Impact of Increasing Agricultural Domestic Support on Food Price Transmission

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Abstract

Purpose – The paper aims to explore how increased agricultural domestic support might affect China's domestic market under the assumption of incomplete price transmission caused by border measure adjustments.

Design/Methodology/approach - We extend the standard Global Trade Analysis Project (GTAP) framework in two respects. First, we incorporate price transmission elasticities so that the extended model accounts for border measures to stabilise domestic prices. Second, we update the current representation of agricultural domestic support in China to analyse the impact of long-term food security policies. Running a set of simulations, we examine how different policy assumptions affect the agricultural market.

Findings – Adjustments of border measures as responses to high international agricultural prices mitigate the domestic prices increase, which also lead to an increase in China's trade deficit and prohibits net food sellers from receiving high prices. In the long term, an increase in China's agricultural domestic support to its WTO *de minimis* commitment level would increase domestic agricultural production and reduce its demand pressure on the international market.

Originality/Value - This paper contributes to the literature by examining the impact of increased agricultural domestic support on the domestic market while innovatively accounting for incomplete food price transmission caused by border measure adjustments. We combine econometric estimated price transmission elasticities and an extended GTAP framework to underscore the importance of interdependencies of different agricultural policies in affecting domestic markets.

Keywords Food price transmission, Border measures, Agricultural domestic support, GTAP

Paper type Research paper

1. Introduction

China's agricultural market has become increasingly integrated into the international agricultural market since its accession to the World Trade Organization (WTO), narrowing the gap between international and domestic prices for agricultural commodities (Martin, 2001; Huang *et al.*, 2009). Nonetheless, maintaining stability and self-sufficiency in the domestic market remains a key target of China's agricultural policy (Ministry of Agriculture of the People's Republic of China (MOA), 2014). During the surge in international agricultural prices in 2007/08, the Chinese government released grain stocks, reduced import tariffs and adopted protectionist measures such as limiting exports to prevent price transmission from the international to the domestic market (Yang *et al.*, 2008). As a result, China's trade deficit of agricultural products increased to its highest level since it became a net agricultural importer in 2004 (Carter *et al.*, 2009). In 2011/12, the surge in international agricultural prices led to a repetition of similar measures of the government, resulting in an even further increase in the trade deficit and lower food price transmission from the international market to China (Food and Agriculture Organisation of the United Nations (FAO), 2014).

International agricultural prices are likely to remain high and stay volatile in the future, given the uncertain developments of factors that caused the price crises in 2007/08 and 2010/11 (World Bank, 2014). In China, the booming demand for agricultural products coupled with disruptions in energy and financial markets particularly stresses the volatility of domestic prices (Organisation for Economic Co-operation and Development (OECD), 2009). China might continue to alter border measures to maintain stable domestic prices; however, the consequences of adjusted border measures are reduced selling prices for domestic producers and an increased competition with net agricultural imports, which could also exacerbate the situation in the international market (Martin and Anderson, 2012; Yang *et al.*, 2015). Timmer (2010) states that stabilising agricultural domestic production might be more effective to prevent food crises in the long run. In China, subsidies provided to agricultural producers have steadily increased since the nationwide abolishment of agricultural taxes in 2004 (Lohmar *et al.*, 2009). Agricultural Producer Support Estimate (PSE) for example accounts for only 6.64% of total agricultural receipts in 2004, whereas this share increased to 20.21% in 2014 (OECD, 2015). This growth was mainly induced by the increase in commodity specific transfers including market price support [1] and output subsidies classified as trade-distorting measures by the WTO (WTO, 2001; OECD, 2015).

The development of agricultural domestic support in China is well documented in the literature (Lohmar *et al.*, 2009; Gale, 2013; Ni, 2013), while other studies highlight the increasing linkage between subsidies and grain production. Based on producer surveys, Huang *et al.* (2011) show that the current protection level in China is rather low and appears to be non-distorting for agricultural production so far. However, they also mention that the increase in agricultural domestic support may have mixed impacts. In this case, utilising a global CGE (Computable General Equilibrium) model, Yu and Jensen (2010) find that using all domestic support permitted to China under WTO *de minimis* limits with existing instruments, i.e., direct payments given to the grain production and purchased inputs, lead to an increase in China's agricultural production and thus boost farm income. Furthermore, decoupled payments have less impact on grain production, although the categorization of decoupled payment such as direct payments in China is still disputable according to Cheng (2008). The same author shows that China may even exceed its WTO *de minimis* level for its agricultural domestic support under certain domestic prices for particular commodities, indicating further impact of such measures on grain productions.

The literature exploring the impact of domestic support measures in the presence of incomplete food price transmission caused by border measure adjustments is rather scarce. To our knowledge, only Yu and Jensen (2014) conduct a study that quantifies the interaction between border measures and domestic subsidies. Retrospectively, they assess the joint impact of existing agricultural domestic support and short-term trade policies responding to the 2007/08 international agricultural prices surge on China's domestic market. Their findings show that the short-run insulating trade policies during the price surge tend to reduce domestic agricultural prices. This offsets the effect of long-run agricultural domestic support designed to increase domestic agricultural prices and to enhance grain production.

However, given the uncertainties in the international agricultural market and continuing growth of China's agricultural domestic support, it is important to also address this issue in an *ex ante* manner. Additionally, during the price surge, not only China, but also many other countries curbed food price transmission to insulate their domestic markets. Therefore, the objectives of this paper are twofold: We examine how a surge in international agricultural prices affects China's domestic market under different border measures causing a variation of price transmission. Additionally, we analyse whether a growing agricultural domestic support in 2020 enhances or reduces the magnitude of the incomplete price transmission. To achieve these goals, we first extend the standard CGE model GTAP (Global Trade Analysis Project) so that it accounts for the incomplete price transmission. Second, we update the representation of China's agricultural domestic support in the framework to facilitate the support increase. In so doing, this paper contributes to the literature by examining the impact of increasing agricultural domestic support on the domestic market while innovatively accounting for incomplete food price transmission caused by border measure adjustments. We combine econometric estimated price transmission elasticities and an extended GTAP framework to underscore the importance of the interdependencies of different agricultural policies in affecting domestic markets.

Our paper is organised as follows. Chapter 2 explains the extensions of the GTAP framework with regard to both food price transmission and agricultural domestic support. In Chapter 3 we simulate the changes in agricultural domestic support in China using both the standard and extended GTAP framework. Chapter 4 compares the results. Conclusions and discussions are presented in Chapter 5.

2. Extensions of the GTAP framework

The standard GTAP framework is a comparative-static, multi-regional CGE model with a detailed, but global representation of economic activities. The model assumes perfect competition and constant returns to scale while bilateral trade is handled via the Armington assumption [2] (Hertel and Tsigas, 1997). Given its firm economic assumptions and the broad data coverage in the underlying database, GTAP has been used extensively in economy-wide policy analyses in a regional/global context. For the purpose of our study, we extend the standard GTAP framework by including incomplete price transmission and by updating agricultural domestic support at a very detailed level.

2.1. Including incomplete price transmission into the GTAP model

2.1.1. Theoretical development

The standard GTAP model assumes homogenous market integration, which does not take account of the imperfect price transmission from the international to domestic market (Valenzuela et al., 2007). Imperfect price transmission is caused by different factors e.g., market structures, the existence of transaction costs, exchange rates fluctuation and implementations of domestic and border policies (Baltzer, 2013). This paper focuses on political measures that affect price transmission. Equation (1) shows the linkage between international and domestic prices in the standard GTAP model:

$$pms(i,r,chn) = pcif(i,r,chn) + tm(i,chn) + tms(i,r,chn) \quad (1)$$

All variables in lower cases indicate percentage changes, whereas i stands for traded goods, r the origin and s the destination of traded goods. We use China (chn) as an example and present the price linkage for imports because China is a net agricultural importer. As elaborated by the equation, changes in domestic prices $pms(i,r,chn)$ equal changes in international prices $pcif(i,r,chn)$ plus changes in the country specific or source generic border *ad valorem* tariffs ($tms(i,r,chn)$ or $tm(i,chn)$). When border measures are unchanged, $tm(i,chn)+tms(i,r,chn)=0$, thus $pms(i,r,chn)$ equals $pcif(i,r,chn)$. This indicates a complete price transmission for imports, unless there are specific tariffs, which stay constant regardless of the value of traded goods (Siddig and Grethe, 2014). Because changes in private consumption prices in the GTAP model are weighted shares of changes in prices of imported goods, i.e., the international prices, and changes in prices of domestically produced goods, the setup in the standard GTAP model would overestimate the volatility transmitted from the international to domestic market when international prices surge.

To enhance the validity of the standard GTAP model in assessing agricultural price volatility, Valenzuela *et al.* (2007) incorporate active market insulation measures by importers into the model, which leads to imperfect price transmission between international and domestic agricultural prices. The authors notice substantial evidence of incomplete wheat price transmission from international to domestic markets, and their extension of the model adequately represents this issue, demonstrated as follows. On one hand, Equation (1) indicates that changes in domestic prices $pms(i,r,chn)$ depend on changes in international prices $pcif(i,r,chn)$ and changes in border measures $tm(i,chn)+tms(i,r,chn)$. On the other hand, the theory of price transmission elasticity developed by Bredahl *et al.* (1979) indicates that the percentage change in domestic prices $pms(i,r,chn)$ given one percentage change in international prices $pcif(i,r,chn)$ could be defined by Equation (2), where $\beta(i,r,chn)$ is defined as $pms(i,r,chn)$ in response to $pcif(i,r,chn)$:

$$pms(i,r,chn)=\beta(i,r,chn)\,pcif(i,r,chn) \tag{2}$$

Combining Equation (1) and (2), Valenzuela *et al.* (2007) generate Equation (3) that links the shift of border measures and the price transmission elasticity, i.e., governments alter border measures to keep a certain level of price transmission from the international to the domestic market. In other words, $\beta(i,r,chn)$ implicitly captures the effect of all border measure adjustments that increase or decrease imperfect price transmission:

$$tm(i,chn) + tms(i,r,chn) = (\beta(i,r,chn) - 1)\,pcif\,(i,r,chn) \tag{3}$$

Obtaining $\beta(i,r,chn)$ and incorporating it into the GTAP model enhances its capability to capture incomplete price transmission. For our purpose, we only allow the adjustment in $tms(i,r,chn)$ to accommodate the changes in $\beta(i,r,chn)$. As a result, when international agricultural price increases, i.e., $pcif\,(i,r,chn)$ is positive, $tms(i,r,chn)$ becomes negative, so that domestic prices increase less than the increase in international prices, i.e., $\beta(i,r,chn)$ is smaller than 1. The following part illustrates the estimation of $\beta(i,r,chn)$.

2.1.2. Estimation of price transmission elasticities

We estimate price transmission elasticities $\beta(i,r,chn)$ for China by regressing the first difference of the log domestic agricultural prices on the first difference of the log international agricultural prices (Campa and Goldberg, 2005; Nakamura and Zerom, 2010):

$$\Delta \log PMS(i,r,chn)_t = \alpha_t + \sum_{k=0}^{k} \beta(i,r,chn)_k \Delta \log PCIF(i,r,chn)_{t-k} + \varepsilon_t \tag{4}$$

$PMS(i,r,chn)$ and $PCIF(i,r,chn)$ represent domestic price index and international agricultural price index, respectively [3]. The subscripts t and k in Equation (4) represent a time index and the number of lags, respectively, whereas ε_t represents the error term. The sum of pass-through coefficients $\sum_{k=0}^{k} \beta(i,r,chn)_k$ generates the price transmission elasticity of the international agricultural prices to the domestic prices. The number of lags k is determined by the rule developed by Nakamura and Zerom (2012) that the transmission elasticity does not change when additional lags are added.

We estimate price transmission elasticities for major agricultural products (Table 1) in China by utilising monthly price indices over the period from January 2004 to October 2013 [4]. For domestic grain prices, we collect farm-gate prices of different agricultural commodities based on National Bureau of Statistics of China. Because only seasonal data are available, we interpolate the data by assuming an equal monthly growth rate during the same season. Domestic prices for other agricultural and food commodities are available from the Ministry of Commerce (MOFCOM) of China. Data of international agricultural prices are retrieved from the FAOSTAT. For different prices reported for the same product, we choose prices from the major trading partner with China. Lastly, because domestic prices are denominated in Chinese Yuan, we use the monthly exchange rates from the International Monetary Fund (IMF) to convert domestic prices from Chinese Yuan to US Dollar [5].

Table 1 Price transmission elasticities from the international market to China [1)]

Commodities i	**Lag length (months)** k	**Price transmission elasticities** $\sum_{k=0}^{k}\beta(i,r,chn)_k$	**Mapping with GTAP sectors**[2)]
Wheat	19	0.25* (0.15)	Wheat
Maize	5	0.18*** (0.05)	Other grains
Soybean	2	0.25*** (0.05)	Oilseeds
Pork	27	-3.69 (1.77)	Pork and chicken
Beef	9	-0.04 (0.18)	Cattle meat
Chicken	13	0.46** (0.20)	Pork and chicken
Soybean oil	12	0.52*** (0.09)	Vegetable oils
Sugar	12	0.15* (0.08)	Sugar
Dairy products	24	0.11* (0.06)	Dairy products
Rice	7	0.11** (0.04)	Processed rice

Note: 1) Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; 2) Refer to Table A2 for details on the sectors.
Source: Own estimation.

Table 1 summarises the estimation results [6]. The first column in Table 1 shows the lengths of lags differ considerably across all commodities. The second column shows the values of the price transmission elasticities. The transmission elasticity of soybeans for example remains at 0.25 after two months, i.e., when the price of internationally traded soybeans changes by 1%, prices of soybeans in China would change by 0.25%. For dairy products, the elasticity reaches 11% after two years. Products such as soybean oil and chicken have higher value price transmission elasticities, indicating their higher trading volumes and better market integration. Yet, the price fluctuation does not fully transmit from international to the domestic market for any of the commodities, partially reflecting the existing border and domestic measures the Chinese government uses to stabilise domestic prices. For meat products such as pork, beef and lamb, we see reversed relationships between international and domestic prices, and the coefficients are not statistically significant. The reason is that price fluctuations of meat products other than chicken are mainly affected by domestic factors. The last column in the table shows corresponding sectors in GTAP model to which these elasticities are applied in the following simulations [7]. Due to the higher aggregation of the GTAP data base we are not able to facilitate a perfect match. For example, in the GTAP database, a sector such as grains includes not only maize. For the purpose of our analysis, we select maize, soybean, soybean oil in the econometric estimation to represent grains, oilseeds and vegetable oils, respectively, due to their large shares in these sectors in China and limited data availability of other sectors. Finally, we obtain 8 sectors in the GTAP model that incorporate the price transmission elasticities covering the major agricultural and food commodities in China, which are wheat, grains, oilseeds, pork and chicken, vegetable oils, sugar and dairy products and processed rice. We need to apply the price transmission elasticity of chicken to pork as well, because these sectors are combined in one sector in the initial GTAP framework. For other sectors we retain the assumption of perfect price transmission.

We also estimate price transmission elasticities for other countries/regions in our aggregation of the GTAP database using a simplified framework that accommodates the limited amount of the data [8] (Valenzuela *et al.*, 2007). Then we incorporate the estimates into the standard GTAP model as tariff equivalent price transmission elasticities $\beta(i,r,chn)$ according to Equation (3) [9]. We hereby take account of the changes in border measures that governments impose to aim for sufficient domestic supply and control for volatile domestic prices in response to the surge of international agricultural prices. In the short-term, Sharma (2011) proved that these measures might be effective in insulating domestic markets from the volatile international market during the 2007-2010 price crisis.

2.2. Updating the representation of agricultural domestic support in the GTAP framework

The standard GTAP model and database depict policy instruments as *ad valorem* tax equivalents that create wedges between the distorted and undistorted prices. Accordingly, agricultural domestic support is modelled in the form of five price wedges affecting producers' transactions at agents' and market prices. These include output, intermediate inputs, land, capital, and labour. The standard GTAP framework thus accounts for budgetary transfers based on OECD PSE data, whereas market price support is implicitly included via border measures.

However, the structure of China's agricultural domestic support is much more complex than it is currently captured within the standard GTAP framework. It has undergone major changes in recent years, covering a wide range from reductions in agricultural taxes and fees to a gradual introduction of direct subsidies provided to agricultural producers (Yu and Jensen, 2010). Between 2004 and 2012, the total value of agricultural subsidies increased from $US 2.1 to $US 32.5 billion. These subsidies are split up into Product Specific (PS) subsidies, including e.g., direct payments for grain production and subsidies for improved crop varieties and into Non-Product Specific (NPS) subsidies, including e.g., comprehensive subsidies for agricultural inputs and farm machinery purchases. NPS subsidies have increased the most since 2004, and particularly striking is the growth of input subsidies, which account for more than 50% of total subsidies (Gale, 2013). Those subsidies are categorised according to the WTO Amber Box, including measures that affect production decisions and distort international trade (WTO, 2004).

To analyse the increase in China's domestic support and the change in its structure, we require a framework that depicts these subsidies at a more detailed level than the standard GTAP framework. Particularly important is the consideration of eligibility criteria specifying production requirements that needs to be met by agricultural producers to receive subsidies. These criteria determine how different subsidies create incentives to produce and affect production decisions at the farm level and thus how much they distort trade. We follow the approach of Urban *et al.* (2014) that builds upon the PSE concept. The PSE concept allocates producer subsidies according to their production requirements. It therefore distinguishes between four payments categories that reflect the allocation either to a specific product, a specific group of commodities, and all commodities or to producers without a requirement of any production. In addition, the PSE distinguishes between different payment types, such as payments based on output, input use, area, animal numbers, receipts, incomes, and non-commodity criteria that are predicted on a current or fixed basis (OECD, 2009). The integration of domestic support at such detailed level requires an extension of the GTAP framework. In doing so, we further subdivide the price wedges, which enables us to consider different production requirements. They assure that PS subsidies are linked to a specific product, whereas NPS subsidies are allocated at a homogenous rate across agricultural commodities belonging to a specified commodity group. In the literature, the decoupled support in China is still criticised for not being fully decoupled from production (Cheng, 2008). We therefore distribute these payments according to the factor usage at a homogeneous rate across all primary agricultural sectors, reflecting a partially decoupled payment in the GTAP framework. As a result, we obtain a detailed representation of domestic support in the underlying value flows and corresponding price linkage equations that account for the effect on farm level output decisions.

3. Simulations design

After introducing the two extensions in the GTAP framework, this section outlines our development of the underlying database, followed by the simulations design based on the different extensions of the GTAP framework.

3.1. Updating the database

The underlying GTAP database Version 9.1 (Narayanan *et al.*, 2015) with base year 2011 links 140 regions and 57 sectors, including bilateral trade and protection data and additional information from the OECD PSE tables. We aggregate the GTAP database into 14 countries and regions as well as 26 sectors by keeping agricultural and food sectors disaggregated (compare Appendix A). In addition, we utilise OECD PSE data (OECD, 2015) and a complex update procedure (Urban *et al.*, 2014) to improve the representation of China’s domestic support in the GTAP database along the lines indicated in Chapter 2.2.

We set a target year of 2020 to explore how increased agricultural domestic support might affect China’s domestic market under the assumption of incomplete price transmission. As demonstrated in Figure 1, the updated database is the starting point to establish a baseline, i.e., to move the global economy from the year 2011 to 2020 assuming there are no policy shifts during this period [10]. In addition, with regard to the development of China’s domestic support value, we deflate the value of domestic support payments during the same period to consider inflation. Thereafter, we conduct two sets of simulations as shown in the figure.

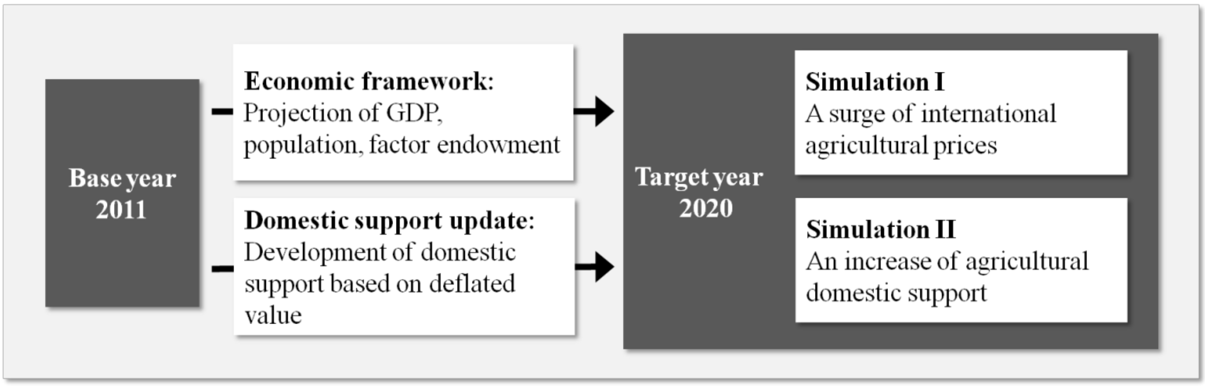

Figure 1 Development of the database
Source: Own illustration.

3.2. Simulations design

Table 2 shows the detailed design of three counterfactual scenarios summarised by two sets of simulations based on the updated database with target year 2020.

Table 2 Simulations design

Simulations		**I**		**II**1)
Scenarios		**1**	**2**	**3**
GTAP framework	**Database**	Updated structure of agricultural domestic support, target year 2020		
	Parameter	Standard	Estimated price transmission elasticity	
	Model	Standard	Border measure adjustments2)	
Shocks	International agricultural prices surge	☒	☒	☒
	Agricultural domestic support increases			☒

Note: 1) We utilise the information on the global technical change obtained in simulation I to accommodate the surge of international agricultural prices. 2) Refer to Chapter 2.1.1 for details on the extended GTAP model.
Source: Own elaboration.

In Simulation I, we explore how a surge in international agricultural prices affects China's agricultural domestic market when the standard GTAP framework (Scenario 1) and the extended GTAP frameworks with the tariff equivalent price transmission elasticities (Scenario 2) are used. We assume that international agricultural prices for all primary agricultural products and processed food increase by 20% in 2020. Because prices are endogenously determined in the standard GTAP model, we swap international prices for all agricultural and food sectors worldwide with the total factor productivity. This swap and the corresponding shock facilitate the model to reduce agricultural production globally by an amount sufficient to accommodate the increase of 20% in international agricultural prices. Thereafter, we compare the results in Scenario 1 and 2.

In Simulation II, we analyse whether an increase in agricultural domestic support alters the effect of price transmission and what it further implicates for the domestic and international market (Scenario 3). For the latter purpose, we undo the swap of international prices and total factor productivity and utilise the technical changes, which increase international agricultural prices initially by 20% according to Scenario 2. As noticed above, PS subsidies tied to agricultural output create the highest production incentives, thus categorised as trade distorting support and are categorised as WTO amber box measures. However, the WTO provides developing countries some flexibility regarding the use of PS subsidies. For China, the ceiling commitment defined by the Bound Total Aggregated Measurement Support (AMS) is effectively limited by the *de minimis* threshold that equals 8.5%, i.e., neither PS nor NPS subsidies should exceed 8.5% of the value of production (WTO, 2001). Figure 2 shows the value of AMS in the year 2002 and 2010 for both PS and NPS support compared to the value of support if China would achieve its 8.5% *de minimis* threshold. There is a prominent gap between those values. According to Gale (2013), officials in China intend to increase those payments until it reaches the *de minimis* limit, which is a substantial increase that would clearly affect agricultural production. Therefore, in Scenario 3, we assume that China makes complete use of their *de minimis*, and thus imposes a unified output subsidy rate for all primary agricultural products in the GTAP sectors to the target *ad valorem* subsidy rate of 8.5% (compare Yu and Jenson, 2010).

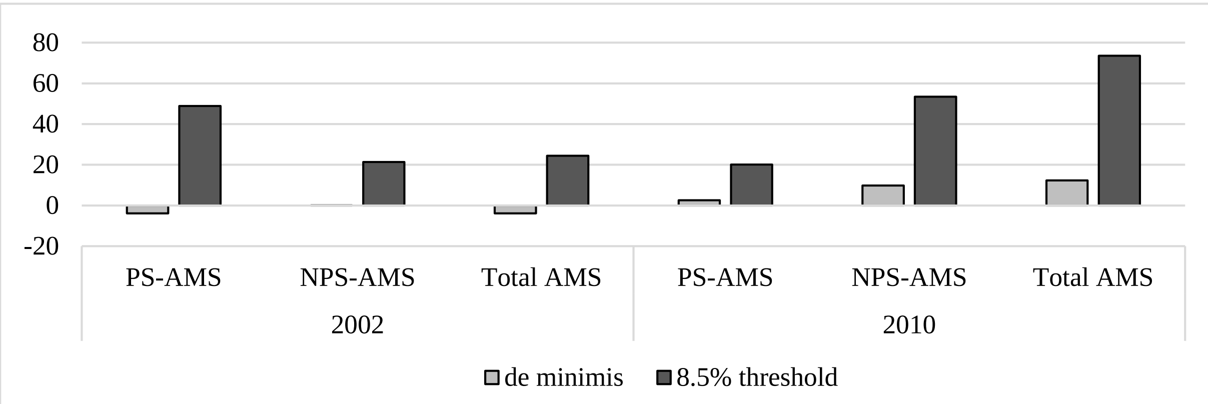

Figure 2 Current level of trade-distorting support compared to the *de minimis* threshold ($US billion)
***Note*:** PS (Product Specific); NPS (Non-product Specific); AMS (Aggregated Measurement Support)
***Source**:* Own calculation based on data from Minister of Finance (MOF), China, 2015.

4. Simulations results

In the first sets of scenarios in Simulation I, our results reflect the changes in price transmission in different GTAP frameworks, whereas Simulation II demonstrates whether the impact of agricultural domestic policy alters the magnitude of price transmission.

Table 3 presents the percentage changes in domestic prices (market prices, producer prices and consumer prices) in China in Scenario 1 and 2 for the most important agricultural and food sectors in China for which we also incorporate price transmission elasticities into the GTAP framework [11]. As shown in the table, the accounting of incomplete price transmission elasticities leads to price changes in Scenario 2, which are lower in all sectors for each price variable than in Scenario 1.

Table 3 Changes in domestic prices of agricultural and food commodities in China (%)[1)]

	Market Prices		**Producer prices**		**Consumer Prices**		**Applied Price Transmission Elasticity**
	1	**2**	**1**	**2**	**1**	**2**	
Wheat	23.3	21.0	23.3	21.0	23.2	21.0	0.25
Other grains[2)]	26.4	14.0	26.4	14.0	20.2	5.9	0.18
Oilseeds	21.9	14.0	21.9	14.0	17.5	5.4	0.25
Pork and chicken	28.3	20.4	28.3	20.4	28.0	19.8	0.46
Vegetable oils	24.5	22.6	24.5	22.6	23.6	20.5	0.52
Dairy products	26.1	24.7	26.1	24.7	25.3	22.0	0.11
Processed rice	24.7	19.7	24.7	19.7	24.6	19.4	0.11
Sugar	27.0	23.4	27.0	23.4	25.0	18.4	0.15

Note: 1) Refer to Chapter 3.2 for details on the Scenarios and to Table A2 for details on the sectors. 2) Other grains cover mainly maize in China.
Source: Own illustration based on simulation results.

In Scenario 1, market price changes in China are between 22% and 28%, and thus are higher than the presumed increase of 20% in the intentional agricultural prices. Because changes in international agricultural prices are the weighted share of price changes of all countries, this result indicates the small share of China's agricultural and food commodities in the international market. Therefore, domestic market prices in China increase more than 20% to accommodate the 20% increase in the international prices. However, when incomplete price transmission is incorporated in the model (Scenario 2), market prices increase less than in Scenario 1. The difference between Scenario 1 and 2 is substantially higher for other grains and oilseeds. Examining the GTAP database, we find that original tariffs applied to these sectors are lower than other sectors, and both sectors have higher trading volumes than other sectors. Comparing values in the last column in Table 3, the applied price transmission elasticities for other grains and oilseeds are lower than other agricultural primary commodities. Therefore, tariff reductions induced by the surge of international agricultural prices lead to considerable changes for these sectors. Our results are in line with the response of China during the 2007/08 food crisis, when the government adjusted border measures especially for grains and soybeans to stabilise their domestic prices.

Producer prices changes are identical to the changes in market prices, because domestic policies are assumed to be constant. Thus, comparing two scenarios, producers are able to take advantage of the price surge in the international agricultural market (Scenario 1), whereas producer prices are suppressed with the adjustment of price transmission parameters (Scenario 2).

Consumer price changes are lower than market price changes, because consumers demand domestically produced as well as imported commodities. Accordingly, consumer price changes are represented in the standard GTAP model as weighted shares of price changes for imported and domestically produced goods. The underlying Armington assumption therefore adjusts price transmission according to the origin of goods imported in the model (Armington, 1969); however, the model still overestimates the degree of transmission. In Scenario 2, changes in consumer prices become lower than in Scenario 1. The incorporated price transmission elasticities reduce tariffs for these sectors when international agricultural prices are higher (see Chapter 2.1.1). As a result, increases in international prices for imported goods only partially transmit to domestic prices, offsetting the magnitude of consumer price increases. Overall, the adopted approach of Valenzuela (2007) enables us to better reflect the incomplete price transmission in the GTAP model and thus in our analysis, so that the results correspond better to the results derived by our econometric estimates. In Scenario 2, when border measures are adjusted in response to the international prices surge, domestic prices increase less than in Scenario 1. Although this is of advantage for net food buyers, it prohibits net food sellers from benefiting from high prices. Because this is what was observed during the last price surge period (e.g., Swinnen, 2011), we feel confident to utilise our extended version of the GTAP model in the following to analyse whether the increase in agricultural domestic support in Simulation II could compensate the loss of domestic producers and what it implies for domestic and international market.

Table 4 shows how the increase in agricultural output subsidy to the *de mnimis* level generates a wedge between market prices and producer prices in China's domestic market for selected commodities, i.e., wheat, other grains and oilseeds [12]. It also shows the response of these sectors in terms of price changes in the international market. To show how incomplete price transmission caused by border measure adjustments and increased agricultural domestic support affect the result differently in our extended framework, we decompose the changes into two parts represented by SubPT and SubDS.

Choosing wheat as an example, Table 4 demonstrates that the market price increases by 15.64% even though the international price change amounts to 18.58%. The decomposed result reveals that a change of 20.94% in market prices is caused by incomplete price transmission (SubPT) as indicated in Simulation I (Table 4). Noticeably, the increase in agricultural domestic support reduces the total changes in the market price by 5.30% (SubDS). The producer price increases by 25.47%. Here, agricultural domestic support enhances the price increase for wheat by 3.59%. Because changes in consumer prices are weighted shares of changes in prices for domestic produced goods and imported goods, the consumer price increases by 15.64%, much lower than the increase in the producer price. For other grains and oilseeds, changes are consistent and more pronounced. Those results indicate that agricultural domestic support offsets the lower increase in producer prices caused by border adjustments as shown in Simulation I, and further decreases the price surge for consumers (e.g., from 21% to 15.64% for wheat in Scenario 2 and 3, respectively).

Table 4 Changes in domestic prices and international prices of selected products in Scenario 3 (%)[1)]

		Domestic Market			**International market**
		Market prices	**Producer prices**	**Consumer prices**	**International prices**
Wheat	Total	15.64	25.47	15.64	18.58
	SubPT[2)]	20.94	21.88	20.93	19.89
	SubDS	-5.30	3.59	-5.29	-1.31
Other grains	Total	8.51	17.74	4.31	18.06
	SubPT	13.97	14.59	5.98	19.74
	SubDS	-5.46	3.14	-1.67	-1.68
Oilseeds	Total	11.48	20.96	4.93	18.85
	SubPT	14.16	14.79	5.38	19.85
	SubDS	-2.68	6.17	-0.45	-1.00

Note: 1) Refer to Chapter 3.2 for details on Scenario 3 and to Table A2 for details on the sectors. 2) SubPT indicates results initiated by extension of the framework to cover price transmission elasticity, whereas SubDS refers to the impact generated by domestic support.
Source: Own illustration based on simulation results.

The substantial increase in agricultural domestic support simulated in Scenario 3 also affects the international market. The last column of Table 4 implies that the initial 20% surge of international prices for wheat, other grains and oilseeds is reduced by 1.31%, 1.68% and 1.00%, respectively. The reason for the declined changes is attributed to increased domestic production (shown in the following part) and reduced net import of those agricultural products by China from the international market. As noted in Scenario 2, the government adjusts border measures to enhance agricultural domestic supply so that domestic prices increase less. Our results for the trade balances indicate that the net import of agricultural and food commodities in China escalate in Scenario 2 from $US 105.29 billion to $US 147.49 billion [13]. In Scenario 3, due to the increased agricultural domestic support, the net import value decreases by $US 9.26 billion, which shows lower demand pressure from China on the international market. However, due to the limited trade volume of agricultural products of China, a nationwide substantial increase in agricultural domestic support to the *de minimis* threshold level imposes only to a certain extent impacts on the international market.

One of the objectives of increasing agricultural domestic support in China is to improve agricultural production. Figure 3 demonstrates output changes in agricultural and food sectors in Scenario 3. As noted in the scenario design, price increases in GTAP are equivalent to negative augmented technical changes in certain sectors. Thus, the technical recession applied in Scenario 3 to accommodate the 20% international agricultural increase reduces the output of the sectors. The total changes in output are more predominant in the non-grain sectors as shown in Figure 3. Grain sectors are less responsive than other processed food sectors to technical shocks, due to their intensive use of sluggish land as a main input factor that is less adjustable. When the output decreases in non-grain sectors, mobile endowments including labour and capital are released from those sectors and migrate into grain sectors, boosting the output of those sectors, e.g., wheat and other grains as shown in Scenario 3 in Figure 3. The impact for oilseeds is different, because domestic oilseeds, mainly soybeans, are notably less competitive than imported oilseeds; border measure adjustments induced by higher international prices for oilseeds increase the net import of this product substantially, and thus curtail the domestic production.

Our extensions of the framework reduce the increase in producer prices in the domestic market. Decomposing the results shows that the incomplete price transmission (SubPT) either undermines the output increase for grain sectors, or worsens the output decrease for other sectors, whereas increased agricultural subsidies (SubDS) not only improve the production for grain sectors and other primary agricultural sectors that receive the subsidy, but also the processed food sectors that utilise primary agricultural products as inputs. The results are in line with the characteristics of AMS payments, which are coupled with domestic agricultural production.

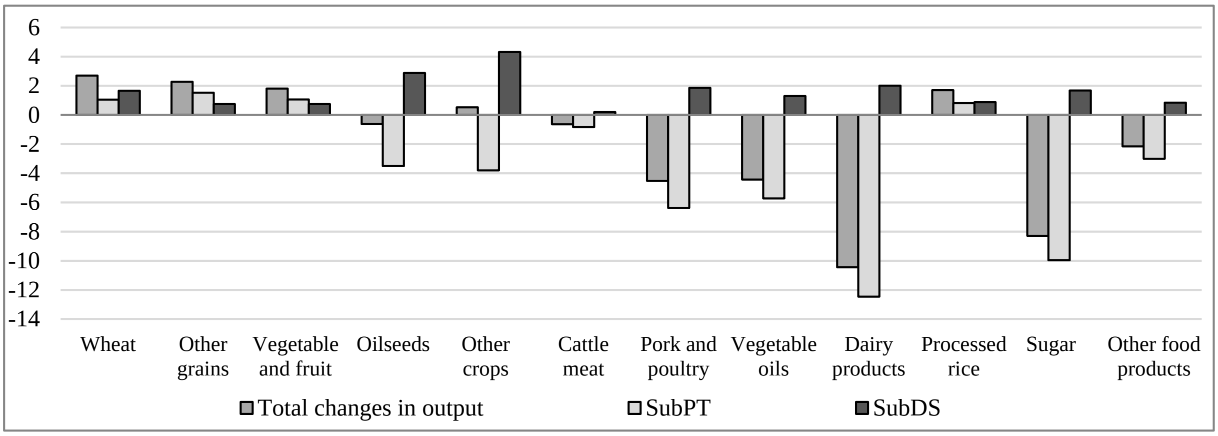

Figure 3 Changes in outputs of agricultural and food products in China in Scenario 3(%)[1)]
Note: 1) Refer to Chapter 3.2 for details on Scenario 3 and to Table A2 for details on the sectors.
Source: Own illustration based on simulation results.

Lastly, we examine the welfare changes. We compare the results of all three scenarios for convenience. Table 5 demonstrates that the price surge induced by technical recession greatly reduces the welfare for all countries and regions remarkably, especially for China by approximately $US 250 billion, followed by the United States and Japan. The European Union also experiences a welfare decline by $US 188 billion. In Scenario 2, the total welfare loss decreases slightly in total, mainly due to the reduced border distortion to accommodate incomplete price transmission in the extended GTAP framework. However, welfare decreases even further in China. In Scenario 3, growing agricultural domestic support reduces the welfare loss for China by $US 4.98 billion (in the last column), with limited impact on the welfare of other countries and regions. Our results could be justified by the "second-best policy" theory proposed by Lipsey and Lancaster (1956-1957). According to the theory, any distorting policies would reduce economic welfare. However, with the presence of market distortions, the presence of taxation and subsidization could correct the negative welfare impact as shown in the Table 5 for China. A further interpretation of the results is based on (Bhagawati, 1969). The authors' argument is that for net agricultural importing countries like China whose agricultural market has limited impact on the international market, domestic subsidies on agriculture has a more important welfare-enhancing role than the import tariffs, in the presence of market distortions. Corden (1974) derives also similar arguments regarding the hierarchy of welfare generated by different policies. However, a conservative interpretation of our welfare results needs to take into account that our scenarios are built upon the target year 2020. When constructing the baseline, *ceteris paribus,* we assume all other policies remain constant between 2011 and 2020. Thus, any change in this condition could influence our results. Furthermore, our sensitivity analyses show negative welfare impact, i.e., higher Chinese welfare losses in Scenario 3 compared to Scenario 2, originating from increased agricultural output subsidy when a higher rate of output subsides is applied.

Table 5 Changes in welfare (($US billion) [1)]

	Simulation I		**Simulation II**
	Scenario 1 [1)]	**Scenario 2**	**Scenario 3**
Countries			
China	-247.46	-249.17	-243.15
United States	-75.24	-61.34	-63.39
Japan	-52.06	-52.47	-51.71
Australia	-18.86	-16.52	-17.37
Canada	-15.58	-11.65	-12.15
Korea	-13.37	-12.89	-12.50
Regions			
European Union	-188.35	-181.40	-180.38
Latin America	-100.46	-85.82	-87.97
Other Asia countries	-97.60	-104.62	-104.59
ASEAN [2)]	-58.08	-55.92	-56.08
SSA	-52.79	-45.58	-46.00
MENA	-44.76	-44.06	-44.20
EFTA	-16.12	-15.91	-15.88
ROW	-163.98	-150.33	-151.64
Total	-1144.70	-1087.68	-1087.01

Note: 1) Refer to Chapter 3.2 for details on Scenario 3 and to Table A2 for details on the regions. 2) ASEAN (Association of Southeast Asian Nation); SSA (Sub-Sahara Africa); MENA (Middle East and North Africa); EFTA (European Free Trade Association); ROW (Rest of the World).
Source: Own illustration based on simulation results.

5. Conclusions

Future international agricultural prices appear to be volatile, which might induce the Chinese government to repeat its adjustment of border measures to insulate domestic market from potential price surges in the international market. Simultaneously, agricultural domestic support in China is limited by the WTO *de minimis* commitment, but given its current low level it has substantial room to grow. This may lead to far-reaching impacts on agricultural production and thus on food prices. Existing analyses in the literature intensively assess these two issues, but seldom address their joint impacts. In this paper, we introduce two extensions of the standard GTAP framework to account for the interdependencies of the imperfect price transmission caused by border measure adjustments and increased agricultural domestic support. The standard GTAP model only uses the Armington assumption to depict food price transmissions. In addition to this assumption, we follow Valenzuela *et al.* (2007) to incorporate econometrically estimated price transmission elasticities into the GTAP model, so that the response of the countries to the surge in international prices is better captured. Furthermore, we extend the structure of the China's agricultural domestic support in the model and update the database accordingly to portray the impact of growing subsidies provided to agricultural producers more accurately.

Utilising the extended GTAP framework, we are able to demonstrate how an increase in China's agricultural output subsidy to the WTO *de minimis* threshold affects incomplete food price transmission induced by border policies. With the assumption of incomplete price transmission, net agricultural importing countries like China experience less volatility than in the standard GTAP model. Reduced price increases benefit domestic consumers, but prohibit producers from high selling prices, so that the model improvingly depicts the observations given during the price surge period 2007 to 2011. When agricultural domestic support increases, changes in consumer prices further decrease due to the increased agricultural domestic production, whereas producers have access to high selling prices. China's trade deficit in agricultural products also decreases, leading to a slight decrease in international agricultural prices. China's agricultural domestic policy could potentially offset the negative impact of incomplete price transmission caused by border measure adjustments on domestic market and lessen its demand pressure on the international market. Our simulations show that the consideration of incomplete price transmission elasticity in studying recent developments in China's agricultural domestic support substantially improves the model's results.

There are two implications for further research we need to address. First, because the focus of this study is on China, we utilise major trading commodities in China in our econometric analyses to represent the corresponding GTAP sectors and are able to achieve the purpose for our simulations. However, in future studies, better data availability could enhance the reconciliation of these two approaches. Second, increasing agricultural domestic support is only one measure among different policies that the Chinese government pursues to support agriculture and enhance farm income. Although this policy appears to generate positive welfare in our analyses, in reality, China might not reach the *de minimis* threshold for all sectors, which might divert the allocation effects. Beside output subsidies, market price support measures are frequently implemented when market prices are low; yet they are of little importance for the analysis of price changes as long as prices are higher than the intervention prices. Other measures categorised as minimally trade-distorting measures (WTO green box) are under development in China, which could provide a springboard for future research. The conclusion of Free Trade Agreements (FTAs) such as Trans-Pacific Partnership (TPP) and the possibility of China joining such agreements may also have potential impact on agricultural domestic market.

Nonetheless, our study highlights the importance of considering the incomplete price transmission caused by adjusted border measure in assessing the impact of increasing agricultural domestic support on China's domestic market. These are two policies frequently pursued in developing countries to justify their implementations of trade-distorting policies in stabilising domestic markets. We also draw on the advantage of combining econometric analysis with a CGE framework in analysing food price transmission. Accounting for incomplete price transmission in this way appears to be essential in analysing the impact of agricultural domestic support.

Notes

1. Xi (2011) notices that farmers often received lower prices than promised by officials and locations for state grain depots are unclear, which diminishes farmers' interest in selling grains to the authorised depots.
2. The framework of the standard GTAP model is well documented in Hertel (1997) and is available on the internet (see www.gtap.org).
3. In GTAP, price indices included in Equation (4) are country specific. However, in our econometric analyses, we do not differentiate agricultural products according to their origins because we focus on the price transmission from the aggregated international agricultural market to China.
4. We collect data rice including paddy rice and processed rice, wheat, maize, soybean, soybean oil, pig and pig meat, cattle and cattle meat, goat and goat meat, poultry and poultry meat, sugar and dairy products.
5. These data are available upon request.
6. We also tested the cointegration of international agricultural prices and China's domestic prices excluding the period 2007/08, the short-term adjustments of most products remain unchanged.
7. Please refer to Appendix A.2 for a detailed sector aggregation.
8. The estimation of transmission elasticities in other countries is available upon request.

9. We also allow for incomplete price transmission for net agricultural exporters by accommodating export taxes according to the degree of price transmission. However, it has a minimal impact on our results.
10. Macroeconomic data utilised to update the database are available upon request.
11. We focus on those sectors which represent the major agricultural and food sectors in China. Additional information is available upon request.
12. We choose those three products because their price transmission elasticities are modelled and they all receive agricultural domestic support. Results of other sectors show a similar although less considerable pattern. Additional information is available upon request.
13. The standard GTAP model only shows the changes in trade balances, we include level index to obtain the original value of trade balances. Changes in each sector are in line with the change in the aggregated level. Additional information for trade balances is available upon request.

References

Armington, P. S. (1969), "A theory of demand for products distinguished by place of production", *IMF Staff Papers* Vol. 16 No. 1, 159-178.

Baltzer, K. (2013), "International to domestic price transmission in fourteen developing countries during the 2007-08 food crisis", WIDER working paper No. 2013/031, World Institute for Development Economics Research, Helsinki.

Bhagwati, J. N. (1969), "The generalized theory of distortions and welfare", working paper 39, Department of Economics Massachusetts Institute of Technology, Massachusetts.

Campa, J. M. and Goldberg, L. S. (2005), "Exchange rate pass-through into import prices", *Review of Economics and Statistics*, Vol. 87 No.4 pp. 679–690.

Carter, C. A., Zhong, F. and Zhu, J. (2009), "Development of Chinese agriculture since WTO accession", *EuroChoices*, Vol. 8 No.2, pp. 10–16.

Cheng, F. (2008), "China: shadow WTO agricultural domestic support notifications", IFPRI Discussion Paper 793, International Food Policy Research Institute, Washington DC.

Corden, W. M. (1974), *Trade Policy and Economic Welfare*. Clarendon Press, Oxford.

FAO (2014), available at http://faostat3.fao.org, Food and Agriculture Organization of the United Nations, Rome.

Gale, H.F. (2013). “Growth and evolution in China’s agricultural support policies”, USDA-ERS Economic Research Report 153, United States Department of Agriculture, Washington DC.

Hertel, T. and Tsigas, M. (1997). Structure of GTAP. Global Trade Analysis: modeling and applications, PP. 13-73. Cambridge university press.

Huang, J., Liu, Y., Martin, W. and Rozelle, S. (2009), “Changes in trade and domestic distortions affecting China’s agriculture”, *Food Policy*, Vol. 34 No. 5, pp. 407-416.

Huang, J., Wang, X., Zhi, H., Huang, Z. and Rozelle, S. (2011), “Subsidies and distortions in China’s agriculture: evidence from producer level-data”, *Australian Journal of Agricultural and Resource Economics*, Vol. 55 No. 1, pp. 53-71.

Lipsey, R. G. and Lancaster, K. (1956-1957), “The general theory of second best”, *Review of Economic Studies*, Vol. 24 No.1, pp. 11-32.

Lohmar, B., Gale, F., Tuan, F. and Hansen, J. (2009), “China’s ongoing agricultural modernization”, USDA Economic Information Bulletin 51, Washington DC.

Martin, W. (2001), “Implications of reform and WTO accession for China’s agricultural policies”, *Economics of Transition*, Vol. 9 No. 3, pp. 717-742.

Martin, W. and Anderson, K. (2012), “Export restrictions and price insulation during commodity price booms”. *American Journal of Agricultural Economics*, Vol. 94 No. 2, pp. 422-427.

MOA (2014), “No.1 Central Document”, Ministry of Agriculture of the People's Republic of China, Beijing.

Nakamura, E. and Zerom, D. (2010), “Accounting for Incomplete Pass-Through”, *Review of Economic Studies*, Vol. 77 No.3, pp. 1192–1230.

Narayanan, B., Aguiar, A. and McDougall, R. Eds. 2015. “Global trade, assistance, and production: The GTAP 9 Data Base”, Center for Global Trade Analysis, Purdue University.

Ni, H (2013), “Agricultural domestic support and sustainable development in China”, ICTSD Issue paper 47, International Centre for Trade and Sustainable Development, Geneva.

OECD (2009), “Agricultural policies in emerging economies: monitoring and evaluation”, Organisation for Economic Co-operation and Development, Paris.

OECD (2013), “Agricultural policy monitoring and evaluation, OECD countries and emerging economies”, updated in 2015, OECD, Paris.

OECD (2015), “Agricultural support estimates”, OECD Agricultural Statistics, Paris.

Sharma, R. (2011), "Food export restrictions: review of the 2007-2010 experience and considerations for disciplining restrictive measures", FAO commodity and trade policy research working paper 32, FAO, Rome.

Siddig, K. and Grethe, H. (2014), "International price transmission in CGE models: How to reconcile econometric evidence and endogenous model response?", *Economic Modelling*, Vol. 38, pp. 12-22.

Swinnen, J. (2011), "The right price of food", *Development Policy Review*, Vol. 26 No. 6, pp. 667–688.

Timmer, C. (2010), "Reflections on food crises past", *Food Policy*, Vol. 35 No. 1, pp.1-11.

Urban, K., Jensen, H, and Brockmeier, M. (2014), "Extending the GTAP data base and Model to cover domestic support issues using the EU as example", GTAP Technical Paper No.35. Center for Global Trade Analysis, Purdue University.

Valenzuela, E., Hertel, T. W., Keeney, R. and Reimer, J. J. (2007), "Assessing global computable general equilibrium model validity using agricultural price volatility", *American Journal of Agricultural Economics*, Vol. 89 No.2, pp. 383–397.

World Bank (2014), "Food price watch", Issue 17, World Bank, Washington DC.

WTO (2001), "WTO successfully concludes negotiations on China's entry", press 243, World Trade Organisation, Geneva.

WTO (2004), "Agriculture negotiations: backgrounder. Domestic support: amber, blue and green boxes", WTO, Geneva.

Yang, F., Bekkers, E., Brockmeier, M., and Francois J. (2015), "Food price pass-through and the role of domestic margin services", *Journal of Agricultural Economics*, Vol. 66 No.3, pp. 796-811.

Yang, J., Qiu, H., Huang, J. and Rozelle, S. (2008), "Fighting global food price rises in the developing world: the response of China and its effect on domestic and world markets", *Agricultural Economics*, Vol. 39 No.s1 pp. 453-464.

Yu, W. and Jensen, H. G. (2010), "China's agricultural policy transition: impacts of recent reforms and future scenarios", *Journal of Agricultural Economics*, Vol. 61 No.2, pp. 343-368.

Yu, W. and Jensen, H. G. (2014), "Trade policy responses to food price crisis and implications for existing domestic support measures: the case of China in 2008", *World Trade Review*, Vol. 13 No. 4, pp. 651-683.

Appendix A: GTAP Region and Sector Aggregation

Table A1: Detailed region aggregation in GTAP

No.	Aggregation	Description
1	China	China.
2	Association of Southeast Asian Nation	Cambodia; Indonesia; LTE People's Democratic Republ; Malaysia; Philippines; Singapore; Thailand; Viet Nam; Rest of Southeast Asia.
3	Australia	Australia.
4	Japan	Japan.
5	Korea	Korea.
6	Other Asia countries	New Zealand; Rest of Oceania; Hong Kong; Mongolia; Taiwan; Rest of East Asia; Brunei Darassalam; Bangladesh; India; Nepal; Pakistan; Sri Lanka; Rest of South Asia.
7	Canada	Canada.
8	United States	United States of America.
9	European Union	Austria; Belgium; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Slovakia; Slovenia; Spain; Sweden; United Kingdom; Bulgaria; Croatia; Romania.
10	European Free Trade Association	Switzerland; Norway; Rest of EFTA.
11	Latin America	Mexico; Rest of North America; Argentina; Bolivia; Brazil; Chile; Colombia; Ecuador; Paraguay; Peru; Uruguay; Venezuela; Rest of South America; Costa Rica; Guatemala; Honduras; Nicaragua; Panama; El Salvador; Rest of Central America; Dominican Republic; Jamaica; Puerto Rico; Trinidad and Tobago; Caribbean.
12	Middle East and North Africa	Rest of Western Asia; Egypt; Morocco; Tunisia; Rest of North Africa.
13	Sub-Saharan Africa	Benin; Burkina Faso; Cameroon; Cote d'Ivoire; Ghana; Guinea; Nigeria; Senegal; Togo; Rest of Western Africa; Central Africa; South Central Africa; Ethiopia; Kenya; Madagascar; Malawi; Mauritius; Mozambique; Rwanda; Tanzania; Uganda; Zambia; Zimbabwe; Rest of Eastern Africa; Botswana; Namibia; Rest of South African Customs .
14	Rest of the world	Albania; Belarus; Russian Federation; Ukraine; Rest of Eastern Europe; Rest of Europe; Kazakhstan; Kyrgyztan; Rest of Former Soviet Union; Armenia; Azerbaijan; Georgia; Bahrain; Iran Islamic Republic of; Israel; Jordhan; Kuwait; Oman; Qatar; Saudi Arabia; Turkey; United Arab Emirates; South Africa; Rest of the World.

Table A2: Detailed sector aggregation in GTAP

No.	Aggregation	Description
1	Paddy rice	Paddy rice.
2	Wheat	Wheat.
3	Other grains	Cereal grains nec.
4	Vegetables and fruits	Vegetables, fruit, nuts.
5	Oilseeds	Oil seeds.
6	Sugar cane and sugar beet	Sugar cane, sugar beet.
7	Plant-based fibres	Plant-based fibres.
8	Other crops	Crops nec.
9	Cattle	Cattle,sheep,goats,horses.
10	Swine and poultry	Animal products nec.
11	Raw milk	Raw milk.
12	Wool	Wool, silk-worm cocoons.
13	Cattle meat	Meat: cattle,sheep,goats,horse.
14	Pork and chicken	Meat products nec.
15	Vegetable oils	Vegetable oils and fats.
16	Dairy products	Dairy products.
17	Processed rice	Processed rice.
18	Sugar	Sugar.
19	Other Food products	Food products nec.
20	Beverages and tobacco	Beverages and tobacco products.
21	Textiles	Forestry; Fishing; Coal; Oil; Gas; Minerals nec.
22	Wearing apparel	Textiles; Wearing apparel.
23	Leather products	Leather products; Wood products; Paper products, publishing; Metal products; Motor vehicles and parts; Transport equipment nec; Manufactures nec.
24	Wood products	Petroleum, coal products; Chemical,rubber,plastic prods; Mineral products nec; Ferrous metals; Metals nec; Electronic equipment; Machinery and equipment nec.
25	Margin services	Trade.
26	Petroleum and coal products	Electricity; Gas manufacture, distribution; Water; Construction; Transport nec; Sea transport; Air transport; Communication; Financial services nec; Insurance; Business services nec; Recreation and other services; PubAdmin/Defence/Health/Educat; Dwellings.