

Trade policy responses to food price rises and implications for existing domestic support measures: the case of China in 2008

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Abstract

Existing literature on the 2007/8 world food price crisis focuses on the causes and poverty and hunger consequences of the crisis and seems to be less concerned with the interactions of different policy measures applied by governments. Using a global CGE model characterized with detailed and up-to-date policy information for China in the year of 2008, this paper provides a first quantitative assessment on the individual and joint effects of China's short term trade policy actions and existing domestic support measures.

A number of results emerge from our simulation exercises. First, China's grain outputs are estimated to be boosted by up to 4 percentage by all the policy interventions combined, with increased spending on existing domestic support (relative to the pre-crisis level) is able to compensate for the lowered outputs due to the short term trade policy measures. Second, while both types of policies reduce domestic market price, roughly two-thirds of the price reduction effects are due to the increased spending on the domestic measures. Third, input-based domestic support and export restriction measures on fertilizers both contribute to increasing grain outputs and reducing their domestic market prices; but they generate offsetting output and price effects on fertilizer itself. Fourth, the overall domestic market price reduction effects achieved are shown to be large and significant, relative to the observed price indexes in China in 2008, indicating that in the absence of these policy actions, domestic market price could have risen much more. However, this success comes with non-negligible fiscal and efficiency costs, especially considering how the short term trade policy measures seemingly necessitated the extra government spending on the input subsidies and how these increased subsidies generated very little increase in farm income, which has long been considered a major long term policy goal.

Key words: *world food price crisis, trade policy, agricultural domestic support, China, CGE model*

JEL Classifications: *C68, F13, Q02, Q17, Q18*

1. Introduction

During the 2007/8 world food price crisis, world market as well as domestic market prices for basic agricultural products increased dramatically. These price rises threatened the livelihood of poor consumers in many developing countries. Consequently, many national governments were forced to implement various policy interventions to moderate domestic market price rises and to secure domestic supply (Demeke *et al.* 2008). In China, the government instituted a series of very active policy interventions at the border to stabilize domestic prices for food, especially for grains and soybeans. These policy interventions include eliminations of export tax rebates, impositions of export taxes and temporary reductions of import tariffs for grains and soybeans (OECD, 2009a; Jones and Kwiecinski, 2010). All these border measures should have helped reduce export supply, boost domestic supply, and ultimately shield the Chinese domestic market from the instabilities in the world market and stabilize domestic market prices. Clearly, the foremost policy objective during that time was to maintain affordable food prices for domestic consumers, especially the poorer segment of consumers. At least in the crisis period, these policy actions – together with China's reliance on domestic grain supply – had seemingly achieved the goal of moderating rises of domestic prices, as actual grain price rises in China were far below those observed in elsewhere in the world for the same period.

While higher food prices pose a threat to the livelihood of poor consumers, if they are allowed to be fully transmitted to the domestic market, they can nevertheless create incentives for producers to produce and supply more to the market. By serving/limiting the transmission of price signals to the domestic market, the incentives for producers/suppliers to produce/supply more are then greatly diminished. Clearly, a first best response would be for producers to respond to the price signals and increase their supply and for the national governments to address potential poverty and hunger issues with targeted safety net mechanisms.¹ Therefore, the efficiency costs arising from reduced supply responses should not be ignored in evaluating the effectiveness of the border policy measures applied by many national governments around the world, including that of China.

¹ World Bank (2008) categorizes typical policy responses to high food prices and discusses the first best instruments in each of these categories.

In the Chinese case, the efficiency costs associated with reduced supply responses are further compounded by the fact that there are existing (and longer term) domestic policy measures aiming at increasing producer incentives. These include direct payments to grain production and subsidies to fertilizer and other inputs.² Lower domestic market prices (as compared to the prevailing world market prices) clearly undermine the objective of existing domestic policy measures in increasing farm income and boosting agricultural production. In fact, in conjunction with the border measures, in 2008 the Chinese government strengthened existing domestic policy measures by increasing direct payments to grain farmers, increasing subsidies for adopting improved seeds, increasing minimum procurement prices for wheat and rice, and perhaps most importantly, significantly raising spending on subsidizing purchased inputs (mainly fertilizer) and on subsidizing the production and distribution of fertilizers (see Table 1 and 2 for details of these measures; for a more complete introduction to China's domestic support measures, see OECD 2009a and 2009b). In addition, export taxes on fertilizers were also introduced in 2008. All these measures should have the effects of reducing producers' costs and/or increasing outputs, thereby offsetting the negative output effects of the short-term border measures on producers.

The above discussion suggests that the Chinese government's short-term price stabilizing border measures seemingly triggered (or at least coincided with) higher spending on maintaining producer incentives through existing domestic support measures. It illustrates the dilemma and complexities facing policy makers in balancing the interests of poor consumers, agriculture producers, and input providers when high commodity prices are present and when incentives sustained by existing domestic measures need to be maintained.³

What is not clear and what has not been quantitatively explored in the current literature, however, is the extent to which the short-term border measures negate/offset the effects of long term domestic support measures, including quantitative estimates on the extra domestic assistance for maintaining the levels of domestic agricultural production. In the recent literature on the 2007/8 food price crisis, focuses have generally been on the causes of the crisis (see for example papers surveyed by Abbott et al., 2009; and Headey and Fan, 2008) and how government policy

²See Yu and Jensen (2010) for a quantitative evaluation on the effects of these subsidies, and OECD (2009) for more updated information on the magnitude and the implementation of these and other related subsidies.

³ See Abbott (2009) for a more comprehensive discussion on the development issues related to high food prices in developing countries.

mitigates the negative effects on the domestic market and/or exasperates the instability on the world market. The complex interactions between the short-term measures and existing domestic support measures seem to be less explored. In the Chinese case, to our best knowledge, the only study that touches upon these interactions is a partial equilibrium analysis provided by Hansen et al. (2009) showing that China's export taxes and domestic subsidies provide offsetting effects.⁴ Yet, that study is limited in its coverage in the various policy instruments applied by China and the interactions between the border and existing domestic measures are not formally explored. For this reason, a more comprehensive study focusing squarely on the interactions of the two types of policy measures is warranted.

The discussion following the 2007/8 food price crisis seems to have elicited a convergence of views on the frequency and persistency of higher food prices. Indeed, in China, another round of high commodity prices (including high food prices, which contribute to the most recent rise of the CPI in China) seems to be in full force again. Analyzing the most recent experience will no doubt provide useful inputs into the debate on how China should best respond to this complicated challenge. A better understanding of the Chinese experience can also provide useful insights into dealing with similar challenges in other developing countries.⁵ Thus, the relevance and timeliness of the issue constitute the second motivation of the paper.

Based on information on China's major policy measures both at the border and domestically in combating the food price crisis for the year 2008, this paper aims at examining how these policy measures individually and jointly affect domestic market prices, domestic supply, farm income, and trade flows into and from China. To consistently capture the inter-linkages across the different policy measures and different sectors, as well as the interrelations between the domestic and world markets, a global computable general equilibrium modeling framework incorporated with the policy details for China is adopted for the current analysis.

The rest of the paper is organized as follows. Section 2 provides an overview of the policy measures adopted by China and their expected domestic market effects. Section 3 introduces the

⁴ In addition, Yang et al. (2008) provide an early review of China's trade policy actions in combating the food price crisis but they do not directly estimate the effects of these policies.

⁵ A comprehensive survey compiled by the FAO (Demeke et al., 2008) clearly shows that many of the trade policy actions pursued by China were also adopted by other developing countries in Asia, Africa, and Latin America. A few of these countries also pursued domestic subsidies for increasing domestic supply.

modeling framework and the scenarios to be simulated and analyzed. Section 4 analyzes the main results. The last section concludes with a summary of the main findings and their implications.

2. Agricultural trade and domestic policy measures applied by China in 2008

2.1 Border policy measures and their expected effects⁶

A host of contingent border policy measures were used by China in 2008 to insulate its domestic market from the world market, including removing export Value Added Tax (VAT) rebate, imposing export tax and licenses on certain grain products, restricting ethanol exports and productions, imposing restrictions on exports of fertilizers, and temporarily removing tariffs on food imports, etc. Tables 1 reports some of the most important trade/border policy measures adopted by China in 2008 and it is clear that export restriction policies are the predominant tools adopted and these restrictions are not only on grains and soybeans but also on chemical fertilizers which have been used intensively in producing grains and other agricultural products in China.⁷

Export restrictions placed on grains and soybeans consisted of removal of export VAT rebates in the range of 13 to 17% and imposition of export taxes between 5 and 20%. These actions are estimated to generate government savings – in the form of reduced government spending on the VAT rebate and increased export tax revenue – by about RMB 1.8 billion.⁸ On the other hand, temporary reductions of import tariff on soybeans reduced tariff revenue by about RMB 2.3 billion, which more than offset the savings achieved through the export restrictions.

From a fiscal implication point of view, however, the most dramatic export policy action was the export tax placed on fertilizers, as shown in Figure 1. For the year 2008, these export taxes were adjusted six times (General Administration of Customs of China, 2008), leading to tax rates as

⁶ Discussions in this section are drawn from OECD (2009a), Jones and Kwiecinski (2010), and our own compilations of information and data obtained from various policy circulars issued by the Customs General of China (2008), the Ministry of Finance of China, and the UN COMTRADE database. See notes for Tables 1 and 2. For an earlier survey of policy actions pursued by other developing countries, see Demeke et al. (2008).

⁷ See Lohmar and Gale (2008) for discussions on the intensive use of fertilizers in China's agriculture sector.

⁸ The average official exchange rate in 2008 is RMB 6.948 per US dollar, according to the IMF.

high as 185% for certain fertilizer products at 8-digit level in September 2008.⁹ Based on detailed monthly export data at HS-8 level and detailed policy announcements by the General Administration of Customs of China, we estimate the average export tax rate for fertilizer for the whole year of 2008 – weighted by the corresponding monthly fertilizer exports from China at HS-8 levels – to be about 62%! Against this average export tax rebate, China exported around 9.276 million tons of fertilizers valued at 4.323 billion US dollars in 2008, implying export tax revenues of 1.665 billion US dollars (or RMB 11.502 billion).

Taking together, from a fiscal perspective, the Chinese government had a net revenue of about RMB 11 billion due to the abovementioned border measures in 2008. The actual trade restrictiveness as well as domestic market implications of these policies also need to be estimated, which is precisely the objective of this study. While these measures might have the desirable effect of securing short run domestic supply and reducing foreign demands, they nevertheless create disincentives for the needed expansion of agricultural production. For example, when world market prices are rising, reductions of import barriers help moderate domestic price hikes through increasing supply to the domestic market; however, increased import supply dampens producers' incentives for producing and supplying more to the domestic market and increases demand on the world market. Increasing export taxes has much the same effects: it makes Chinese products more expensive on the world market, thereby shifting supply to the domestic market and dampening domestic market prices, thus hurting producers' incentives. Reducing export VAT rebate rates is similar to a reduction in export subsidies. Therefore, it has the same domestic market effect as increasing export taxes.

2.2 Increased spending on domestic policy measures and their interactions with border measures

At the same time of introducing the above border measures, the Chinese government also strengthened existing domestic policy measures mainly for encouraging domestic grain production. As shown in Table 2, specific measures adopted include increased support for purchasing farm machineries, increased subsidies for purchasing farm inputs such as fuels,

⁹ Export taxes on fertilizers for 2008 were originally scheduled on December 24, 2007. Since then, five subsequent adjustments were announced by the General Administration of Customs of China in 2008: on February 14, March 26, April 14, August 29, and November 25.

fertilizers and seeds, increased direct payments to grain producers, and new pilot insurance schemes for crop and livestock producers. Most notable among these measures are the increased subsidies on inputs: RMB 12.1 billion on seeds (about RMB 8 billion higher than the pre-crisis spending level in 2006), 63.8 billion on purchased subsidies under the comprehensive subsidy program (about RMB 42 billion higher than the spending recorded for 2006), and nearly 90 billion on fertilizer production and distribution (about RMB 29 billion higher than the 2006 spending level).¹⁰ In addition, the minimum procurement prices for wheat and rice were also increased with the increased government expenditure reaching RMB 5.7 billion (see the last two rows in Table 1).

Clearly, strengthening existing domestic support policy measures should have created further incentives for agriculture producers to expand agriculture production or at least to prevent significant decreases in agricultural production. For example, output subsidies in the form of minimum procurement prices for wheat and rice help increase producer's prices by creating a gap between producers' prices and the corresponding domestic market prices. Direct payments to grain farmers increase the return to land and increase grain supply; subsidies to purchased inputs, seeds and machineries reduce producers' costs and boost outputs. In addition, export taxes on inputs such as fertilizers push down domestic market prices for farm inputs by reducing foreign demand, which in turn reduces producers' costs of production and increases agricultural production. In short, these domestic support measures are likely to generate the opposite effect to export taxes on agricultural outputs.

When domestic market prices for grains are pushed down (or kept below the corresponding world market prices) by the border measures, producers' prices will be necessarily dropping for any given set of domestic support measures. This will reduce the incentive for agricultural production. Although in the very short run, agricultural production decisions such as planting areas may not be altered, farmers and other stockholders still have the option to increase their stockholding and reduce their supply to the market when domestic prices are kept artificially low. In addition, farmers can also observe the prevailing market price signals for making decisions on

¹⁰ A more complete account of China's agricultural domestic support can be found in the PSE tables compiled by the OECD (2009b).

variable inputs such as labor hours, fertilizers and pesticides, which ultimately influence agricultural outputs. Therefore, in the presence of border policy induced artificially low domestic market prices and soaring costs for key agricultural inputs (due to the oil price shocks in the same period), higher spending on existing agricultural domestic support measures would be desirable for supporting producer prices to achieve a desirable level of production. The experience of China in 2008 clearly lends support to this reasoning as tight export controls on grains and fertilizers coincided with increased spending on existing domestic measures.

3. Methodology and scenarios

3.1 Model and database

We adopt and modify the well-known computable general equilibrium model GTAP (Hertel, 1997) with agricultural sector policy details for modeling and analyzing the 2008 border policy and agricultural domestic support policy adopted by China. Following Yu and Jensen (2010), we have made significant changes to the standard GTAP modeling structure to accommodate the observed domestic support and border policy measures of China and characteristics of the Chinese agricultural economy.

The effects and the interactions of the border policy measures and existing domestic policy measures are examined through a series of counterfactual simulations with the modified GTAP model. We base these simulation exercises on the GTAP database version 8 pre-release, which has 2007 as its base year and covers 112 countries/groups of countries and 57 sectors.¹¹ For the purposes of this study, we aggregate the original database to a manageable size of 12 regions (including China, its main trading partners, and several aggregated regions covering the rest of the world) and 40 sectors (including all 19 agriculture and food sectors originally listed in the disaggregated GTAP database).

It is worth noting that fertilizer is not a separated GTAP commodity as it is included in the “chemical, rubber and petroleum” (CRP) category. In order to capture the effects of the aforementioned export policies on fertilizer (which differs significantly from trade policies

¹¹ Detailed documentation for the GTAP 8 database is not yet available. For details of the most recent earlier version of that database, see Badri and Walmsley (2008).

applied to CRP in general), we use a GTAP database program named SplitCom (Horridge, 2008) to create a new fertilizer sector in our aggregated GTAP database. In carrying out the split, we target both the trade flows for fertilizer as well as the total domestic production values of fertilizers in China. The input-output relationships concerning the new sector mirror those of the CRP sector. The resulted new database otherwise maintains all the other information in the GTAP database. After the SplitCom procedure, the specific trade policies for fertilizer are imposed in the new database to establish the base case of this study.

Since the GTAP version 8 pre-release reflects the macroeconomic situation in 2007, it does not include agricultural trade and production values for China in 2008. Both the short term agricultural trade policy measures and domestic policy measures adopted by China in 2008 are not presented in the prerelease database. Part of the data effort underpinning this study is to gather this information and systematically calibrate them to the database to form a realistic agriculture baseline for China in the year 2008. This carefully calibrated base case for the year 2008 reflects everything that we know about 2008 in terms of China's agricultural domestic support policy, agricultural trade policy, agricultural production and trade patterns for China, and agricultural price levels in China.

Counterfactual policy scenarios aiming at estimating the individual and joint effects of the short-term border policy measures and the existing domestic subsidy programs will then be simulated by using the 2008 base case.

3.2 Calibration of the 2008 base case

Regarding the agricultural trade and domestic policy measures, this requires firstly mapping the policy instruments to the relevant variables in the model and then calibrating the observed fiscal spending (or revenue) on the domestic support and trade policy measures into the accompanying database.

Some of the more important policy measures are discussed below:

- a. Output subsidy captures the difference between a product's producer price and the corresponding domestic market price. This instrument is used to model the reported increase in China's minimum procurement prices for rice and wheat in 2008, which normally raises

producer price and reduces market prices for the two products. The reported spending of RMB3.15 billion for rice and 2.53 billion for wheat are calibrated to the 2008 base case.

- b. Intermediate input subsidy captures the difference between farmers' (users') purchasing price and the corresponding market price of a specific intermediate input. The main input subsidies in agriculture used by China are the so-called "comprehensive subsidies on agriculture inputs" (namely, fertilizers, pesticides, and other purchased farm inputs; RMB 63.8 billion in 2008; see Table 2) and subsidies on "improved quality seeds". Subsidies on purchased inputs in recent years have been mainly given to grain production and as such are associated with input use in grains only, whereas seeds subsidies are attached to the use of grains seeds, rapeseed seeds and cotton seeds in the respective sectors. In addition to the input subsidies, producers of fertilizers in China also receive subsidies to compensate for the lower market prices at which they sell to fertilizer users. These are captured in the model and database as the differences between producers' prices and the market prices of fertilizers. Unlike the comprehensive input subsidies, these subsidies apply to fertilizers used by all crops.
- c. Land (or capital)-based agricultural subsidy measures the difference between farmers' (users') rental price and the corresponding market rental price of land (or capital). Several different payments/programs fall into this category. Direct subsidies to grain production are generally considered to be attached to arable land for grain production and are modeled as land subsidies, whereas subsidies for purchasing agricultural machineries are treated as subsidies to capital.
- d. The relevant border protection measures, mainly export protection measures, are modeled as price wedges between relevant domestic and world market prices. More specifically, export tax implies that the domestic market price falls below the corresponding free on board (FOB) export price. On the other hand, export VAT tax rebate is treated as an export subsidy, implying that the domestic price exceeds the FOB export price when the rebate rate is positive. Therefore, eliminating export VAT rebate has the same qualitative effect as increasing export tax. These export restrictions mainly concern grains, soybean, and fertilizers.

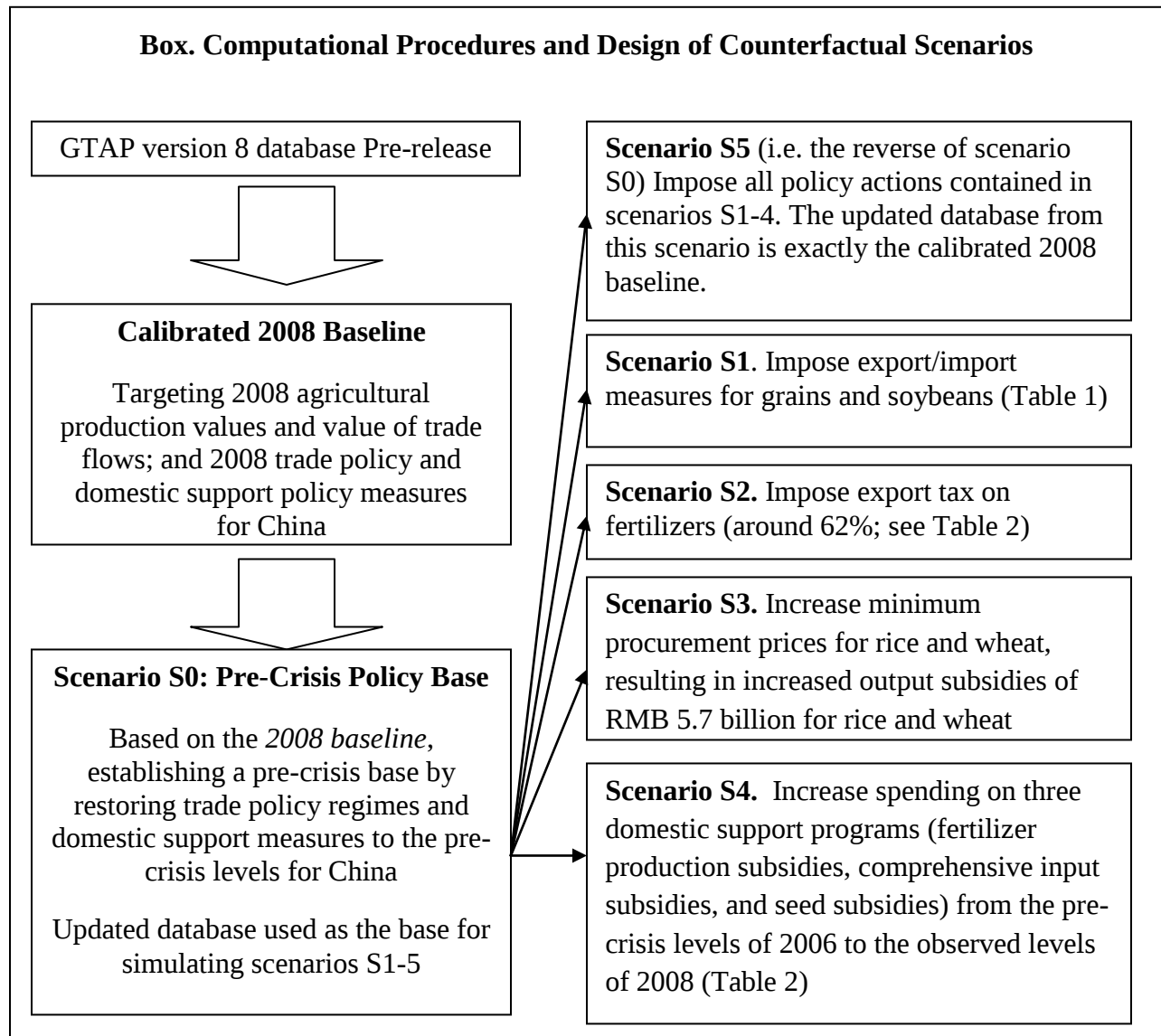
It needs to be noted that the standard GTAP model typically treats the above policy instruments as *ad valorem* tax wedges. To make sure that the budget outlays associated with the various instruments discussed above are correctly represented in the modified GTAP database, we choose to target the budget outlays while allowing the tax wedges to adjust in the calibration processes. As mentioned earlier, the targeted budgetary implications associated with these measures are reported in Tables 1 and 2.

3.3 Alternative scenarios

Against the 2008 baseline, we first simulate a counterfactual scenario in which all the border measures adopted by China in 2008 – as summarized in Table 1 – are removed (e.g. export taxes) or restored to the pre-crisis levels (e.g. export VAT rebates and import tariffs). In this scenario (named scenario S0), we also reduce the government spending on key domestic support programs to their pre-crisis levels (i.e. in 2006), as shown in Table 2. The resulted new equilibrium (named “*pre-crisis policy base*” hereafter) reflects the hypothetical situation without the border and domestic policy interventions of China in 2008. As such, the percentage differences between this new equilibrium (*pre-crisis policy base*) and the *2008 baseline* can be considered as the effects of removing the aforementioned policy interventions by China. However, the purpose of the current paper is to quantitatively estimate the effects of *imposing* – rather than *removing* – those policy interventions. To serve this purpose, the updated database characterizing the *pre-crisis policy base* is used as the new base case for simulating the reverse of the shocks contained in scenario S0. The computed percentage change results then correctly capture the effects of imposing the policy interventions (as summarized in Tables 1 and 2).

More specifically, four scenarios are simulated against the *pre-crisis policy base* for purposes of estimating the individual effects of imposing border measures on grains and soybeans (scenario S1), imposing export taxes on fertilizers (scenario S2), increasing minimum procurement prices for rice and wheat (scenario S3), and lowering spending on domestic support measures (scenario S4). Moreover, a final scenario (scenario S5) is also simulated to estimate the joint effects of imposing all the shocks contained in scenarios S1-4. In other words, scenario S5 simply reverses all the shocks contained in scenario S0. Thus, the updated database from implementing S5 is exactly the *2008 baseline* (from which S0 is simulated) and the percentage change results obtained from S5 correctly capture the joint effects of imposing all the policy interventions (as

summarized in Tables 1 and 2). In the box below, we summarize the computational procedures and details of each scenario.



Due to the short run nature of the policy responses to the food price crisis, a short-run perspective is assumed for all the above scenarios. In particular, we restrict the mobility of land across arable crops, permanent crops and pastures but do allow for imperfect mobility of land within each of the three agricultural activities (for example, in observing changes in domestic agricultural support measures). Capital is also assumed to be immobile to suit the short-run nature of the policy action taken by China in 2008. In particular, this assumption has particular relevance in the case of modeling export restrictions on input productions. For instance, China's

fertilizer export tax policy was changed six times for 2008. It is unlikely that these policy changes triggered increased or reduced fertilizer production capacities in such short intervals.

4. Results

This section reports and analyzes the simulated individual and joint effects of the short-term trade policy responses and changes in the existing domestic support measures on domestic outputs, domestic market prices, and export quantities for key agricultural products (see Tables 3, 4, and 5, respectively). In addition, percentage changes of farm income are reported in the last row of Table 3.

S1. Effects of imposing export tax and eliminating export VAT rebates on grains and soybeans

The imposition of export taxes and elimination of export VAT rebates (which is similar to the removal of export subsidies) generally increase export prices, lower the corresponding domestic market prices, thereby reducing exports and dampening domestic outputs. Indeed, these measures are shown to significantly reduce exports of rice (processed), wheat, other grains (maize), and oil seeds (soybeans) by about 53%, 94%, 34%, and 46%, respectively, as shown in Table 5.

These changes in agricultural exports influence their domestic outputs (Table 3). In particular, domestic outputs of oil seeds drop the most by 2.2%, followed by more modest output reductions of rice, wheat and other grains (maize) at respectively 0.3, 0.3, and 0.1 percent. In contrast to the estimated changes in exports for these products, the estimated output changes seem to be quite modest. This is because except for soybeans, most of these commodities are not traded (either imported or exported) heavily by China and exports as a share of domestic use remain quite small at around 1 percent (see Appendix Table 1 for imports and exports of major agricultural commodities into and from China in recent years).

Accompanying the estimated reductions of domestic outputs, domestic market prices are also estimated to be lowered by these export measures (Table 4), ranging from reductions of about 0.8% for rice (processed), to 0.7% for wheat, and 2.3% for oil seeds (soybeans). These lowered prices and reduced outputs lead to 0.7% reduction of farm income, with the export restrictions on oil seeds, vegetable oils, and rice being the main contributors. Clearly, while the export measures result in lower domestic market prices which benefit consumers, it also places a cost on

producers and in particular, farm income drops as a result of lowered agricultural outputs and reduced domestic market prices. These are indications of production efficiency costs of these export measures.

S2. Effects of imposing export tax on fertilizers

In contrast to the export measures on agricultural products, export taxes placed on agricultural inputs such as fertilizers have different intentions and lead to different effects: they reduce domestic costs of these inputs and therefore contribute to lowering domestic market prices of agricultural outputs; however by lowering domestic input prices, they also discourage domestic input production. The exact effects on agricultural production and domestic market price depend on the intensities of these inputs in producing individual products. Simulation results from scenario S2 show that outputs of major agricultural products such as paddy rice, wheat, cotton and other crops rise marginally. These modest changes in outputs can be justified by the estimated reductions in domestic market prices for essentially all agricultural products, most notably on wheat (1.5%) and other grains (1%). As a result of rising domestic outputs and decreasing domestic prices, agricultural exports also increase marginally. On balance, the effect of lowered input cost is nearly offset by the lowered domestic market prices, leading to slightly higher farm income.

Compared to the above discussed effects on agricultural outputs, fertilizer export restrictions affect fertilizer production, exports and prices in a more pronounced way. Simulation results show that the 62% average export tax on fertilizer reduces China's fertilizer exports by over 83%, which implies nearly 17% reductions of domestic fertilizer outputs in the short run.¹² Domestic market price for fertilizer also drops by nearly 7%.

In summary, the objective of restricting fertilizer exports for keeping input costs low for producers seems to be realized as these export taxes lead to small increases in domestic agricultural outputs and more noticeable decreases in their domestic market prices. However, these export taxes certainly discourage domestic fertilizer production by greatly limiting their supply to the world market. As will be discussed in Scenario 4, in conjunction with the export

¹² In the longer run with capital mobility, the reduction will be more substantial as capital will have to move from the fertilizer sector to other sectors.

restrictions on fertilizers, China ended up increasing its domestic subsidies on fertilizers, which moderates the disincentives placed by these export restrictions on fertilizer production.

S3. Effects of increasing minimum procurement prices for wheat and rice

Simulation results show that the increased fiscal spending of RMB 5.7 billion due to increased minimum procurement prices for wheat and rice indeed reduces domestic market prices for rice and wheat (0.7% and 1.3% respectively) but only slightly increases producer prices by less than 0.2%. In responding to slightly increased producer prices, outputs of wheat and rice are increased marginally by 0.3% and 0.2%, respectively. As such, farm income is actually slightly higher (0.1%). Therefore, this market price measure partially offsets the negative effects on rice and wheat production and farm income caused by the export measures discussed in scenario S1.

S4. Effects of increasing domestic subsidies to agricultural inputs and fertilizer production

Scenario S4 focuses on the increased spending on three domestic measures, namely, the comprehensive input subsidy program, the improved seed program for grains, and the production/distribution subsidies on fertilizers used for all crops.¹³ All these subsidies contribute to lowering production costs, moderating rises of domestic market prices, and increasing outputs of grains. Domestic outputs increase the most for other grains (maize) at 3.8%, followed by wheat at 3.5% and paddy rice at 1.2%. Domestic market prices drop more: 4.2% for paddy rice, 10.5% for wheat, and 10.4% for other grains (maize). Due to lowered domestic market prices, even with the presence of export taxes, in this case China would be able to increase its exports to the world market most notably for wheat, and then rice and other grains. Farm income is estimated to increase by nearly 1.1% due to the increased spending on these subsidies, which more than compensates the estimated farm income losses resulted from the short term export measures (0.7%, as reported for scenario S1).

Among the three types of domestic support measures considered, the comprehensive input subsidies on fertilizers, pesticides, and other chemicals and fuels seem to generate the largest output expansion and price reduction effects for grains. For instance, more than 1 percentage point of the 1.2% increase in paddy rice output and 2.7 percentage points of the 2.9% increase in

¹³ The direct payments to grain production only increased by just less than RMB 1 billion between 2006 and 2008. They are therefore not considered in this scenario due to space limitations.

wheat output are due to the increased spending in the comprehensive input subsidy program; whereas 3.9 percentage points of the 4.4% reduction in paddy rice price and 8.7 percentage points of the 10.5% reduction in wheat price are caused by the increased spending in the same program. Despite the reductions in grain market prices, increases in grain outputs and reduced input costs actually lead to increased farm income at about 1.1%, around half of which is due to the increased comprehensive input subsidies. This result is quite understandable as the change in spending on this program between 2006 and 2008 is the largest (valued at nearly RMB 52 billion) among all the domestic support measures considered here. Another reason is that unlike the production and distribution subsidies given to fertilizers (which reduce production costs for all agricultural products), the comprehensive subsidies mainly benefit grain productions by design.

In the case of fertilizers, increased spending on both the comprehensive input subsidies and fertilizer production subsidies leads to higher domestic fertilizer outputs at 2.5% and 1.9% respectively and jointly they contribute to the 4.5% increase in fertilizer production. At the same time, these subsidies lead to higher fertilizer prices due to increased demand triggered by these subsidies. These positive domestic output and market price effects for fertilizers are in stark contrast to the negative output and price effects caused by the fertilizer export taxes discussed in scenario S2. However, the large increase in the input-based domestic subsidies (to the tune of about RMB 73 billion) only offsets less than one-third of the negative price and output effects for fertilizers caused by the export taxes.

In summary, while the increase in domestic input-based subsidies helps boost grain outputs and moderate rises in grain prices, it is nevertheless quite expensive, especially considering the very small increase in farm income achieved and how these subsidies are used to offset the negative consequences on input production caused by fertilizer export taxes.

S5. Joint effects of short term trade policy measures and increasing domestic subsidies

When all the short term trade policy measures and domestic support policy measures examined in S1-S4 are considered jointly, the combined effects of all these policy measures are obtained. Results from scenario S5 summarize these joint effects, which are reported as the last columns in Tables 3-5. Results reported for the previous scenarios in these tables can be seen as an indicative decomposition of the results for scenario S5, while an exact decomposition of the

contributions from individual shocks to the cumulative results obtained from S5 is offered in Table 6, where for presentation purposes contributions from individual shocks are normalized such that the sum of the absolute values of all shocks sum to 100 percent (see Table 6 note).¹⁴

On aggregate, the combined forces of all the policy measures have the joint effects of boosting outputs for many agricultural products up to nearly 4 percent, indicating that the extra spending on existing domestic support measures is able to compensate for the negative output effects due to the short term border measures (Table 3). In particular, grain outputs are estimated to increase: 1.3% for paddy rice, 3.2% for wheat and 3.9% for other grains (maize). The only key product that is estimated to be negatively influenced by all these measures is oil seeds (soybeans) with an estimated 1.8% decrease in outputs. This is mainly because the joint effects of the reduced import tariff and increased export restrictions on soybeans outweigh the incentives offered through the input-based subsidy programs.

The relative importance of the individual policy actions explored in scenarios S1-4 in contributing to the joint output effects (as reported above) can be obtained by inspecting the top panel of Table 6. For the three major grain products, it is clear that the comprehensive input subsidies generate dominant positive effects and contribute near or more than half of the output increases of these products. Fertilizer production subsidies and seed subsidies also increase agriculture outputs but their effects are generally dwarfed by those caused by the comprehensive input subsidies. In contrast, border measures explored in scenario S1 universally reduce grain outputs but their negative output effects are far less than the positive effects due to the comprehensive input subsidies. In the case of the export tax on fertilizer, it is clear that this tax marginally increases all agricultural outputs but drastically reduces fertilizer outputs.

Since both sets of policies generally reduce domestic market prices – as discussed in scenarios S1-S4 – the price stabilizing effects are mutually strengthening between the two types of policies (see Table 4). On aggregate, domestic market prices for grain are lowered by between 6.5 for paddy rice to 14% for wheat (as compared to the situation where these policy measures are

¹⁴ When all the individual shocks contained in scenarios 1-4 are simulated simultaneously, as done in scenario S5, contributions to the cumulative results from that simulation (i.e. S5) can be obtained through a decomposition routine developed by Harrison, Horridge and Pearson (2000). However, the interpretation of these “subtotal” results is not exactly the same as that of the results obtained from simulations with individual shocks, as in the former case, the contribution from any individual shock to the cumulative result depends on the presence of all the other shocks.

absent), and between 1 to 3% for other agricultural products. According to China's statistical yearbook (National Bureau of Statistics of China, 2009), the year-on-year retailing price index and producers' price index for grains in 2008 are respectively 7 and 7.1 percent.¹⁵ Relative to these official price indexes, our estimated domestic market price effects due to the policy measures are quite large, suggesting that in the absence of these policy measures, grain prices would have risen to much higher levels.

The middle panel of Table 6 presents the normalized percentage contributions to the above price effects by individual policy actions. It is clear that as compared to the short term border measures, the domestic policy measures contribute more to the reductions of domestic market prices for grains, with near or more than two-third of the price reductions attributable to the increased spending on these domestic subsidies. Again, the comprehensive input subsidies prove to be the dominant force in stabilizing domestic market prices for grains. While almost all policy instruments contribute to reducing market prices for grains, it is clear that the comprehensive input subsidies given to grains actually increases market prices for oil seeds (soybeans) and vegetable oils. This is because the comprehensive input subsidies reduce production costs for grains and increase their outputs, the latter of which leads to competitions for resources (arable land and labor) previously used in oil seeds production.

In the case of fertilizers, while export restrictions are estimated to severely reduce their domestic outputs and market prices (16.8% and 6.8% respectively), increased domestic subsidies only partially offset these negative consequences and lead to lower reductions in fertilizer outputs and market prices (11.5% and 4.7% respectively). Again, these negative effects on input producers need to be considered when evaluating the costs of these policy responses to food price rises.

On the trade side, although the world market price effects of these policy measures are not the focus of the current paper, China's policy actions do affect the world market through reduced exports and increased imports in the case of oil seeds (soybeans). Reduced exports are most pronounced in relative terms for wheat, rice, and oil seeds, and other grains (maize). However, other than soybean, China has not been a large exporter/importer for grains in recent years and both imports and exports of grains constitute a very small share of China's domestic production

¹⁵ The OECD reports an 18.7% increase in consumer food price increase for 2007/8, according to Jones and Kwiecinski (2010).

and use of these products (See Appendix Table 1). So the extent to which China's action contributed to the food price crisis cannot be exaggerated, as pointed out by Abbott (2009) and certainly supported by results from the current study which suggests that China's policy action contributed to less than one percent increase in world market prices for grains.

Last, farm income is estimated to increase by half of a percentage point. As reported in scenarios S1-4, while the short term border measures reduce farm income, increased spending on the domestic measures helps increase farm income which more than offsets the negative farm income effect caused by the border measures. Nevertheless, the joint farm income effect is very small, especially considering the size of increased spending on the domestic measures.¹⁶

5. Conclusions

Few studies in the existing literature have investigated the complex interactions among the domestic and trade policy measures many national governments adopted to combat the 2007/8 global food price crisis. This paper provides a first quantitative assessment on the individual and joint effects of China's short term trade policy actions and existing domestic support measures on domestic market prices, outputs, trade flows and farm income in China. The analysis is based on a global CGE model characterized with detailed and up-to-date policy information for China in the year of 2008. A base case characterizing the agricultural trade and production situation and the associated policy environment for China is constructed for that year and is used for establishing and simulation five counterfactual scenarios to estimate the individual and joint effects of China's policy actions in 2008.

A series of interesting results emerge from these quantitative exercises. First, grain outputs in China are estimated to be boosted by up to 4 percentage due to all the policy interventions, with the extra government spending on key input-based subsidy programs in 2008 (over and above the pre-crisis level in 2006) being more than enough to compensate for the lowered outputs due to the short term border measures. Second, while both the short term trade policy measures and increased spending on existing domestic measures are able to reduce domestic market prices,

¹⁶ In contrast to the estimated half a percentage point increase in farm income, according to Yu and Jensen (2010), the RMB 140 billion increase in domestic support on agriculture during 2003-05 (without any changes in trade policy instruments) is estimated to increase farm income by 8%.

more than two-thirds of the reductions of grain prices are due to the increased spending on the domestic measures. Third, export tax on fertilizers and more importantly the increased comprehensive input subsidies (especially on fertilizers) are important contributors to the above output and domestic market price effects. However, these two measures generate offsetting output and price effects on fertilizer itself. Fourth, the domestic market price reduction effects of the observed policy measures are shown to be large and significant, relative to the observed agriculture and food price indexes in China in 2008, indicating that in the absence of these policy actions, domestic market price could have risen much more. Lastly, while China seems to be quite successful in tackling the food price inflation using a combination of policy measures, the fiscal and efficiency costs are not negligible, especially if one considers the extra government spending on the input subsidies seemingly necessitated with the insulating trade and border policy measures. In fact, our results indicate that the increased spending on the domestic measures generated very little increase in farm income.

These results suggest that the short-run insulating trade policy measures aiming at protecting poor consumers in the time of high food prices undermine the longer term domestic policy measures designed for maintaining incentives for agricultural production, especially grain production in the case of China. Ironically, it has been suggested that maintaining agricultural production incentives should be the long term solution to tackling future price volatilities. Facing this dilemma, in 2008 the Chinese government increased its spending on existing domestic programs, which are shown to be able to compensate for the losses of agricultural production incentives due to the short-term trade policy measures. This clearly illustrates the expensive nature of the policy actions aiming at balancing short-term and long-term policy goals during the world food price crisis. It is also worth noting that the three domestic support programs considered in this paper are all input based measures, with two of them being tied to fertilizer and other purchased inputs. Our estimates show that these fertilizer based subsidies dominate both the domestic output and market price effects for grains. As the intensity of fertilizer use in Chinese agricultural has already been very high, the continued emphasis on fertilizer subsidies as both a short and long run solution for maintaining stable domestic grain production and supply should be re-evaluated, especially with respect to the potential environmental consequences and the long term sustainability of China's agricultural resource base.

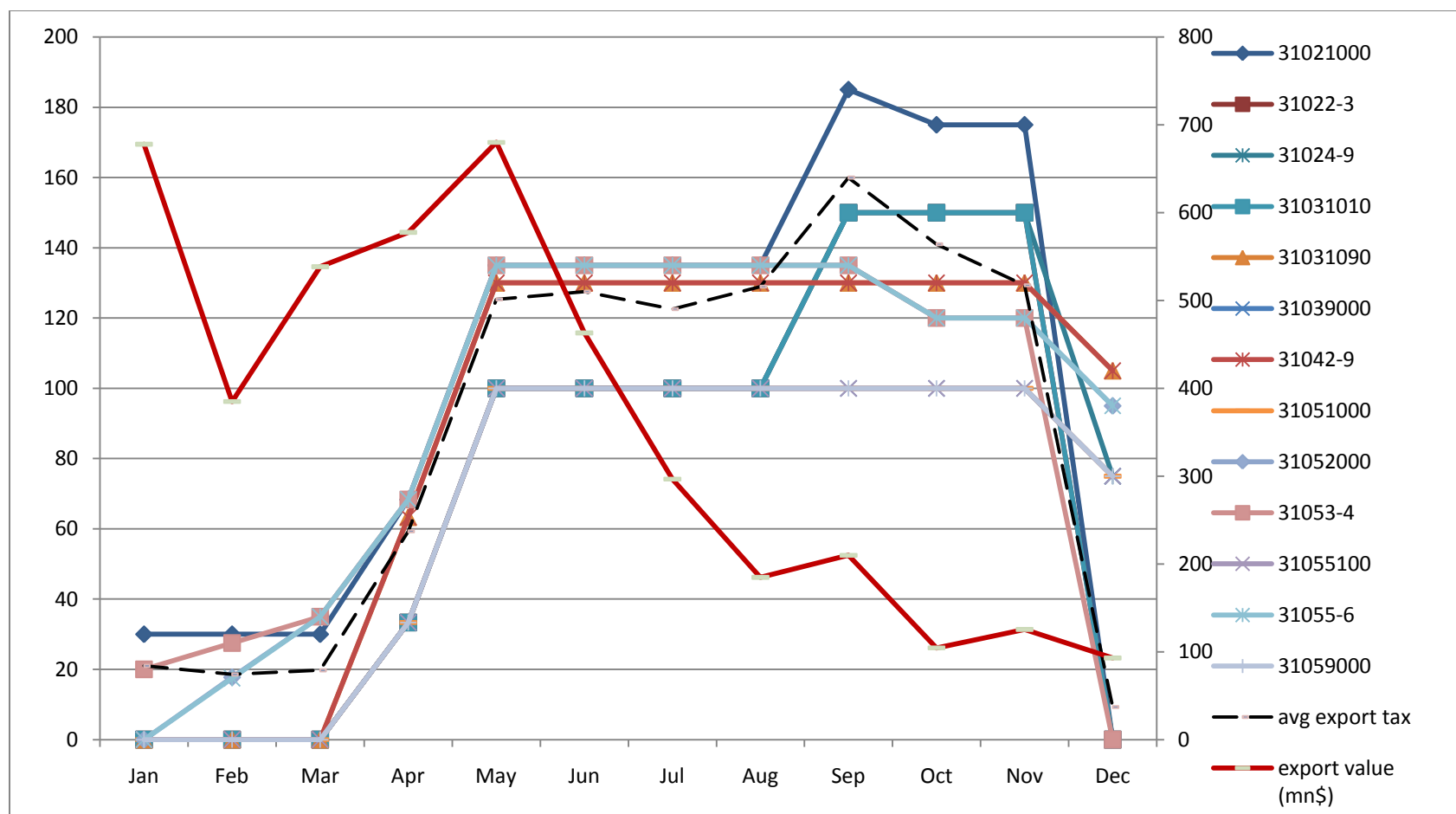


Figure 1. China's fertilizer export taxes by HS8 code (%; left axis) and export values (million USD; right axis) in 2008

Source: own calculations based on data and information obtained from the General Administration of Customs of China.

Table 1. Short run trade policy measures adopted in 2008 in China

Instrument	Description	Commodities	GTAP sector	Fiscal implications (RMB mil)	Fiscal implications (USD mil)	2008 base case	Counterfactual scenarios
Import tariff	3% to 1%	Soybeans	osd ¹	2274.0	327.3	1%	3%
Export VAT rebat	13% to 0%	Grains	pcr, wht, gra	-607.6 ²	-87.5	0	13% export subsidy
Export VAT rebat	13% to 0%	Soybeans	osd	-317.1 ²	-45.6	0	13% export subsidy
Export VAT rebat	13%-17% to 0%	Vegetable oils	vol	-467.0	-67.2	0	14.1% export subsidy ³
Export tax	5%	Soybeans	osd	-116.2	-16.7	5% export tax	0%
Export tax	5%	maize, rice, sorghum, millet	pdr, pcr, gra	-212.5	-30.6	5% export tax	0%
Export tax	20%	Wheat	wht	-35.4	-5.1	20% export tax	0%
Export tax	20-185%	Fertilizers	crp	-11502.0	-1,665.4	62% export tax ⁴	0%
Min procurement price	9%-10%	Rice	pdr	3150.0	453.4	453.4mn output subsidies	0%
Minimum procurement price	4%-7%	Wheat	wht	2520.0	362.7	363.7 mn output subsidies	0%

Note: this table is based on Appendix table A.4 on pp 66-67 of Jones and Kwiecinski (2010), information from the General Administration of Customs of China, our own calculations based on data from UN COMTRADE database, and the GTAP concordance between GTAP sectors and the HS system (www.gtapi.org).

The exchange rate for converting the value from RMB yuan to US dollar is 6.948 RMB per US dollar, according to the IMF.

1. UN COMTRADE database shows that most OSD imports into China in 2008 were soybeans and a significant portion of its OSD exports was also soybeans.
2. Jones and Kwiecinski (2010) report the fiscal savings from reducing the tax rebate for grains and soybeans in 2008 are 916 million RMB. Our calculations based on data from UN COMTRADE database suggest a total saving of RMB 924.7 million on both grains and soybeans.
3. The average rebate rate is calculated by using trade data from UN COMTRADE.
4. The 62% average export tax rate is obtained by using the total export tax revenue levied on chemical fertilizer products and the corresponding value of exports. To compute the total export tax revenue, we use the monthly export data at 8-digit level obtained from the Chinese Customs and match them with the corresponding export tax rates.

Table 2. Major agricultural domestic subsidies in China: 2004-2008 (billion RMB)

	Direct subsidies to grains (rice, wheat, maize)	Improved quality seeds (wheat, rice, maize, soybean since 2006; rapeseeds and cotton added since 2007)	Comprehensive subsidy on agricultural inputs (mainly grains)	subsidy for the purchase of agricultural machinery	subsidies on fertilizer production and distribution (all crops)
2004	11.6	2.85	0	0.48	12.889
2005	13.2	3.87	0	1.4	41.494
2006	14.2	4.15	12	1.7	60.943
2007	15.1	6.66	27.6	2 (central gov't only)	89.508
2008	15.1 (US\$2,173.3mil)	12.1 (US\$1,741.5 mil)	63.8 (US\$9,182.5mil)	4 (central gov't only) (US\$808.4mil)	89.508* (US\$12,882.6mil)

Source: OECD (2009) and various documents from the websites of Ministry of Finance, China. The exchange rate for converting the value from RMB yuan to US dollar is 6.948 RMB per US dollar, according to the IMF.

*Subsidies to fertilizer producers in 2008 are not available and in this paper we use the 2007 figure.

Table 3. Simulated changes in agricultural outputs for selected products and chemical fertilizers (percent)

	S1. border measures							S2. export tax on fertilizer	S3. minimum procurement prices	S4. domestic subsidies				S5. ALL
	sum	Import tariff	Export tax and export VAT rebate							sum	Fertilizer prod subsidy	Input subsidy	seed subsidy	
			oil seeds	rice	other grains	wheat	oil seeds							
paddy rice	-0.2	0.02	-0.37	0.01	0.01	0.08	0.04	0.11	0.17	1.19	0.15	1.04	0	1.3
wheat	-0.28	0.02	0.03	0.01	-0.45	0.07	0.04	0.34	0.37	3.47	0.41	2.73	0.33	3.22
other grains (maize)	-0.08	0.03	0.03	-0.25	0.01	0.11	-0.02	0.18	-0.02	3.81	0.28	1.76	1.77	3.91
vege & fruits	0.13	0.02	0.03	0.01	0.01	0.08	0	0.11	-0.02	0.08	0.15	-0.04	-0.02	0.34
oil seeds	-2.15	-0.29	0.08	0.02	0.04	-1.51	-0.49	0.46	-0.08	-0.03	0.3	-0.24	-0.09	-1.75
sugar cane/beets	0.36	0.04	0.06	0.01	0.02	0.14	0.09	0.33	-0.04	0.05	0.26	-0.14	-0.07	0.75
cotton	0.17	0.04	0	0.01	0.02	0.12	-0.01	0.89	-0.02	0.65	0.6	-0.16	0.21	1.72
other crops	0.75	0.05	0.13	0.03	0.05	0.35	0.15	0.71	-0.12	-0.48	0.17	-0.45	-0.2	0.95
vegetable oil	-0.3	0.1	0.05	0.01	0.02	0.62	-1.1	0.15	-0.03	0.25	0.22	0.03	0	0.1
rice	-0.27	0.06	-0.42	0.01	0.01	0.05	0.03	0.09	0.12	0.82	0.11	0.71	-0.01	0.72
fertilizers	-0.07	0	-0.01	-0.01	-0.03	-0.01	-0.02	-16.77	0.04	4.45	1.94	2.45	0.06	-11.53
Farm income	-0.73	-0.03	-0.12	-0.03	-0.07	-0.28	-0.2	0.09	0.14	1.02	0.33	0.47	0.22	0.53

Source: Simulation results.

*: for scenarios with multiple policy measures, “sum” refers to the total effects of imposing all the concerned instruments, while the subsequent columns in the same block provide a decomposition of the individual effects of individual policy measures according to the method developed by Harrison, Horridge and Pearson (2000).

Table 4. Simulated changes in domestic market prices for selected agricultural products and chemical fertilizers (percent)

	S1. Border measures							S2. Export tax on fertilizer	S3. minimum procurement prices	S4. domestic subsidies				S5. ALL
	Sum	Import tariff	Export tax and export VAT rebate							sum	Fertilizer prod subsidy	Input subsidy	seed subsidy	
			oil seeds	rice	other grains	wheat	oil seeds		Veg. oil					
paddy rice	-0.92	-0.04	-0.35	-0.03	-0.05	-0.29	-0.17	-0.51	-0.7	-4.21	-0.42	-3.92	0.13	-6.52
wheat	-0.67	-0.03	-0.08	-0.02	-0.21	-0.21	-0.12	-1.45	-1.27	-10.45	-1.23	-8.74	-0.48	-14.01
other grains (maize)	-0.73	-0.03	-0.09	-0.15	-0.04	-0.24	-0.17	-1.03	0.1	-10.35	-0.82	-6.36	-3.17	-12.11
vege & fruits	-0.42	-0.01	-0.06	-0.01	-0.03	-0.15	-0.16	-0.65	0.08	0.22	-0.41	0.49	0.14	-0.82
oil seeds	-2.29	-0.24	-0.1	-0.02	-0.04	-1.35	-0.53	-0.34	0.09	0.36	-0.25	0.45	0.16	-2.29
sugar cane/beets	-0.66	-0.04	-0.1	-0.03	-0.04	-0.29	-0.16	-0.64	0.11	0.25	-0.5	0.55	0.19	-1.03
cotton	-0.41	-0.02	-0.08	-0.02	-0.03	-0.15	-0.12	-1.48	0.07	-0.7	-1.38	0.71	-0.03	-2.57
other crops	-0.26	-0.01	-0.04	-0.01	-0.02	-0.09	-0.1	0.13	0.04	0.2	-0.06	0.18	0.08	0.07
vegetable oil	-1.17	-0.09	-0.06	-0.01	-0.02	-0.51	-0.48	-0.39	0.05	-0.1	-0.2	0.09	0.01	-1.69
rice	-0.81	-0.21	-0.3	-0.02	-0.03	-0.14	-0.11	-0.38	-0.45	-2.74	-0.29	-2.53	0.09	-4.51
fertilizers	-0.06	0	-0.01	0	-0.01	-0.01	-0.02	-6.78	0.02	1.77	0.77	0.98	0.02	-4.72

Source: Simulation results.

*: for scenarios with multiple policy measures, “sum” refers to the total effects of imposing all the concerned instruments, while the subsequent columns in the same block provide a decomposition of the individual effects of individual policy measures.

Table 5. Simulated changes in export quantities for selected agricultural products and chemical fertilizers (percent)

	S1. Border measures							S2. export tax on fertilizer	S3. minimum procurement prices	S4. domestic subsidies				S5. ALL
	Sum*	Import tariff	Export tax and export VAT rebate							Sum*	Fertilizer prod subsidy	Input subsidy	seed subsidy	
			oil seeds	rice	other grains	wheat	oil seeds							
paddy rice	9.86	0.34	4.67	0.24	0.41	2.77	1.44	9.11	5.59	38.44	3.72	35.92	-1.2	76.4
wheat	-94.37	0.1	0.29	0.06	-95.97	0.74	0.41	17.99	11.22	148.15	17.46	123.89	6.79	-79.91
other grains (maize)	-33.51	0.07	0.21	-34.78	0.09	0.53	0.38	3.9	-0.25	30.29	2.38	18.6	9.31	-9.29
vege & fruits	1.43	0.05	0.23	0.05	0.09	0.53	0.49	3.21	-0.24	-0.78	1.17	-1.54	-0.41	3.74
oil seeds	-46.03	1.16	0.25	0.07	0.13	-49.94	2.3	3.24	-0.35	-1.44	0.87	-1.7	-0.6	-45
sugar cane/beets	1.71	0.09	0.3	0.07	0.11	0.75	0.39	3.38	-0.27	-0.67	1.17	-1.37	-0.46	4.34
cotton	2.04	0.09	0.36	0.08	0.13	0.8	0.58	10.8	-0.32	3.22	6.57	-3.43	0.07	16.54
other crops	1.81	0.09	0.29	0.06	0.11	0.66	0.6	2.06	-0.27	-1.36	0.25	-1.15	-0.46	2.41
vegetable oil	-49.05	0.53	0.21	0.06	0.09	3.64	53.57	3.2	-0.23	0.51	0.96	-0.42	-0.03	-46.99
rice	-52.82	0.68	54.59	0.06	0.12	0.52	0.38	3.24	1.99	12.7	1.32	11.79	-0.41	-43.14
fertilizers	0.37	0.02	0.05	0.02	0.05	0.15	0.08	-83.15	-0.05	-7.54	-3.32	-4.16	-0.06	-85.3

Source: Simulation results.

*: for scenarios with multiple policy measures, “sum” refers to the total effects of imposing all the concerned instruments, while the subsequent columns in the same block provide a decomposition of the individual effects of individual policy measures.

Table 6. Percentage contributions to simulated changes in outputs, domestic prices and export quantities obtained from scenario S5

	Total changes (%)	percentage contributions from individual shocks*					
		S1 Border measures	S2 export tax fertilizer	S3 min procurement prices wheat & rice	S4 fertilizer production subsidies	S4 comprehensive input subsidies	S4 seed subsidies
Output							
paddy rice	1.3	-12	8	10	9	61	0
wheat	3.22	-12	8	8	9	57	7
other grains (maize)	3.91	-2	5	0	7	43	43
oil seeds	-1.75	-66	14	-2	9	-6	-3
vege oils	0.1	-38	21	-4	30	7	0
rice	0.72	-22	7	8	8	53	-1
fertilizer	-11.53	0	-77	0	10	12	0
domestic market prices							
paddy rice	-6.52	-15	-8	-10	-6	-59	2
wheat	-14.01	-6	-10	-8	-9	-63	-3
other grains (maize)	-12.11	-6	-8	1	-7	-52	-25
oil seeds	-2.29	-64	-10	2	-7	12	4
vege oils	-1.69	-62	-21	2	-10	4	1
rice	-4.51	-18	-9	-9	-6	-55	2
fertilizer	-4.72	-1	-77	0	10	12	0
export quantities							
paddy rice	76.4	17	15	9	6	52	-2
wheat	-79.91	-68	5	3	3	20	1
other grains (maize)	-9.29	-56	6	0	3	23	11
oil seeds	-45	-90	5	-1	1	-3	-1
vege oils	-46.99	-93	5	0	1	-1	0
rice	-43.14	-80	4	2	1	13	0
fertilizer	-85.3	0	-94	0	-3	-3	0

*: use x_{ij} to denote the computed contributions (percentage changes) by shock j to output/market price/export quantity of product i , obtained by using the “subtotal” routine developed by Harrison, Horridge, and Pearson (2000). Use X_i to denote the computed total changes for product i . Then $X_i = \sum_j x_{ij}$. The normalized percentage contributions by individual shock j to product i is then computed as: $\frac{x_{ij}}{\sum_j |x_{ij}|} * 100\%$. The advantage of this normalization is that the sum of the absolute values of the normalized contributions is 100%. It also clearly illustrates how different instruments may offset the effect of each other.

Appendix Table 1. China's agricultural trade flows, selected products: 2004-2009

	2004	2005	2006	2007	2008	2009	2004	2005	2006	2007	2008	2009
Values of Exports (million USD)							Quantity of Exports (1,000 tons)					
wheat	112	37	161	481	31	2	784	260	1,114	2,337	126	8
maize	396	1,151	468	1,008	161	92	2,728	8,814	3,258	5,445	509	291
oil seeds incl soybeans	575	691	561	689	973	715	910	1,079	915	966	929	800
vegetable oil	348	391	360	509	807	750	885	961	835	1,193	1,005	1,481
rice	185	176	342	385	371	365	782	561	1,090	1,154	801	623
Chemical fertilizer	1,290	988	1,145	3,706	4,323	2,561	7,083	4,460	5,272	13,380	9,276	8,827
Values of Imports (million USD)							Quantity of Imports (1,000 tons)					
wheat	1,640	762	108	21	7	205	7,233	3,510	584	83	32	894
maize	325	436	424	277	508	470	1,724	2,208	2,234	965	1,166	1,888
oil seeds incl soybeans	7,070	7,916	7,738	11,693	22,123	19,292	20,360	26,761	28,562	31,098	37,723	43,074
vegetable oil	3,881	3,127	3,920	7,024	10,067	7,170	7,264	6,896	8,668	9,558	9,423	10,721
rice	251	196	287	217	182	196	756	514	714	467	288	320
Chemical fertilizer	2,285	3,049	2,482	2,902	3,475	1,986	12,391	13,951	11,275	11,674	6,185	4,043

Source: own aggregation based on data from UN COMTRADE.

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