

## The Implications of Trade Liberalization on TPP Countries' Livestock Product Sector

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### Abstract

**Problem Statement :** The Trans-Pacific Strategic Economic Partnership Agreement (TPP) is a new free trade agreement in the Asia and Pacific. It may lead to an increase in productivity and efficiency in Asia Pacific, especially in the livestock sector and thus lead to higher growth and economic and social well-being. **Approach :** To address TPP issues and other questions that are associated to alternative policies on the livestock sectors, a computable general analysis model (CGE) or Global Trade Analysis Project (GTAP) was employed to highlight the incidence of protection change on the variables of interest. **Results :** Real GDP of the TPP economies were increased by up to one percent in eight of the ten participating countries, namely Canada, Vietnam, New Zealand, Malaysia, Australia, Singapore, and Peru with newly Japan participation. **Conclusion :** The TPP would benefit, even small, both the economies and welfare with the elimination of tariffs.

**Keyword :** TPP, livestock, CGE, GTAP, real GDP, trade effects.

### 1. Introduction

In the past two decades, many developed and developing countries have concluded regional and multilateral FTAs to enhance their trade and boost their economic growth. The Trans-Pacific Strategic Economic Partnership Agreement (TPP-better known as "P4") is a trade agreement, currently under negotiation, that has its roots in an existing agreement between Brunei Darussalam, Chile, New Zealand and Singapore that was signed in 2005.

In February 2008, the United States agreed to enter into talk with the P4 members regarding liberalization of trade in financial services. On September 22, 2008, U.S. Trade Representative Susan C. Schwab announced that the United States would begin negotiations, with the first round of talks scheduled for early 2009. In November 2008, Australia, Vietnam, and Peru announced that they would also be joining the P4 trade bloc. In October 2010, Malaysia announced that it had also joined the TPP negotiations. Canada and Japan have also expressed interest in TPP membership. The above-mentioned 10 countries have joined the TPP free trade.

The objective of the original agreement was to eliminate 90 percent of all tariffs between member countries by January 1, 2006, and reduce all trade tariffs to zero by the year 2015. It

is comprehensive agreement covering all the main pillars of a free trade agreement, including goods, rule of origin, trade remedies, sanitary and phytosanitary measures, technical barriers to trade, trade in service, intellectual property, government and competition policy <sup>(1)</sup>. Moreover, the goal of these original four TPP members was not to form a union based on economic synergies among the current partners, but rather to create a model agreement that could be expanded to include additional members from both sides of the Pacific.

Accordingly, negotiating an agreement with the TPP countries, implementation of multilateral and bilateral trade agreement is likely to provide benefits for the economy and increase welfare for society. In case of the livestock sector, trade liberalization may bring both opportunities and threats, and have effects on both the supply and the demand sides. For example, income growth may increase demand for meat, but the domestic industry may also have to compete with imported products. Reducing tax on imported maize/ or soybean may cause feed prices to decrease, but the opportunity cost of labor in livestock production may increase <sup>(2)</sup>. Moreover, the TPP free trade area could affect farmers, who have consistently opposed to the liberalization of the livestock trade. It is certain that the role of the livestock trade and any associated level of protection afforded it will be a major concern in any

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forthcoming process of negotiations.

To address these issues and other question that are connected to direct and indirect effects of alternative policies on the livestock sectors, a computable general analysis model (CGE) was used to highlight the incidence of protection change on the variables of interest. The objective of this study is to analyze implications of trade liberalization on TPP countries 'livestock' producers. This paper will examine how welfare of the household is affected when prices change due to the trade liberalization, and also investigate how household production and consumption actions change.

The paper proceeds as follows: Section 2 presents a brief of theoretical model and data specification of the GTAP model. The simulation results are reported in Section 3. The conclusions of this paper presents in Section 4.

## 2. Theoretical model and data specification

The model used in the study was developed within the global trade analysis project (GTAP). GTAP was initially developed in 1992 at Purdue University, USA. It is a standard Computable General Equilibrium (CGE) model based on the neoclassical theory of firm and household behavior assuming perfect competition, rational and utility optimizing behavior. Moreover, the CGE model has solid micro-foundations that are theoretically transparent. Function forms are specified in an explicit manner and interdependencies and feedback are incorporated. Therefore, the model provides a framework for assessing the effects of policy and structural changes on resource allocation by clarifying "who gains and who loses."

The project is a global network of researchers and policy makers conducting quantitative analysis of international policy issues. It is designed to be a multi-region, general equilibrium model with bilateral trade flows between all region and linkages between economies and between sectors within economies. Each region has a single representative household. The share of aggregate government expenditure in each region's income is held fixed. There is a global banking sector which intermediates between global saving and bilateral trade is handled via the Armington assumption. Primary factors (land, unskilled labor, skilled labor, capital and natural resources) are substitutable but as a composite are used in fixed proportion to intermediate inputs. The standard model is a comparative static model which means that after introducing an exogenous shock, like policy change, the model works out a new equilibrium in all market and determiners new values

for the endogenous variables. Full documentation of the theoretical structure of GTAP is available <sup>(3)</sup>.

In this paper GTAP version7 is the source of the data for simulation. It covers 113 regions, 57 commodities or sectors, and five primary sectors. The database corresponds to the world economy based on 2004 benchmark <sup>(4,5)</sup>. For this model, the GTAP dataset was aggregated down to 17 regions and 15 sectors, respectively (17 regions : Australia, Chile, New Zealand, Peru, Singapore, USA, Vietnam, Japan, China China (Taiwan, Hong Kong), South Korea, Canada, Mexico, and Malaysia, ASEAN (Indonesia, Philippines, Thailand, Cambodia, Lao PDR, Burma), Latin America (Argentina, Bolivia, Brazil, Columbia, Ecuador, Paraguay, Uruguay, Venezuela, Rest of South America, Costa Rica, Guatemala, Nicaragua, Panama, Rest of Central America, Caribbean), EU (Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherland, Poland, Portugal, Slovakia, Spain, Sweden, United Kingdom), and Rest of the world, 15 sectors : Rice (Paddy rice), Wheat, Grains (Cereal grains nec), Vegetable and fruit (vegetable and fruits, nut), livestock Animal (cattle, sheep goats, horses, swine, poultry), eggs, raw milk, wool), Meat product (animal meat, meat products), Fishing, Process food (Vegetable oils and fats, Dairy products, Process rice, Sugar Food product nec, Beverages and tobacco products), Natural resource (Forestry, coal, oil gas, minerals), Textiles and apparel (Textiles and wearing apparel), Light Manufacturing (Leather products, Wood products, Paper products, publishing, Metal products nec, Motor vehicle and parts, Transport equipment nec, Manufactures nec), Heavy Manufacturing (Petroleum, coal products, Chemical, rubber, plastic prods, Mineral product nec, Ferrous metals, Metals nec, electronic equipment, Machinery and equipment), Utilities & Construction (Electricity, gas, water, construction), Trade (Trade, transport, water and air transport, communications), transport, Comm., Other services (Financial intermediation, insurance, real estate, recreation, government)).

## 3. Simulation results

### 3.1 Macroeconomics effect

Table 1 shows the percentage change on real GDP, import volume, export volume, and term of trade in trade liberalization's TPP on livestock sectors. Real GDP increased in eight of eleven countries, but the projected percentage change in-

Table 1 Macroeconomic effect  
(unit: percent change)

Regions	real GDP	Import	Export	TOT
Australia	0.003	0.75	0.15	0.52
New Zealand	0.02	0.65	-0.10	0.66
Singapore	0.002	-0.02	-0.03	0.01
USA	-0.001	0.37	0.25	0.16
Chile	-0.001	0.18	0.001	0.23
Peru	0.000	-0.03	0.08	-0.05
Vietnam	0.02	0.13	0.15	-0.01
Japan	0.07	1.49	1.54	-0.28
Canada	0.05	0.80	0.71	0.00
Mexico	-0.02	-0.02	0.11	-0.03
Malaysia	0.01	-0.01	-0.0	0.004
China	0.004	0.03	0.02	0.01
Korea	0.01	0.41	0.30	-0.06
ASEAN	0.01	0.00	0.02	-0.02
Latin	0.00	-0.11	0.02	-0.06
EU	0.00	-0.02	0.01	-0.01
ROW	0.00	-0.02	0.01	-0.01

Source: Model Simulation

crease was less than one percent in Japan, Canada, Vietnam, New Zealand, Malaysia, Australia, Singapore, and Peru while Mexico, the US, and Chile would experience a reduction real GDP. However, non-member countries have positive percentage change. This supports arguments that TPP is a beneficial to member countries, and also to non-member countries in term of livestock sectors. In general, non-members would be at a disadvantage as a result of the trade diversion.

The rate of export growth among member countries would produce positive increases. The percentage changes show more than one percent increase of 1.54 percent for Japan while other members increase would have an of less than one percent; Canada (0.71), the US (0.25), Australia, Vietnam (0.15), Mexico (0.11), Peru (0.08), and Chile (0.001). Unsurprisingly, imports in all participating members would increase more than exports. In particular, Japan would increase 1.49 percent and three of ten would increase; Canada (0.80), Australia (0.75), New Zealand (0.65).

In international economics, term of trade is expressed as the ratio of the price of an export commodity ( $s$ ) to the price of an import commodity ( $s$ ). An improvement in a nation's term of trade is beneficial to that country in the sense that it has to pay less for the products it imports, that is, it has to give up less export for the import it receives. Percentage change shows that mostly there would be better off in term of trade, especially for New Zealand (0.66) and Australia (0.52). The

Table 2 Equivalent Variation and Welfare decomposition  
(unit: Million US \$)

Regions	EV	Allocative efficiency	Term of Trade Effect	Explanatory Factors
Australia	630.1	20.0	566.5	43.5
New Zealand	193.2	17.3	183.5	-7.6
Singapore	14.4	2.3	18.2	-6.1
USA	2192.7	-160.5	1797.6	555.5
Chile	66.1	-1.1	86.8	-19.4
Peru	-7.2	-0.2	-5.5	-1.4
Vietnam	3.6	8.6	-2.5	-2.4
Japan	1654.4	3356.5	-1850.0	147.9
Canada	423.2	458.9	16.0	-51.6
Mexico	-184.1	-118.9	-45.9	-19.2
Malaysia	9.1	12.1	-0.1	-2.8
China	-36.6	93.7	20.8	-151.2
Korea	-153.6	57.5	-190.8	-20.4
ASEAN	-30.5	30.5	-56.9	-4.1
Latin	-207.8	2.3	-179.8	-30.2
EU	-674.9	-124.8	-279.2	-270.8
ROW	-253.1	-6.1	-87.8	-159.2
Total	3639.1	3648.3	-9.2	-0.06

Source: Model Simulation

loss to the Japan, Peru, Mexico and Vietnam would not be unduly burdensome at 0.28, 0.05, 0.03, and 0.01 percent change, respectively. All non-members except China would see a improvement of 0.01 percent change.

### 3. 2. Welfare decomposition

Welfare indicators can be seen as a summary of policy changes. They incorporate change in consumption, production, price and trade flows. The GTAP model uses the concept of equivalent variation (EV) in income to measure welfare effects. Table 2 shows the welfare and decomposition of welfare.

An examination of the table for the welfare contributions by country shows that for the biggest welfare gains would occur in the US (2192.2 \$US Million), Japan (1654.4 \$US Million), Australia (630.1 \$US Million), Canada (423.2 \$US Million), and New Zealand (193.2 \$US Million), while the big loser is Mexico, with a loss welfare of 184.1 \$US Million. Furthermore, total gains/losses are decomposing into contributions from improvement in allocative efficiency, term of trade effect, and explanatory factors. As the decomposition of each component of the main welfare shows, the more important effect on term of trade effect comes from the elimination of the import tariff. Gains from term of trade improve in the US (177.6 \$ US Million), Australia (566.5 \$ US Million), New Zealand (183.5 \$ US Million), Chile (86.2 \$ US Million),

Table 3 Output, supply price by primary factor by region  
(Unit: percent change)

Regions	Land	UnSkLab	SkLab	Capital	NatRes
Australia	9.47	0.17	0.07	0.01	-2.97
New Zealand	13.17	0.27	0.07	0.05	-5.64
Singapore	0.73	0.01	0.02	0.01	-0.16
USA	4.15	0.03	0.00	0.02	-0.89
Chile	7.49	0.05	-0.02	-0.03	-1.79
Peru	0.19	-0.01	-0.01	-0.02	0.00
Vietnam	-0.02	0.06	0.09	0.07	-0.40
Japan	-12.27	0.25	0.31	0.25	0.65
Canada	4.75	0.17	0.13	0.15	-0.90
Mexico	1.42	0.04	-0.02	-0.03	-0.59
Malaysia	-0.03	0.00	0.01	0.00	-0.03
China	-0.60	0.01	0.03	0.03	0.04
Korea	-4.91	0.20	0.23	0.24	-0.42
ASEAN	-0.45	0.00	0.03	0.02	0.14
Latin	-0.39	-0.01	0.00	-0.01	0.05
EU	0.13	0.00	0.00	0.00	-0.06
ROW	0.18	0.00	-0.01	-0.01	-0.07

Source: Model Simulation

Singapore (18.2 \$ US Million), and Canada (16.0 \$ US Million) while only two members' TPP improve allocative efficiency, Japan (3356.5 \$ US Million) and Canada (458.9 \$ US Million).

In fact, the explanation factor has reported a positive value in three of eleven, of 555.5 \$ US Million for the US, 147.9 \$ US Million for Japan, and 43.5 \$ US Million for Australia.

### 3.3. Output, supply price by primary factor by region

Table 3 illustrates the changes in the livestock sector. Here the quantity of land is fixed in that it can only be used in primary livestock production while unskilled/skilled labor, capital and natural resources, in both price and quantity, as resources can move freely in and out of the other industries in the economy. We can see that for all TPP members, and for the rest of the world, the impact upon livestock factor natural resources is modest, except for Japan and Peru, which would experience a positive percentage change of 0.69 and 0.00, respectively.

The gains to the member countries are derived from a better use of land, labor and capital. Land prices would increase more than one percent in New Zealand (13.17), Australia (9.47), Chile (7.49), Canada (4.75), the US (4.15), and Mexico (1.42). While contribution from employed unskilled livestock labor and livestock capital are also marginally positive for these eight countries except Peru in unskilled labor,

Table 4 Industry output supply price and domestic share on animal sectors  
(Unit: percent change)

	Industry output		Supply price		Domestic share	
	Livestock	Meat Product	Livestock	Meat Product	Livestock	Meat Product
Australia	6.59	20.19	2.14	1.21	9.64	1.46
New Zealand	3.81	12.61	1.70	1.16	4.66	1.19
Singapore	0.18	0.30	0.11	0.06	-0.17	0.45
USA	3.85	7.08	0.74	0.33	3.81	0.02
Chile	9.90	15.61	1.97	1.32	10.48	0.26
Peru	-0.25	-0.79	-0.03	-0.06	-0.26	-0.36
Vietnam	-0.01	-1.78	-0.14	-0.22	-0.15	-1.83
Japan	-24.81	-53.06	-2.01	-2.97	-24.96	-53.19
Canada	4.09	10.68	0.53	-1.93	4.38	-14.45
Mexico	0.56	5.86	0.32	0.09	0.48	-1.15
Malaysia	-0.25	-3.60	-0.05	-0.01	-0.41	0.30
China	-0.40	-3.24	-0.18	-0.11	-0.38	0.01
Korea	-13.02	-20.54	-2.17	-1.90	-13.15	-20.66
ASEAN	-1.18	-3.11	-0.45	-0.27	-1.26	-0.07
Latin	-0.98	-1.99	-0.23	-0.16	-1.02	-0.17
EU	-0.19	-1.20	-0.04	-0.04	-0.20	-0.03
ROW	-0.02	-0.14	0.00	-0.01	-0.01	-0.02

Source: Model Simulation

Chile, Canada, and Peru in skilled labor and capital. Thus, TPP free trade area is good for livestock in eight countries; Australia, New Zealand, Singapore, the US, Japan, Vietnam, Canada, and Malaysia, but has no effect elsewhere.

### 3.4 Industry output supply price and domestic share on livestock sectors

Table 4 shows the results of simulation on TPP countries on livestock production. Under the FTA, the meat sector would show positive values, more than five percent in Australia (20.19), Chile (15.61), New Zealand (12.61), Canada (10.68), the US (7.08), and Mexico (5.86), while the livestock sector would show improved value but the percentage change would increase less than ten percent in five countries; 9.90 percent for Chile, 6.59 percent for Australia, 4.09 percent for Canada, 3.85 percent for the US, and 3.81 percent for New Zealand. Moreover, both that supply prices and domestic shares would also positive values.

However, Peru, Vietnam, Japan and Malaysia would fall in both livestock and meat product. The percentages change are 24.81 for Japan, 0.25 for Peru and Malaysia, and 0.01 for Vietnam in terms of the livestock industry output while meat product shows a projected drop of 53.06 for Japan, 1.78 for Vietnam, 3.60 for Malaysia, and 0.79 for Peru. The drop in these countries can be explained by both domestic share and firm share that weaken in four countries, especially for Japan

where domestic would have a negative effect of more than 50 percent in meat sector and 24.96 percent in livestock sector.

#### 4. Summary and Conclusions

In this paper, the impact of a regional trade liberalization measure was quantitatively analyzed using the CGE model of global trade or GTAP model. The analysis paid special attention to livestock key structural of TPP members. The data aggregation based on the most update version of a global trade database, GTAP 7 database, distinguishes fifteen sectors and seventeen regions (15 sectors : Rice, Wheat, Grains, Vegetable and fruit, livestock, Meat product, Fishing, Process food, Natural resource, Textiles and apparel, Light Manufacturing, Heavy Manufacturing, Utilities & Construction, Trade, transport, comm., Other service, and 17 regions : Australia, Chile, New Zealand, Peru, Singapore, the US, Vietnam, Japan, China, South Korea, Canada, Mexico, and Malaysia, ASEAN, Latin America, EU, and Rest of the world).

The results show that formation of the TPP trading bloc could result in both winners and losers in the group. It is estimated that real GDP of the TPP economies on percent change would be boosted by less than one percent in eight of eleven participating countries, Japan, Canada, Vietnam, New Zealand, Malaysia, Australia, Singapore, and Peru while Mexico, the US, and Chile would experience a reduction real GDP. However, non-members showed positive values in real GDP. Unsurprisingly, imports would increase more than exports, especially in Japan with a projected 1.49 percent change. Moreover, the biggest welfare gains would occur in the US, Japan, Australia, Canada, and New Zealand. Distribution of the gains and losses would be mainly affected by the term of trade effect. Gains from term of trade improve in six of eleven participating countries, namely the US, Australia, New Zealand, Chile, Singapore, and Canada. While the impact upon livestock factor natural resource would be modest for the participating countries, except for Japan and Peru, which would experience a positive percent change. The sector that would benefit most from the TPP is the meat sector whereby six participating countries of TPP FTAs, Australia, Chile, New Zealand, Canada, the US, and Mexico, would improve by more than five percent. Consequently, this would lead to the corresponding adjustments in primary market in TPP member countries.

Given these results from the GTAP model simulation, it is clear that the TPP would benefit both economies and welfare

with the eliminate tariff rate in term of livestock sectors. Most TPP members' economy would boost their economies growth or gain benefit from the TPP agreement. While considering the domestic share and supply share in each sector, the net results would be that consumers and producers would have increased options for both goods and input.

There are some limitations in these projects due to the GTAP model itself and other factors. The GTAP model is a comparative static model, thus it is hard to capture some dynamic effects of trade liberalization, and therefore the simulation, and project in this paper may not reflect the true outcome.

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## 貿易自由化がTPP諸国の畜産物セクターに及ぼす影響

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### 要 約

問題の所在：環太平洋経済連携協定（TPP）はアジア太平洋における新たな自由貿易協定である。これにより生産性と効率性の向上をもたらすことが期待される。殊に畜産セクターにおいてその成長と経済社会厚生を高めることが期待される。課題と方法：TPP参加に伴い、畜産セクターへの新たな政策に関連した疑問に対処すべく、計算可能一般均衡（CGE）モデルである世界貿易分析プロジェクト（GTAP）モデルを用いて、輸入関税の削減がもたらす影響を主要な指標について検討する。結果：TPP諸国の実質GDPは1パーセントほど増加する。結論：TPPによる輸入関税の削減は経済と厚生水準の向上に貢献すると期待される。