

Introduction

The US economy represents approximately 25% of world's GSP, as such, the US is an important trading partner for many countries. To date, the US has signed comprehensive free trade agreements with 20 countries. Excluding the renegotiation of the regional trade agreement between the countries of North America, in over a decade, no other trade agreement has been completed, while other countries in the world have continued to finalized trade agreements. This study explores the effects on US agriculture of the inaction to promote trade while other nations actively pursue more trade agreements.

According to a World Bank brief¹, in 2018 there were close to 300 agreements worldwide. Because it is unfeasible to analyze all of them, this study focuses on the following trade agreements:

- Japan-Australia Economic Partnership Agreement (JAEPA)
- EU-Vietnam Free Trade Agreement (EVFTA)

Given the international scope across different markets, the study uses a global multi-region, multi-sector, general equilibrium model calibrated to the latest GTAP Data Base. This is GTAP 11, consisting of 141 countries and 19 aggregate regions, 65 commodities/sectors (12 agricultural, 8 food, 25 manufacturing, and 20 service sectors) for each of the countries/regions, and several factors of production (Aguiar et al. 2022).

Data

For the empirical framework, the database is aggregated to focus on food and agriculture. In terms of regions, we consider the US, Japan, Australia, EU, and Vietnam. Other regions in this aggregation are listed in Table 1. In terms of sectors, the focus of the study is on food and agriculture, the remaining sector are aggregated as listed in Table 2.

The GTAP database represents a snapshot of the world economy in the year of reference, for GTAP 11 this is 2017. For its construction, the database relies on information for more than

¹ <https://www.worldbank.org/en/topic/regional-integration/brief/regional-trade-agreements>

200 countries. The Input-Output tables (IOTs), are what allows GTAP to separately identify a country. Not all countries have an IOT, when missing, IOTs are estimated and aggregated into each of the 19 rest of regions.

Countries and regions are interconnected through trade and transportation data. Because IOTs represent various reference years, the data in IOTs are supplemented with other international data sets. For example, macroeconomic data comes from the World Bank's World Development Indicators.

The database also incorporates domestic and trade protective policies. Agricultural domestic support values are based on the Organisation for Economic Cooperation and Development (OECD) Producer Support Estimates (PSE). PSE data covers OECD countries and several non-OECD countries, and their incorporation into GTAP is described by Boulanger et al. (2023) for the EU and Wang and Aguiar (2023) for non-EU countries. Trade protection data consists of export and import measures. Agricultural export taxes/subsidies are incorporated from the notifications to the World Trade Organization (WTO) as explained in Ajewole et al. (2023). Applied import tariffs for all merchandise (agricultural and non-agricultural) are included from the International Trade Center (ITC) MacMAP data (Mimouni et al., 2023). The value flows in the database are measured on a pre and post-tax basis and in millions of 2017 USD.

Model

The GTAP model is a comparative static, general equilibrium model of global trade and is well documented in Hertel (1997) and more recently by Corong et al. (2017). The GTAP model is a global, multi-regional, multi-sectoral that provides linkages across goods (products and services) and factors in each economy as well as international linkages of goods between economies through international trade. In particular, we use the GTAP-E model, which is capable of tracking carbon dioxide due to fuel combustion (McDougall and Golub 2009).

The model considers the optimizing behavior of agents (consumers and producers) in the economy. First, it considers a representative country/regional household that maximizes its utility and owns factor endowments used by firms. Household expenditures across private, public, and savings are governed by an aggregate Cobb-Douglas *per capita* utility function. Second, firms' profit maximization behavior operates under perfect competition and constant returns to scale technology. Firms utilize inputs (both domestic and imported) and value added

(e.g., capital and labor) to produce goods for final demand and make factor payments to the regional household.

Without a government agent, it is the regional household who receives all tariff and other tax revenues, and incurs public expenditures. Consequently, welfare indicators are computed from the regional household's utility function.

For the firm, input demand functions are nested constant elasticity of substitution (CES) functions. The model assumes that all factors of production are fully employed.² While capital and labor are perfectly mobile across sectors within a region, land and natural resources are imperfectly mobile. Perfect mobility of capital and labor implies returns to each of these factors will be equalized across all sectors. Imperfectly mobile factors enter the model as a constant elasticity of transformation (CET) supply function which controls the mobility and results in sectoral-differentiated prices.

In addition to international trade, there are two additional features of this model: international transport margins are explicitly represented, and a global banking sector links world savings and investment.

Results

The following trade agreements are considered:

- Japan-Australia Economic Partnership Agreement (JAEPa)
- EU-Vietnam Free Trade Agreement (EVFTA)

The implementation of these agreements only considers the tariff removal in food and agriculture between the selected parties. The results presented here focus on the effects that the tariff removal has for the US.

After the implementation of these agreements, there is a reduction of US imports of all products and services. The reduction is driven by the Japan-Australian agreement. Australian exports to the US decrease while Australian exports to Japan increase. Japan exports increase to Australia and the US.

² This assumption is relaxed to consider the sensitivity of results to unemployment of labor endowments.

Similarly, US exports of food and agricultural products decrease mainly due to the JAEPA, see table 5. Wheat and cattle from the agricultural side and from the food products the decrease is driven by cattle meat, processed rice, and sugar. Because of lower exports, output in the US due to this agreement decreases, mainly driven by the JAEPA, see table 4.

In terms of welfare changes, the US see its equivalent variation diminish while the Australia show the larger gains. The negative effects for Japan and the EU need to be further investigated.

Conclusions

References

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Table 1. Regional Aggregation

No.	New Code	region Description	Comprising old regions
1	AUS	Australia	aus
2	R_Oceania	Rest of Oceania	nzl xoc
3	JPN	Japan	jpn
4	CHN	China	chn
5	R_EastAsia	Rest of East Asia	hkg kor mng twn xea brn
6	VNM	Vietnam	vnm
7	R_SEAsia	Rest of Southeast Asia	khn idn lao mys phl sgp tha xse
8	IND	India	ind
9	SouthAsia	South Asia	afg bgd npl pak lka xsa
10	USA	United States	usa
11	R_NAmerica	Rest of North America	can mex xna
12	LatinAmer	Latin America	arg bol bra chl col ecu pry per ury ven xsm cri gtm hnd nic pan slv xca dom hti jam pri tto xcb
13	EU	EU	aut bel bgr hrv cyp cze dnk est fin fra deu grc hun irl ita lva ltu lux mlt nld pol prt rou svk svn esp swe
14	R_EU	Rest of EU	gbr che nor xef
15	MENA	Middle East and North Africa	bhr irn irq isr jor kwt lbn omr pse qat sau syr tur are xws dza egy mar tun xnf
16	SSA	Sub-Saharan Africa	ben bfa cmr civ gha gin mli ner nga sen tgo xwf caf tcd cog cod gng gab xac com eth ken mdg mwi mus moz rwa sdn tza uga zmb zwe xec bwa swz nam zaf xsc
17	RestofWorld	Rest of World	alb srb blr rus ukr xee xer kaz kgz tjk uzb xsu arm aze geo xtw

Table 2. Sectoral Aggregation

No.	New Code	sector Description	Comprising old sectors
1	pdr	Paddy rice	pdr
2	wht	Wheat	wht
3	gro	Other grains	gro
4	v_f	Vegetables and Fruits	v_f
5	osd	Oil seeds	osd
6	c_b	Sugar cane/beets	c_b
7	pfb	Plant fibres	pfb
8	ocr	Other crops	ocr
9	ctl	Cattle	ctl
10	oap	Other Animal products	oap
11	rmk	Raw milk	rmk
12	wol	Wool	wol
13	FF	Forestry and Fishery	frs fsh
14	Coal	Coal Mining	coa
15	Oil	Crude oil	oil
16	Gas	Natural gas extraction	gas gdt
17	Oil_pcts	Refined oil products	p_c
18	Electricity	Electricity	ely
19	En_Int_ind	Energy intensive industries	oxt chm bph rpp nmm i_s nfm
20	cmt	Cattle meat	cmt
21	omt	Other meat	omt
22	vol	Vegetable oil	vol
23	mil	Dairy	mil
24	pcr	Processed rice	pcr
25	sgr	Sugar	sgr
26	ofd	Other food	ofd
27	b_t	Beverage and tobacco	b_t
28	OIND	Other industries	tex wap lea lum ppp fmp ele eeq ome mvh otn omf
29	Oth_ser	Other services	wtr cns trd afs otp wtp atp whs cmn ofi ins rsa obs ros osg edu hht dwe

Table 3. Import changes (percentage unless otherwise stated)

Sectors	Baseline (million \$)	FTAs	EU_VNM	AUS_JPN
Paddy rice	2.31	-0.48	-0.01	-0.47
Wheat	730.63	-0.36	-0.01	-0.35
Other grains	1075.32	-0.02	0.00	-0.02
Vegetables and Fruits	27831.89	-0.06	-0.01	-0.05
Oil seeds	1192.90	-0.10	0.00	-0.10
Sugar cane/beets	2.40	-0.30	-0.01	-0.29
Plant fibres	83.76	-0.14	0.00	-0.14
Other crops	12586.52	-0.07	0.00	-0.07
Cattle	2200.30	-0.84	-0.01	-0.83
Other Animal products	2012.14	-0.13	-0.02	-0.11
Raw milk	6.60	-0.26	-0.01	-0.24
Wool	10.54	-1.94	-0.01	-1.93
Forestry and Fishery	3497.66	-0.07	0.00	-0.07
Coal Mining	422.84	-0.06	0.00	-0.07
Crude oil	136457.05	-0.01	0.00	-0.01
Natural gas extraction	18355.75	0.01	0.00	0.01
Refined oil products	56301.81	-0.02	0.00	-0.02
Electricity	4826.56	0.00	0.00	0.00
Energy intensive industries	413925.81	-0.02	0.00	-0.02
Cattle meat	6620.16	-1.42	0.01	-1.42
Other meat	3002.51	-0.14	-0.01	-0.14
Vegetable oil	8257.65	-0.09	0.00	-0.08
Dairy	2780.62	-0.10	0.00	-0.10
Processed rice	779.08	-0.02	0.00	-0.02
Sugar	2371.09	-0.15	0.00	-0.15
Other food	60150.00	-0.15	0.00	-0.15
Beverage and tobacco	26764.43	-0.02	0.00	-0.02
Other industries	1546174.88	-0.01	0.00	0.00
Other services	547057.75	-0.02	0.00	-0.02

Table A4. Output changes (percentage unless otherwise stated)

Sectors	Baseline (million \$)	FTAs	EU_VNM	AUS_JPN
Paddy rice	2,638.89	-0.04	0.00	-0.04
Wheat	15,477.65	-2.34	-0.01	-2.33
Other grains	61,256.55	-0.03	0.00	-0.02
Vegetables and Fruits	69,282.30	0.07	0.01	0.07
Oil seeds	50,536.30	0.12	0.00	0.12
Sugar cane/beets	2,788.90	-0.01	0.00	-0.01
Plant fibres	15,825.68	0.33	0.00	0.32
Other crops	13,438.92	0.12	0.01	0.12
Cattle	64,570.40	-0.72	0.00	-0.71
Other Animal products	68,062.98	-0.01	-0.02	0.02
Raw milk	40,203.74	-0.04	-0.01	-0.03
Wool	636.37	0.41	0.00	0.41
Forestry and Fishery	58,953.03	-0.05	0.00	-0.05
Coal Mining	47,095.82	0.07	0.00	0.07
Crude oil	158,136.58	0.01	0.00	0.01
Natural gas extraction	106,326.60	0.05	0.00	0.05
Refined oil products	386,678.09	0.00	0.00	0.00
Electricity	384,264.06	0.00	0.00	0.00
Energy intensive industries	1,695,668.50	0.02	0.00	0.02
Cattle meat	130,113.98	-0.80	-0.01	-0.79
Other meat	127,908.01	-0.04	-0.04	0.00
Vegetable oil	68,390.84	0.03	0.00	0.03
Dairy	136,428.77	-0.05	-0.01	-0.04
Processed rice	5,028.96	-2.28	0.00	-2.28
Sugar	38,990.16	-0.04	0.00	-0.03
Other food	429,041.34	-0.01	0.00	-0.01
Beverage and tobacco	182,377.59	0.00	-0.01	0.00
Other industries	3,411,617.00	0.01	0.00	0.01
Other services	24,293,860.00	0.00	0.00	0.00

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Table A5. Export changes (percentage unless otherwise stated)

Sectors	Baseline (million \$)	FTAs	EU_VNM	AUS_JPN
Paddy rice	442.03	0.22	-0.01	0.23
Wheat	6511.75	-5.46	-0.01	-5.44
Other grains	11613.97	0.14	-0.01	0.15
Vegetables and Fruits	19351.88	0.20	0.02	0.18
Oil seeds	23754.60	0.22	0.00	0.21
Sugar cane/beets	8.64	0.01	0.00	0.01
Plant fibres	6142.48	0.82	0.01	0.81
Other crops	3271.84	0.25	0.02	0.24
Cattle	905.24	-1.76	0.01	-1.77
Other Animal products	3351.82	0.28	0.00	0.29
Raw milk	1.17	0.50	0.02	0.48
Wool	25.75	9.46	-0.03	9.48
Forestry and Fishery	2608.61	0.16	0.02	0.15
Coal Mining	10616.47	0.41	0.00	0.41
Crude oil	12355.95	0.05	0.00	0.05
Natural gas extraction	28710.84	0.23	0.00	0.23
Refined oil products	96152.63	0.01	0.00	0.01
Electricity	637.27	0.03	0.00	0.03
Energy intensive industries	347779.28	0.07	0.00	0.07
Cattle meat	7924.83	-12.15	-0.07	-12.08
Other meat	11968.71	-0.42	-0.29	-0.12
Vegetable oil	7524.92	0.17	0.00	0.17
Dairy	4355.42	-1.26	-0.18	-1.08
Processed rice	1366.17	-8.41	-0.01	-8.40
Sugar	297.94	-4.72	-0.01	-4.71
Other food	36330.56	-0.04	-0.03	-0.01
Beverage and tobacco	11658.62	-0.06	-0.09	0.03
Other industries	837494.63	0.04	0.00	0.04
Other services	734616.13	0.05	0.00	0.05

Table 6. Equivalent variation

Countries/regions	Equivalent Variation (million \$)	EU_VNM	AUS_JPN
Australia	1,405.54	-5.01	1,410.55
Rest of Oceania	-61.40	-5.79	-55.61
Japan	-880.82	0.88	-881.70
China	-303.46	-1.69	-301.77
Rest of East Asia	-67.57	-6.47	-61.11
Vietnam	3.94	33.18	-29.01
Rest of Southeast Asia	-69.82	-13.68	-56.14
India	-111.52	-5.98	-105.54
South Asia	-18.28	0.59	-18.87
United States	-164.57	-16.27	-148.30
Rest of North America	-46.28	-1.15	-45.13
Latin America	37.41	-17.37	54.78
EU	-22.89	79.22	-102.11
Rest of EU	-8.74	-12.91	4.17
Middle East and North Africa	55.42	-4.19	59.62
Sub-Saharan Africa	30.59	0.73	29.86
Rest of World	72.15	-3.76	75.91