 billion, but the impact on the United States is much greater, an additional $15 billion. On these figures, China would have a much greater incentive to negotiate a truce to the tariff war than the United States.

The impacts of the Chinese tariffs can be seen in the China only scenario. Chinese losses are a modest $3.8 billion, and US losses $16 billion. This illustrates the effects of Chinese tariffs on US imports are half those of US tariffs, both on itself and the US. This reflects the volume of trade, $60 million, against which tariffs where imposed on each side.

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[7] The welfare measure used here is equivalent variation, an indicator of consumption, as opposed to GDP, which reflects production.
[8] All figures are in US dollars.

In our simulations, the effects are surprisingly additive. Welfare losses in the "Trade war" scenario are almost the sum of the first two scenarios.

The welfare effects on third countries are positive. As shown in figure 4, while the United States and China experience welfare losses of $24 and $53 billion, the other regions gain. The major beneficiaries are suppliers of manufacturing goods the European Union, Japan, Korea, other developed countries and Latin America excluding Brazil. The benefits to Australia are minimal, $710 million. Global losses are $30 billion.

Figure 4 Third country welfare impacts for Trade war scenario
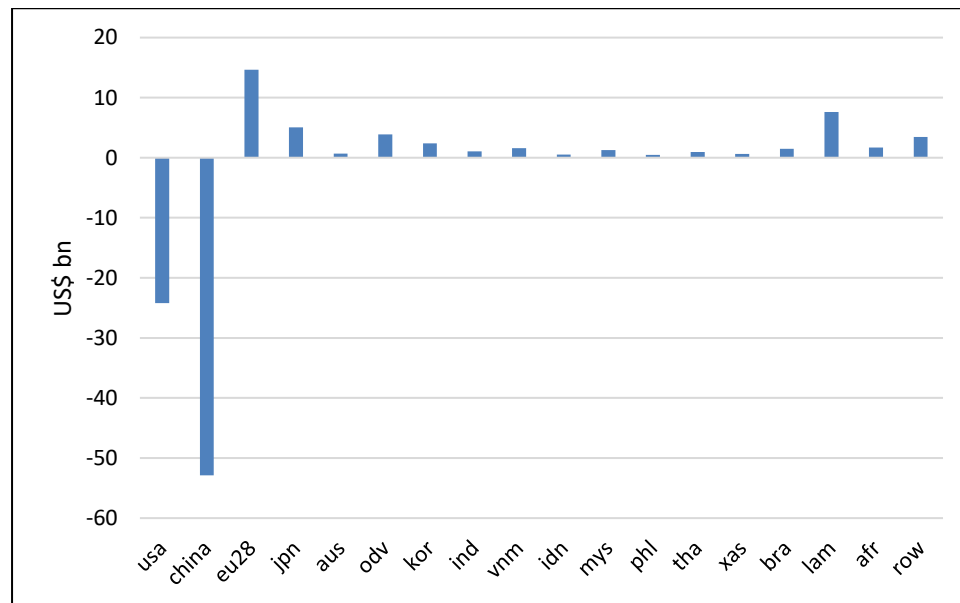
Source: GTAP simulations.

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 1.62 per cent in the worst case, whereas losses in the United States are 0.3 per cent. The United States gains in GDP terms by imposing tariffs bilaterally if China does not respond. However, China minimises its losses by responding. Of course, both countries would be better off if they avoided a reciprocal tariff war altogether.

Figure 4 GDP impacts
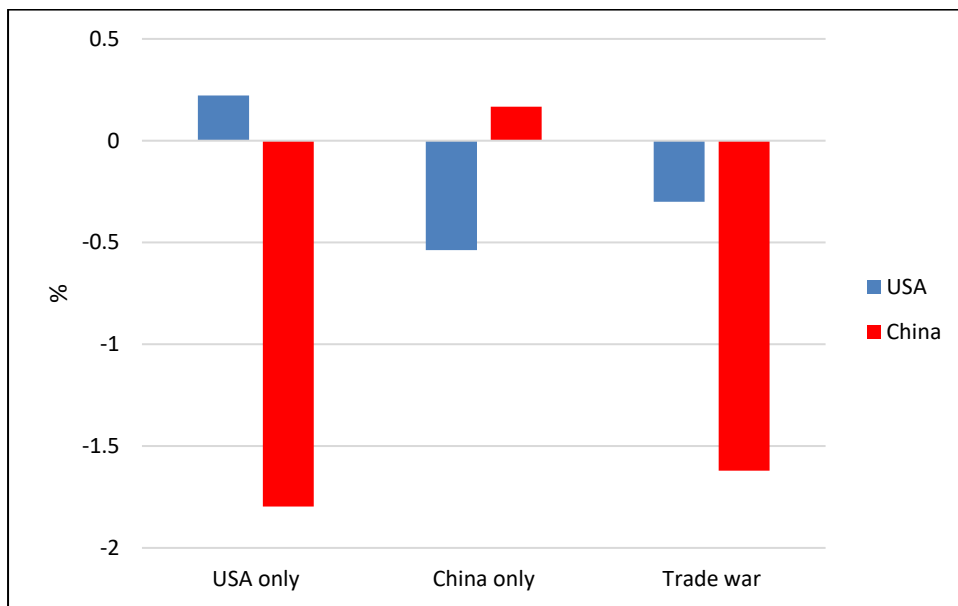
Source: GTAP simulations.

Trade

Imposing bilateral tariffs will obviously inhibit bilateral trade, but trade diversion will offset much of the fall. In the trade war scenario, "Trade war", bilateral merchandise trade flows fall significantly, by 43 per cent for the United States and 35 per cent for China. However, national imports fall only 3.3 and 4.0 per cent respectively as shown in figure 5. Global trade falls only 0.3 per cent.

In the trade war scenario, US merchandise imports from China are reduced by $208 billion. Other suppliers provide $123 billion, leaving a shortfall of $85 billion. This is a small fraction of total imports, but quite a large share of the reduction in bilateral imports. Trade diversion doesn't offset the loss in bilateral trade.

Figure 5 Trade
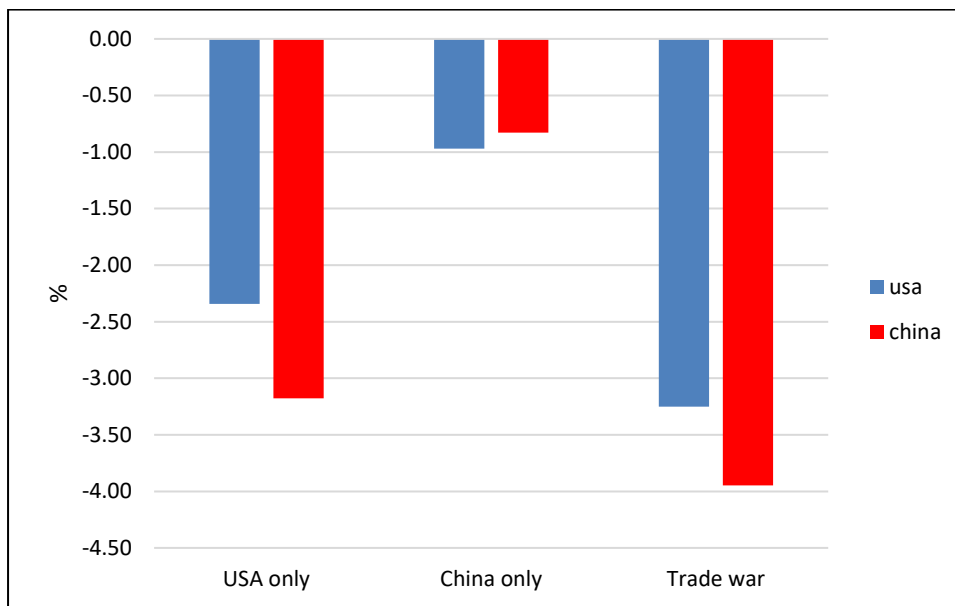
Source: GTAP simulations.

Real wages

The Trump Administration has expressed concern about stagnant real wages, particularly in the manufacturing sector. Figure 6 shows the estimated effects on real wages in the United States and China 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.

Figure 6 Real wages following Trade war scenario
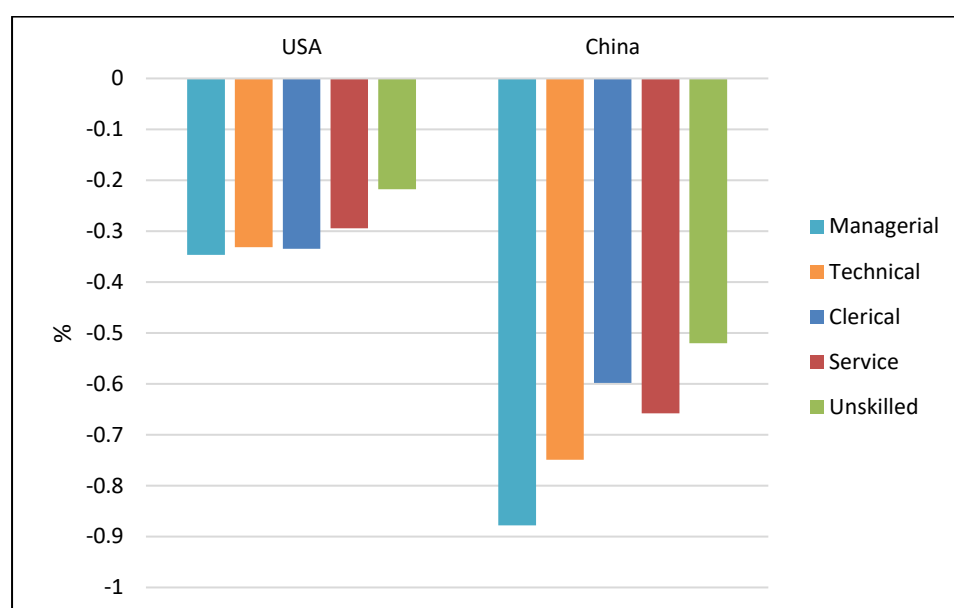
Source: GTAP simulations.

The macro results presented so far suggest both participating countries lose from a tariff war, $24 billion for the United States and $53 for China. Global losses are $30 billion, so this implies that third countries gain $47 billion.

In GDP terms the losses are 0.3 per cent for the United States and 1.6 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.

Next, we look at trade and output at a sectoral level.

Sectoral impacts

Following a tariff war, many sectors are expected to show a decrease in bilateral imports into the United States of 40-60 per cent, but in absolute terms the sectors most affected are motor vehicles, chemicals, rubber and plastics, manufactured goods, and textiles, clothing and footwear. Among agricultural goods, the most significantly affected sectors are vegetables, fruit and nuts and pork and poultry meat. Table A4 shows the absolute and percentage changes by sector.

US imports

Figure 6 shows absolute changes. The Motor vehicles sector is most affected. The percentage change is -55 per cent, but the initial trade flows are much greater than other sectors, so the drop in imports is large, $142 billion. Some $100 billion is supplied by other exporters, mainly the European Union, Latin America (Mexico) and Japan. The shortfall in Motor vehicles imports is $42 billion. This is, to a large extent, filled by an increase in domestic production of

$30 billion. The increase in prices due to higher tariffs on Chinese vehicles leads to a fall in consumption in the United States.

Figure 6 Change in US imports from China following Trade war scenario
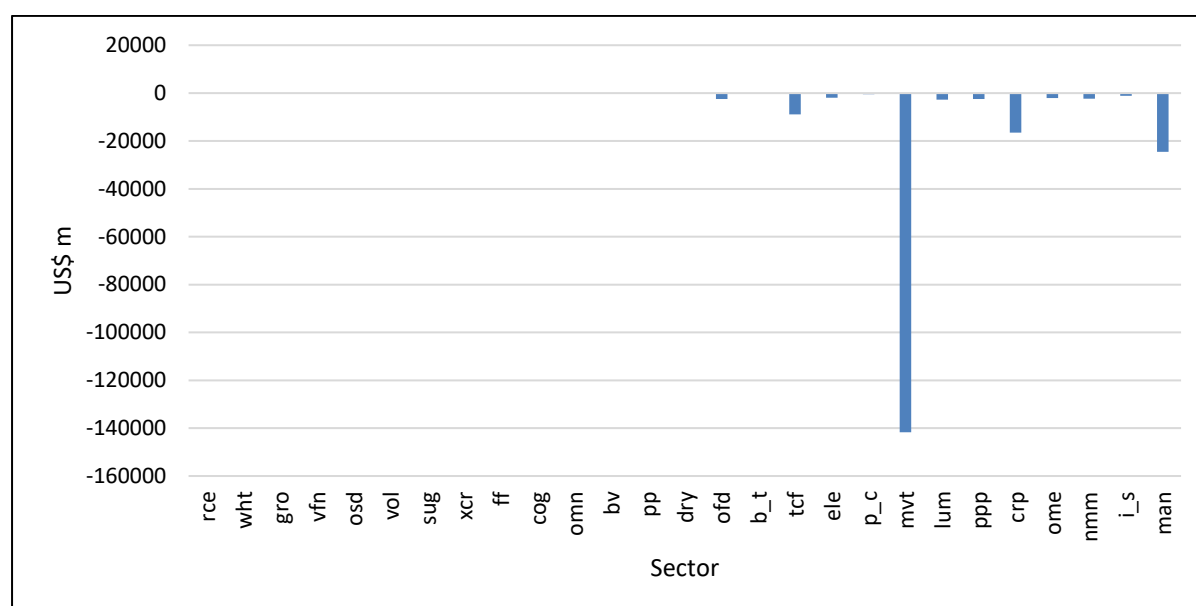
Source: GTAP simulations.

There is a reduction in bilateral imports of Manufactures of $24 billion, and Chemicals, rubber and plastics of $17 billion, and Textiles, clothing and footwear $9 billion. Alternative supplies are provided by the European Union, Other developed countries, and Latin America, particularly for manufactures.

One sensitive industrial area is electronics, which includes items such as mobile phones, computers and television sets. This is sensitive because the United States raised concerns about intellectual property. The reduction in bilateral imports is only $2 billion, about 18 per cent.

Within agriculture, the most significant reductions in bilateral imports from China to the United States are Other food products ($2.5 billion), Vegetables, fruit and nuts ($209 million), and Pork and poultry ($173 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 is from $6129 million to $3681 million, a fall of 40 per cent. alternative suppliers are the European Union, Other developed countries and Latin America fill half the gap in imports. However, half the gap ($1.6 billion) is unfilled.

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 fall from $497 million to

$288 million, a drop of 42 per cent. Half the gap is filled and Latin America and Other developed countries. The remainder, ($109 million) is unfilled.

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 fall from $373 million to $200 million, a fall of 46 per cent. The European Union and Other developed countries 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 the motor vehicle market, China's affected imports are more widespread (figure 7). However, there is little impact on agricultural products. This is because China revised its initial list to remove products used to feed livestock.

The main affected sectors are Machinery and equipment nec, $14 billion, Chemicals rubber and plastics, $11 billion, Electronics, $8 billion, Motor vehicles, $6 billion and Manufactures, $6 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 $56 billion. The total decline to national imports is $84 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.

Figure 7 Change in Chinese imports from USA following Trade war scenario
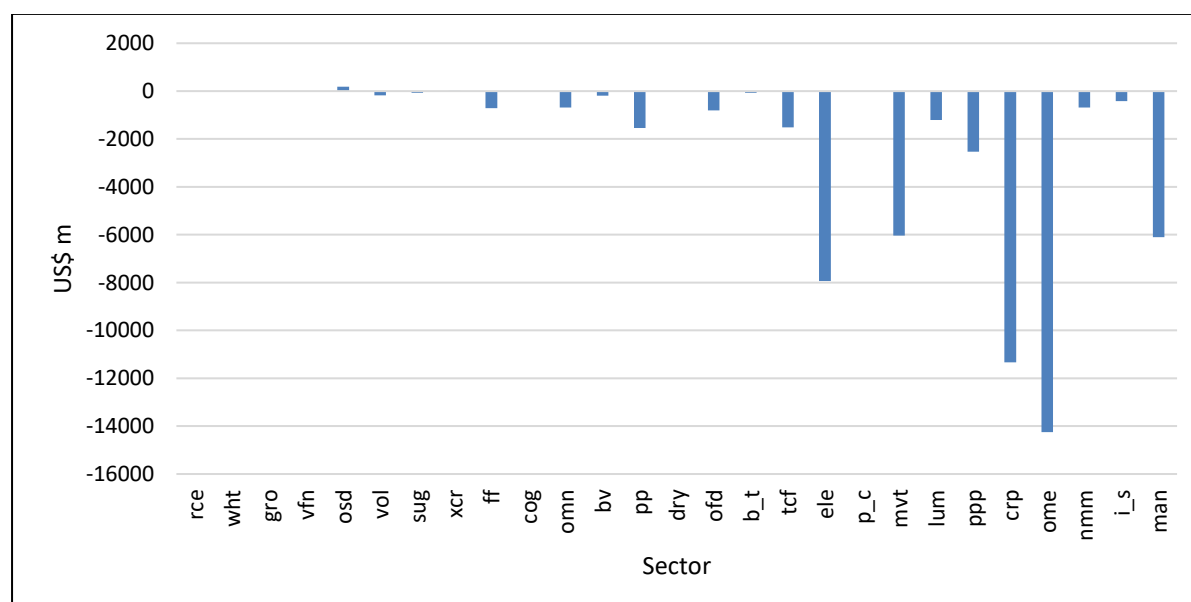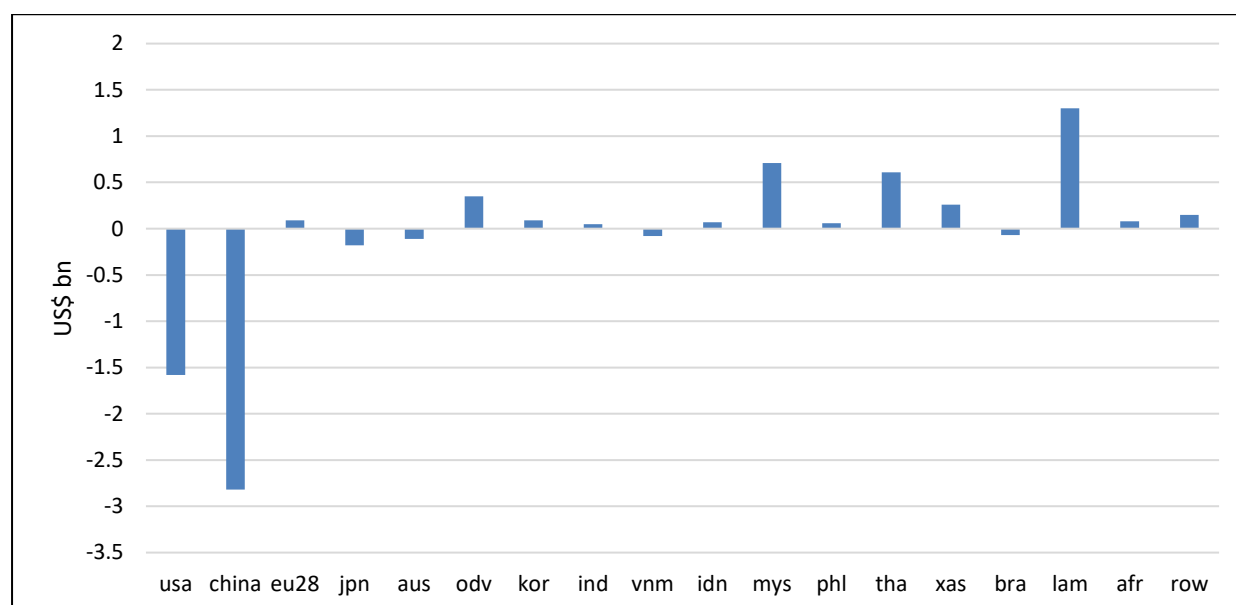

Source: GTAP simulations.

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 (figure 8). The European Union, Japan, Latin America, Other developed countries and Korea export more motor vehicles to the United States.

Figure 7 Change in exports by region 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 itself is worse off in terms of trade, welfare (a measure of consumption) and GDP (a measure of domestic production). Furthermore, it does not appear to support an increase in real wages. Our estimates quantity these effects in the medium term.

More broadly, the policy undermines the global rules-based system of international trade overseen by the WTO and in this sense makes most countries worse off.

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. To this extent at least, the magnitude of the impacts provides an incentive

for Chian to negotiate a better outcome. Indeed, there are signs, for example at the G20 meeting, that China may relent on some of these issues.

In terms of supporting domestic US industries, the effects are likely to be marginal, although our results show an increase in domestic production of motor vehicles, a sector where US producers have suffered in recent years. The problem, however, is that Chinese imports can be replaced by imports from other countries, such as Japan, Korea, the European Union or Mexico.

A further problem for the United States is that many of the intermediate inputs into production of Chines 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 trade in agricultural exports and the effects on third countries. We find that third countries are likely to benefit from the trade war, but the effects are quite small. There is little impact on agricultural exporters, primarily because China removed soya beans from its list.

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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

	US tariffs on imports from China		China tariffs on imports from USA	
	Base	Final	Base	Final
	%	%	%	%
Rice	5.3	28.2	0.1	0.1
Wheat	0.9	24.9	1.0	1.0
Oil seeds	0.1	22.8	1.4	1.4
Vegetables, fruit, nuts	1.1	20.3	4.1	4.1
Oil seeds.	0.0	22.4	3.0	3.1
Veg. oils & fats	1.7	15.5	9.7	31.9
Sugar	14.9	22.6	10.7	35.0
Other crops & cotton	0.7	5.0	1.9	2.0
Forestry & fishing	0.2	9.6	0.7	19.6
Coal, oil & gas	0.0	24.2	0.0	0.0
Minerals	0.2	3.8	0.1	22.3
Cattle & sheep products	0.5	8.5	1.3	4.3
Pork and poultry	1.0	12.8	6.6	17.2
Dairy products	16.9	16.9	5.7	5.9
Food products nec	2.6	19.7	8.6	18.8
Beverages & tobacco	5.0	16.4	6.0	7.5
Textiles, clothing & footwear	11.2	15.1	7.1	28.8
Electronics	0.3	4.0	1.4	10.8
Petroleum, coal products	0.6	9.7	3.2	3.2
Motor vehicle & trans equip.	1.6	19.7	13.7	15.6
Wood products	3.2	19.6	0.2	24.9
Paper products, publishing	0.2	12.1	1.1	13.7
Chemical, rubber & plastics	3.0	15.8	5.6	20.0
Machinery and equipment nec	1.3	11.8	4.9	24.8
Mineral products nec	4.8	18.6	7.8	26.6
Ferrous metals	1.0	8.3	3.6	18.9
Manufactures	1.6	10.7	2.5	9.4

Table A4 Bilateral merchandise trade impacts of trade war

	US imports from China		China imports from USA	
	Change $m	%	Change $m	%
Rice	-16	-64	-1	-20
Wheat	-1	-100	-7	-3
Oil seeds	-1	-50	-7	0
Vegetables, fruit, nuts	-222	-45	-16	-1
Oil seeds.	-57	-61	180	1
Veg. oils & fats	-50	-54	-184	-70
Sugar	-4	-22	-65	-65
Other crops & cotton	-70	-18	1	0
Forestry & fishing	-27	-25	-719	-44
Coal, oil & gas	-32	-94	-1	0
Minerals	-24	-4	-685	-30
Cattle & sheep products	-77	-40	-185	-19
Pork and poultry	-184	-49	-1544	-46
Dairy products	2	13	-14	-2
Food products nec	-2571	-42	-802	-29
Beverages & tobacco	-29	-19	-72	-4
Textiles, clothing & footwear	-9536	-12	-1516	-75
Electronics	-2171	-20	-7955	-51
Petroleum, coal products	-392	-29	-3	0
Motor vehicle & trans equip.	-145985	-56	-6130	-16
Wood products	-2724	-57	-1208	-76
Paper products, publishing	-2473	-42	-2535	-47
Chemical, rubber & plastics	-17060	-48	-11349	-56
Machinery and equipment nec	-2187	-51	-14263	-70
Mineral products nec	-3219	-42	-690	-60
Ferrous metals	-1171	-28	-423	-56
Manufactures	-25341	-39	-6128	-40
Total	**-215622**	**-44**	**-56321**	**-36**