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China's grain reserves, price support and import policies: Examining the medium-term market impacts of alternative policy scenarios

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China's grain reserves, price support and import policies: Examining the medium-term market impacts of alternative policy scenarios

Annelies Deuss and Marcel Adenäuer, OECD

In 2016, the People's Republic of China removed its support prices for maize and started destocking its large public reserves of maize. This paper investigates what would happen if China were to also eliminate its support prices for rice and wheat and reduce its public stocks of these two commodities. The analysis examines domestic and international market impacts over the next ten years by comparing a baseline (or business-as-usual scenario) with three scenarios that each assume support prices are eliminated but incorporate different assumptions about China's import policies. To account for the uncertainty about China's actual stock levels, the baseline and three scenarios are conducted under a minimum and maximum stock level assumption. The results show that the impacts will be most pronounced during the first years when temporary public stocks are depleted, with strong drops in domestic prices and reduced production. Over the medium term, domestic prices are projected to recover but will remain below baseline levels. The analysis also shows that even though the actual size of stocks has no significant impact over the medium term, its impact can be substantial during the first years a new policy is implemented, which underscores the importance of transparency when reporting on stock levels and stockholding policies.

JEL codes: F13, F14, Q11, Q17, Q18

Keywords: China, cereals, stocks, TRQ, agricultural policy reform, partial equilibrium model

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Executive Summary

In 2016, the People's Republic of China (hereafter "China") removed its support prices for maize and started destocking its large public reserves of maize. This paper investigates what would happen if China were to also remove its support prices for rice and wheat and consequently reduce its public stocks of these two commodities. The analysis examines the impacts over the next ten years by comparing a baseline (or business-as-usual scenario) with different scenarios that incorporate potential changes to China's import policies.

The probability of China eliminating its rice and wheat support prices and revise its grain import policies has increased in recent years because of several developments. First, China has already eliminated its support price for several crops, including for maize in 2016. Second, China introduced pilot programmes in selected provinces in 2018 whereby it replaced support prices for rice and wheat with more market-oriented mechanisms. Finally, China is facing international pressure to revise its price support policies as well as its import policies due to two recent decisions of the WTO dispute panel. The first, published in February 2019, determined that China had exceeded its limits for support for rice and wheat. The second, published in April 2019, concluded that China was administering its Tariff Rate Quotas (TRQs) for maize, rice and wheat in a manner inconsistent with its Accession Protocol obligations.

This report uses scenario analysis to examine the medium-term impacts of changes in China's support price and import policies. More specifically, the baseline assumes that the current policy situation remains in place over the projection period (2019-2030), namely that there are support prices for rice and wheat, area payments for maize, and that China keeps under-filling its TRQs for maize, rice and wheat.

The scenarios assume that the support prices for rice and wheat and the area payments for maize are eliminated and replaced by non-commodity specific area payments. The elimination of these support prices will lead to the progressive depletion of China's temporary public stocks during the first years of the projection period. These temporary public stocks are a type of public stocks that are composed exclusively of grains purchased at support prices. The central public stocks are assumed to remain stable over the projection period. The scenarios differ in their assumptions about China's import policy.

There are three sets of scenarios. The first scenarios have the same assumption about China's import policy as the baseline; they assume that China keeps administering its TRQs as it has until 2018, i.e. in a manner that inhibits the filling of the TRQs ("underfilled" scenario). The second set assumes that China administers its TRQs in a manner that does not inhibit the filling of the TRQs and hence allows for full utilisation of the tariff quota or even imports above the quota levels at the higher out-of-quota tariffs depending on the international and domestic grain price relation ("filled" scenario). The third set of scenarios examines what would happen if China were to remove its TRQs for grains and keep the low in-quota tariff of 1% as the MFN tariff ("no TRQ" scenario).

Crucial to the proposed scenarios are the grain stock levels in China. However, data on Chinese reserves of grains are difficult to obtain. To account for the uncertainty about China's actual stock levels, the baseline and the three scenarios are all conducted under a minimum and maximum stock level assumption. This approach provides bounds for the potential market impacts.

A drastic change in China's support price and public stockholding policy is expected to affect domestic and international markets significantly, especially during the transition period (2019-2021) when temporary public stocks are depleted. Accordingly, the actual level of public stocks plays an important role during this period as larger volumes of reserves imply that more reserves would be released and hence the effects amplified.

If China were to preserve its current import policies ("underfilled") and hold the assumed minimum level of stock, then domestic prices of rice and wheat are projected to decrease on average by 12% and 21%, respectively, during the transition period. If instead China were to hold the maximum level of stock, then these price declines are projected to reach 14% for rice and 28% for wheat. However, if China were to allow imports to increase during the destocking period ("filled" and "no TRQ"), then the domestic price declines would be even more severe, reaching up to 17% for rice and 32% for wheat. Domestic maize prices are also projected to be lower under the scenarios than under the baseline, but the relative decrease will be less pronounced than for rice and wheat since the support price for maize was already abolished before the projection period.

The lower domestic prices under the scenarios compared to the baseline during the transition period would lead to reduced incentives to grow these crops, which translates into lower production. In addition, as China destocks, domestic availability increases. In the "underfilled" scenarios, China is assumed to maintain its current import policy and hence this oversupply would reduce import demand for maize, rice and wheat. However, if China were to change its import policy, as under the "filled" and "no TRQ" scenarios, then it would already start increasing its imports during the transition period.

The different directions of import demand during the transition period under the "underfilled" scenario compared to the "filled" and "no TRQ" scenarios also affect international markets, with international prices projected to decline under the "underfilled" scenario, whereas they would rise under the "filled" and "no TRQ" scenarios.

Again, stock levels will play a role during the transition period as relatively higher domestic stock levels would weaken additional import demand. The levels of China's stocks are especially relevant for the international prices of rice and wheat under the "filled" and "no TRQ" scenarios: the price increase is projected to be around twice as large under the minimum compared to the maximum level assumption.

Over the medium term, domestic prices under the scenarios are expected to recover as stock levels stabilise and the market adapts to an environment without support prices. However, domestic prices under the scenarios are projected to stay below the levels under the baseline and the difference with prices under the baseline is more pronounced as more imports are allowed.

If China were to eliminate its support prices for rice and wheat and remove its grain TRQs as modelled under the "no TRQ" scenario, then imports would increase significantly. Comparing the "no TRQ" scenario with the baseline, imports of maize in 2030 are projected to be more than five times higher, rice imports would almost double and wheat imports would be three times higher. Consequently, China's role in global imports will also become more important.

International prices would also be affected if China were to change its support price and import policies. Whereas during the destocking period import demand is expected to be subdued due to increased domestic availability, it will increase significantly over the medium term. Comparing the "no TRQ" scenario with the baseline shows that international prices of maize and wheat in 2030 are projected to be more than 5% higher, and for rice 4% higher. These effects are similar to those obtained in the study by Kimura, Gay and Yu (2019).

The uncertainty around China's actual stock levels would mainly affect markets during the transition period, when temporary stocks are depleted and released onto the domestic market. The larger stocks under the maximum level assumption imply that larger quantities will be released on the markets, leading to a relatively stronger drop in domestic prices and in imports than under the minimum level assumption. Over

the medium term, however, stock levels would stabilise at either the maximum or minimum level and hence there would no longer be any significant difference in impact between the two stock level assumptions.

For China's policy makers, this analysis has two important implications. First, the scenario results show that removing support prices would lead to lower domestic prices in the short term, and that these drops would be more pronounced as more imports enter the country. In order to avoid severe negative impacts on farm income during the transition period, policy makers could provide temporary support to farmers. However, this support need only be given for a limited duration, given that the analysis also shows that the market impacts dissipate over the medium term, with domestic prices and production recovering under the scenarios.

Second, policy makers should consider carefully how long the destocking period should last keeping in mind the costs and benefits of extending the destocking period. On the one hand, extending the destocking period could lead to lower fiscal revenues from the sales of the stored commodities as the quality of the commodities deteriorates the longer they are kept in storage. A longer transition period can also increase the fiscal burden as it implies a longer period of temporary compensatory payments to farmers and of managing the temporary reserves. On the other hand, a slower destocking process would give farmers more time to adjust gradually to the new market environment and could spread and potentially weaken the severity of the price and production impacts.

Crucial in the policy maker's decision process about the amount of temporary support and period of destocking is the knowledge about the size and quality of the stored commodities. For producers and consumers in both domestic and international markets, transparency in the reporting of stock levels and stockholding policies is necessary to help them deal with the significant impacts they can face during the first years a new policy is implemented.

1. Introduction

The exact size of China's grain reserves is unknown, but the country's stocks are considered to be the largest worldwide. The USDA estimates that in 2018/19 China will hold almost 70% of global rice stocks, 67% of global maize stocks and 52% of global wheat stocks (USDA, 2019). The majority of China's reserves are thought to be owned by the government (public stocks), and the remainder are held by the industry or farmers (private stocks).

China's public stocks are mostly composed of domestically produced grains. China's public stockholding activities intensified considerably in the 2000s, following the introduction of support price programmes. Under these programmes, the Chinese government would buy maize, rice and wheat from farmers when market prices fell below minimum prices. The acquired commodities were then stored in a new type of public stock, called temporary reserves.

Total maize stock levels started to decline after 2016, when the price support program for maize was abolished and the government started to actively dispose of its public maize stocks, but these are still thought to be very large. The support prices for rice and wheat are still in place and total rice and wheat stocks are estimated to be currently at record levels. Consequently, questions are arising about how China is planning to reduce its grain stocks and how this would affect domestic and international markets.

This report examines what would be the medium-term market impacts if China were to eliminate its support prices for rice and wheat and reduce its public stocks. The probability of this happening has become higher in recent years due to several developments. First, China has already abolished the support price for maize (in 2016) and replaced it with area payments¹. One of the drivers behind this decision was the fiscal burden of managing the very large maize stocks (Yu, 2017).

Second, pilot programmes were introduced in 2018 in selected provinces where support prices for wheat and rice were replaced by more market-oriented mechanisms. For example, in Xinjiang province, the minimum support price system for wheat is being replaced by market price mechanisms and additional direct payments for farmers (Grain News, 2018a). In Guanzhong province, the "2018 Rice Target Price Subsidy Implementation Plan" sets a target price for rice and provides compensatory payments for farmers producing high-quality rice² (Grain News, 2018b).

Furthermore, China is facing international pressure to revise its price support policies. In September 2016, The United States initiated a WTO dispute wherein it claimed that China had exceeded its allowed level of support under the WTO Agreement for Agriculture for maize, rice and wheat during 2012-15 as a result of its price support policies. On 28 February 2019, the WTO dispute panel determined that China had indeed exceeded its limits for support for rice and wheat (WTO, 2019a). The panel did not make an assessment on maize since the support price for maize was abolished in 2016.

If China were to remove its support prices for rice and wheat, then this would most likely reduce the incentives to plant these crops and lead to reduced outputs. In the short term, a lower production of maize, rice and wheat would not necessarily lead to higher imports given that stocks are still abundant. However, once stocks are drawn down, it is possible that China would start importing more, which might result in the full utilisation of the tariff quota.

¹ China also abolished its price support for soybean, rapeseed and cotton.

² The May 2018 guidelines refer to procuring rice and wheat of certain quality: only grain of national grade 3 or higher will be purchased at minimum prices. Notwithstanding, in cases where there are large volumes of grain below grade 3 due to weather events or other reasons, provincial authorities are urged to pursue their own "temporary reserve" grain purchases.

In addition to these domestic adjustments that could raise import demand, China is also experiencing external pressure to increase its grain imports. Since their introduction in 2001, the tariff rate quotas (TRQs) for the three commodities have been consistently under-filled. Even in recent years, when the domestic prices of maize, rice and wheat were well above world prices, the TRQs remained under-filled. This motivated the United States to initiate a second WTO dispute in December 2016 concerning China's administration of its tariff rate quotas, including those for wheat, short- and medium-grain rice, long grain rice and maize. In its claim, the United States' argued that China's administration of its grains TRQs is inconsistent with its WTO obligations and restricts imports of wheat, rice and maize. On 18 April 2019, the WTO dispute panel determined that China was administering its TRQs in a manner inconsistent³ with its Accession Protocol obligations (WTO, 2019b).

To examine how the elimination of support prices for rice and wheat would affect domestic and international markets over the next ten years, this report uses the OECD-FAO Aglink-Cosimo model. Additional scenarios examine how these impacts would vary depending on whether China were to completely fill its TRQs for grains or even eliminate them.

Previous OECD research (Kimura, Gay and Yu, 2019) has examined the potential impacts of reforming China's domestic price support programmes for maize, wheat and rice. That analysis was carried out with two modelling tools: The OECD Policy Evaluation Model (PEM) and the OECD-FAO Aglink-Cosimo model. The PEM model can assess both the market and welfare effects of different policy reform scenarios, but does not incorporate stocks. Hence the analysis of the links between China's price support policy and its stock levels was performed with the Aglink-Cosimo model.

This report builds on the work in Kimura, Gay and Yu (2019) by providing a deeper analysis of the interaction between China's stock levels and its public stockholding policy. This extension is possible thanks to the newly developed framework that allows for a more complete modelling of rice stocks in Aglink-Cosimo (OECD, 2018). The new framework was further adjusted for this study and as a result the model now separates private from public stocks, distinguishes between China's temporary and central public stocks, and the approach covers maize and wheat, in addition to rice.

The report also takes into account the recent elimination of the maize support price policy. In Kimura, Gay and Yu (2019), the baseline assumed that the minimum support prices for maize, rice and wheat were still in place. This reports starts from a baseline where the maize support price has been eliminated and replaced by area payments. The already observed effects of the elimination of this program on the production and stock levels of maize are used to better model the potential impacts of removing the support prices for rice and wheat.

Furthermore, the report explores the global market impacts of price policy reforms by incorporating additional trade liberalisation scenarios wherein China fills its TRQs or alternatively eliminates its TRQs for wheat, rice and maize and instead applies a 1% MFN import tariff.

Crucial to the proposed scenarios are the starting stock levels in China. Yet data on Chinese reserves of grains are difficult to obtain. One of the main reasons is that the level of public central stocks is a state secret. Given China's prominent role in grain markets, all major grain organisations and governmental institutions publish estimates on China's total (public and private) stock levels. These estimates, however, can vary significantly among the different agencies as there are no official data on China's public central stock levels nor on private stocks. An additional complication is that estimates of China's supply balances, and implied stock changes, have been revised regularly and substantially over the last two decades. The

³ A summary of the key findings of the panel report, including an explanation of what the panel report determined to be "inconsistent" can be found on https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds517_e.htm#collapseA. An empirical analysis of China's grain TRQ administration can be found in Chen et al. (2019) "Tariff quota administration in China's grain markets: An empirical assessment", published online <https://onlinelibrary.wiley.com/doi/pdf/10.1111/agec.12549>.

most recent revisions are a result of the latest census, published in October 2018 by the National Bureau of Statistics (NBS) of China.

The actual levels of total stocks in China are thus unknown and estimates vary considerably among different sources. This report therefore does not select one specific source for the stock data. Instead, it considers the historic values from multiple sources and identifies the minimum and maximum reported levels of stocks. Consequently, the different scenarios are conducted under both the minimum and maximum stock levels, which provides bounds on the potential market impacts.

The remainder of this report is organised as follows. Section 2 provides background information on China's grain reserves, its support price policies, imports and TRQs. Section 3 describes the methodology and explains how the baseline is constructed. Section 4 presents the results of the scenario analysis. Section 5 summarises the results and concludes.

2. China's grain reserves, support prices and TRQs

2.1. China's grain reserves

Statistical information on stocks can be difficult to obtain. Given the importance of reliable and transparent data on stocks, one of the objectives of the Agricultural Market Information System (AMIS) initiative was to improve stock data. Some progress has been made since the inception of AMIS in 2011, but stock data are still – together with data on use – often the missing elements of a country's supply and demand balances.

This section reviews the main issues with data on China's grain reserves. It first describes the different types of stocks and then presents the latest revisions of China's stock data. The next section illustrates the discrepancies in reported data on China's stock levels among the major agencies. The final section explains how the analysis in this paper deals with these data issues in the scenarios.

2.1.1. The types of stocks

A distinction can be made between public stocks (owned by the government) and private stocks (owned by the industry or farmers). In China, there are three categories of public stocks (central stocks, temporary stocks and local stocks) and two types of private stocks (farmers' stocks and industry stocks).

Figure 2.1. Types of stocks in China

Public Stocks	Central stocks
	Temporary stocks
	Local stocks
Private stocks	Farmers' stocks
	Industry stocks

China's *central stock* is a long-standing strategic stock that serves a variety of purposes, including stabilising the grain market by adjusting the amount of grain supply and demand, and providing assistance during natural disasters and other emergencies. It is required that 20% to 30% of the grains in the central stock are rotated each year to guarantee the quality of the stock (State Administration of Grain et al., 2001; State Council, 2003). By law, the level of the central stock cannot be made public.

Temporary stocks are the type of public stock built with grains purchased under the “Minimum Purchasing Price” programme and the “Temporary Purchase and Storage Price” programme. Both programmes are price support schemes. The former programme was implemented in 2004 for rice and in 2006 for wheat and is still active for both crops in their major producing regions, while the latter program was applied to maize from 2008 until 2016, when the programme was officially terminated.

Local governments, under the overall control of the central government, can also store grains. The main purposes of these stocks are to stabilise the local grain market and prepare for natural disasters or other emergencies. *Local stocks* exist at three levels (provincial stock, city stock, and county stock) and each is managed by the corresponding level of government (Yang, 2014).

Farmers’ stock can be categorised into two parts: one part that is kept for a short term (maximum 3 months) and another part that is kept for a longer period (usually a year). The short-term stock is in general the larger of the two types and the stored grains are intended to be sold in the market. The grains in the long-term storage are mainly used for food, feed and seed (Hu, 2017).

Most of the *industry stocks* are stored by food-processing private enterprises and they typically are turnover stocks. To prevent enterprises from amplifying price movements by, for example, holding onto stocks and halting procurement when supply is high, private enterprises are subject to rules that determine how much grain they can keep. According to the “Grain Circulation Management Regulation”, they must maintain a certain amount of inventory and, when necessary, local governments can set a lower and upper bound for this inventory (State Council, 2004).

With the exception of some data on temporary stock, data on the other types of stock in China are difficult to obtain or not available at all. Published data on China’s total stock levels are the result of accounting exercises based on the demand and supply balance sheets (see Section 2.1.3).

2.1.2. The multiple revisions of China’s cereal stock data

Estimates of China’s total stocks have been subject to major revisions over the last two decades. In 2001, both FAO and USDA substantially increased their estimates for China’s cereals stocks. This revision was necessary because the significant drawdown in stocks would have led to negative stock numbers, meaning that the previous estimates for stocks were significantly underestimated. USDA raised its estimates of total grain stocks by 164 million tonnes, representing a 250% increase (USDA, 2001). The FAO/GIEWS revision resulted in a ten-fold upward adjustment in China’s cereal stocks (FAO, 2001).

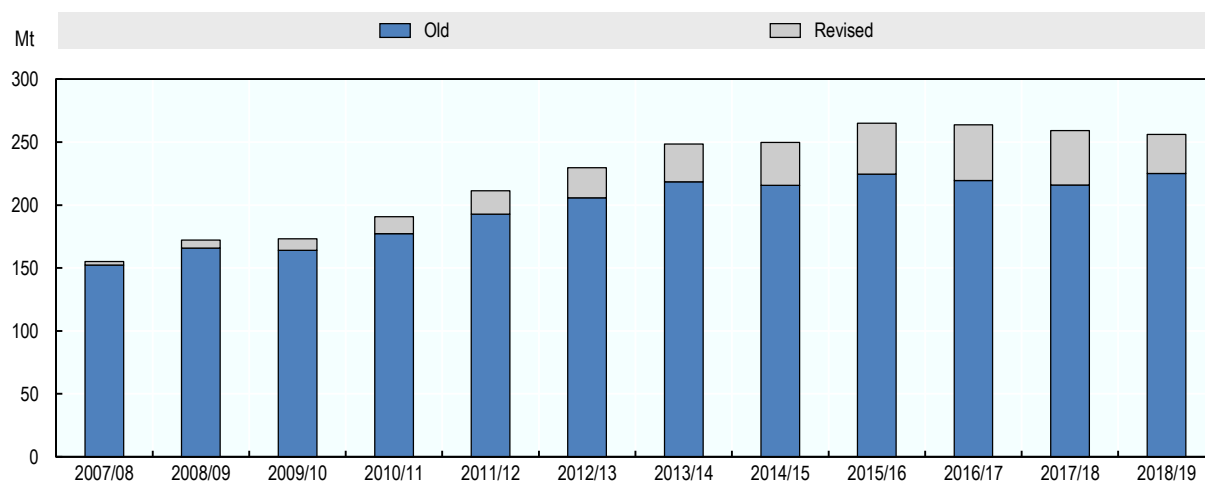
USDA revised its estimates of China’s stock again in July 2006, following new data from the China National Grain & Oils Information Center (USDA, July WASDE 2006). Rice stock estimates for 2006/07, for example, were increased from 18.8 million tonnes to 37.4 million tonnes. In January 2018, the International Grains Council (IGC) significantly revised its estimates of China’s maize stocks for 2017/18 from 76.2 million tonnes to 190.6 million tonnes (January 2018 Grain Market Report).

The most recent revisions are a result of the latest census, published in October 2018 by the National Bureau of Statistics (NBS) of China. These census results led to revisions of the country’s production, yield and area estimates for maize, rice and wheat⁴. The revisions extend back to 2007, when the last census took place. Whereas it is not unusual for countries to revise their production estimates, the extent of China’s latest production revisions is remarkable. For maize production alone, the accumulated revisions over the period 2007-17 amount to an additional 266 million tonnes. Under the revised estimates, maize output in 2017 was 259 million tonnes, which is 20% higher than the 216 million tonnes reported under the previous estimates (Figure 2.2). For maize, rice and wheat combined, the accumulated output revisions over the

⁴ The output revisions concerned all commodities, including livestock.

period 2007-17 amounted to 304 million tonnes, an amount larger than the European Union and Argentina's combined level of annual production in 2017/18 (AMIS, 2019).

Figure 2.2. China's revised maize production



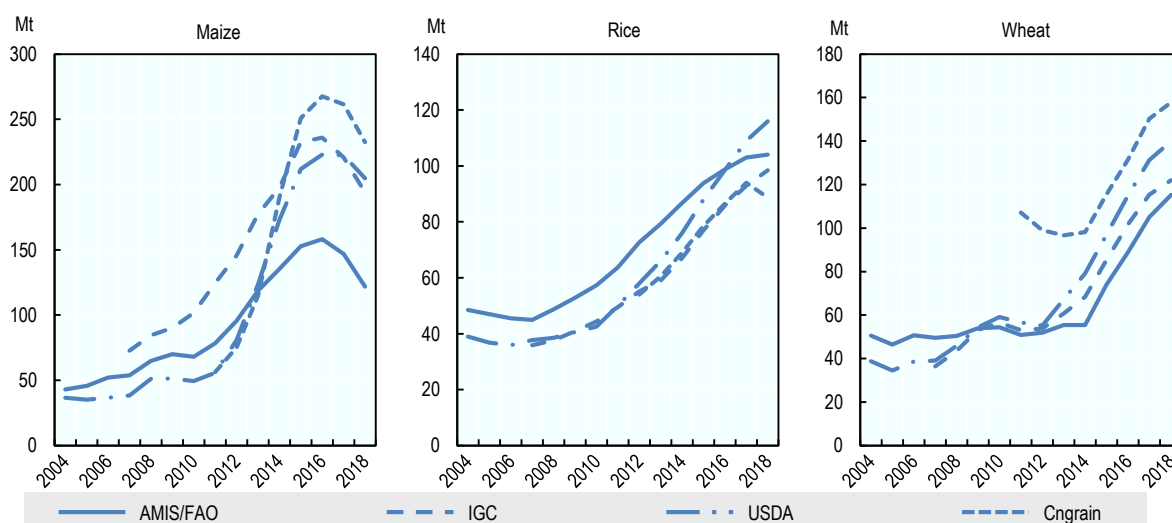
Source: NBS (2018).

The main challenge in making use of these revised estimates lies in deciding how to allocate the additional volumes to the various forms of utilisation (feed, food, industrial use, stocks and waste). The USDA, for example, has allocated most of the increase to stocks, while IGC and AMIS have allocated relatively more to feed use. Regardless of the relative adjustments to stock estimates between the different sources, in all cases the newly published revised estimates lead to upward revisions to China's total stock data.

2.1.3. Discrepancies in cereal stock levels for China among different agencies

The multiple and substantial revisions are indicative of the high level of uncertainty regarding China's cereal stock levels. This uncertainty is further reflected in the at times large discrepancies in total stock data among the major agencies that report on these, such as FAO/AMIS, IGC, USDA and Cngrain (Figure 2.3).

Figure 2.3. China's total maize, rice and wheat stocks according to different agencies, 2004-2018



Source: AMIS/FAO, IGC and USDA data are obtained from AMIS (2019), Cngrain data are obtained from Cngrain (2019).

The differences in reported levels of Chinese cereal stocks across major organisations are the result of a number of different factors. First, total stock data are the combination of public and private stock data. While only a few countries (e.g. Philippines and India) publish data on their public stocks, in China, data on public central stock levels cannot, by law, be made public. A second complicating factor is that there are no survey data on private stock levels. Given the absence of official data on public stocks, and of survey data on private stocks, Chinese total stock estimates are derived as a residual from the food balance or supply utilisation equilibrium. The food balance or supply utilisation equilibrium is represented by:

Figure 2.4. Food balance equation

$$\begin{array}{ccccccc} \text{Carry-in stocks +} & & & & & & \text{Food use +} \\ \text{Production +} & = & \text{Supply} & = & \text{Demand} & = & \text{Feed use +} \\ \text{Imports} & & & & & & \text{Industrial use, waste, losses and seed use +} \\ & & & & & & \text{Exports +} \\ & & & & & & \text{Carry-out stocks} \end{array}$$

The practice of estimating stock positions as a residual in the food balance of supply-utilisation equilibrium is not unique to China. In fact, this is the standard methodology applied in most countries. However, this methodology is sub-optimal as it uses incomplete information on several components in the balances, which results in potentially large errors on the stock change estimates. More specifically, whereas data on production, imports and exports are usually observed, data on uses are usually not known. This means that the equation above has two components which are unknown, namely stocks and use. Even if use data were available, this would mean that the above equation would only provide an idea of the change in stock and hence would need at least one observation on actual stock levels.

The best solution to deal with these data issues is to conduct surveys of the level of stocks, both public and private⁵. However, in the absence of such surveys for China at the present time, the only data available are those published by the different agencies.

2.1.4. How to incorporate data on Chinese grain stocks in the scenario analysis?

The most recent revisions of Chinese production data – especially for maize – were large in absolute terms. When making projections, the data for the starting point or base period are crucial, which requires reliable estimates.

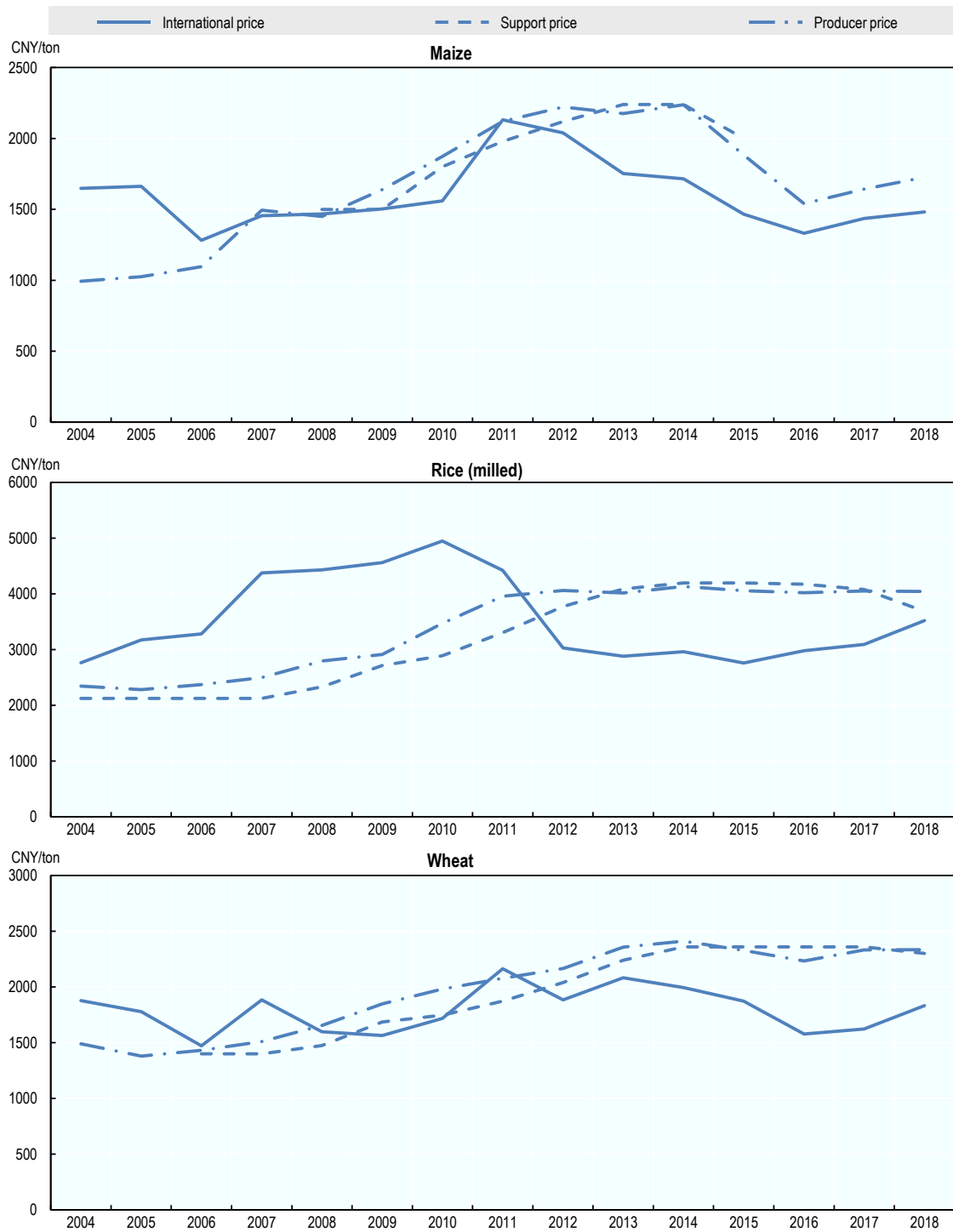
Given the uncertainty about the actual stock levels, with widely varying estimates across different sources, it does not make sense to select one source. Instead, the scenario analysis is conducted under both the minimum and maximum reported stock levels. This approach is also preferred to averaging the existing estimates, as it provides bounds on the potential market impacts.

2.2. China's support price policies

China's temporary stocks were created with the implementation of the "minimum purchase price" (MPP) policy in the major production areas for rice (since 2004) and for wheat (since 2006) and the "Temporary Purchase and Storage Price" (TPSP) programme for maize (from 2008 until 2016).

⁵ This was also the conclusion of the "Expert Workshop on Stock and Utilization Measurement in China", organised by CAAS and AMIS, on 6-7 July 2015.

Figure 2.5. Maize, rice and wheat producer and support prices for China and international prices, 2004-2018



Note: OECD uses margins to adjust observed international market prices to the corresponding implied producer prices at China's farm gate level.

Sources: Producer prices and international prices at farm level from OECD (2019); support prices from National Development and Reform Commission (2018).

The procurement price under the MPP programme is announced each year by the National Development and Reform Commission (NDRC) prior to sowing in order to help farmers with their production decisions. Local governments in the regions outside the major production areas can decide whether or not to implement the MPP. Originally, procurement was activated when the market price fell below the MPP. This policy changed in May 2018, when the conditions activating the MPP procurement changed with a new requirement that the market price be below the MPP for three consecutive days (Economic Daily, 2018). Conversely, the minimum price procurement must be suspended when the market price is above the MPP for three days.

The TPSP for maize was abolished in 2016. Contrary to the MPP, the TPSP was announced only during the harvest season. The TPSP for maize was increased each year from 2009 until 2013 and was lowered only in 2015, the last year of the policy's implementation.

Figure 2.5 shows the MPP for rice and wheat and the TPSP for maize and compares these support prices with their respective producer prices and international prices. The figure shows that the support prices worked as a floor price for producer prices. In addition, they have kept the producer prices above the international prices for all three commodities in recent years.

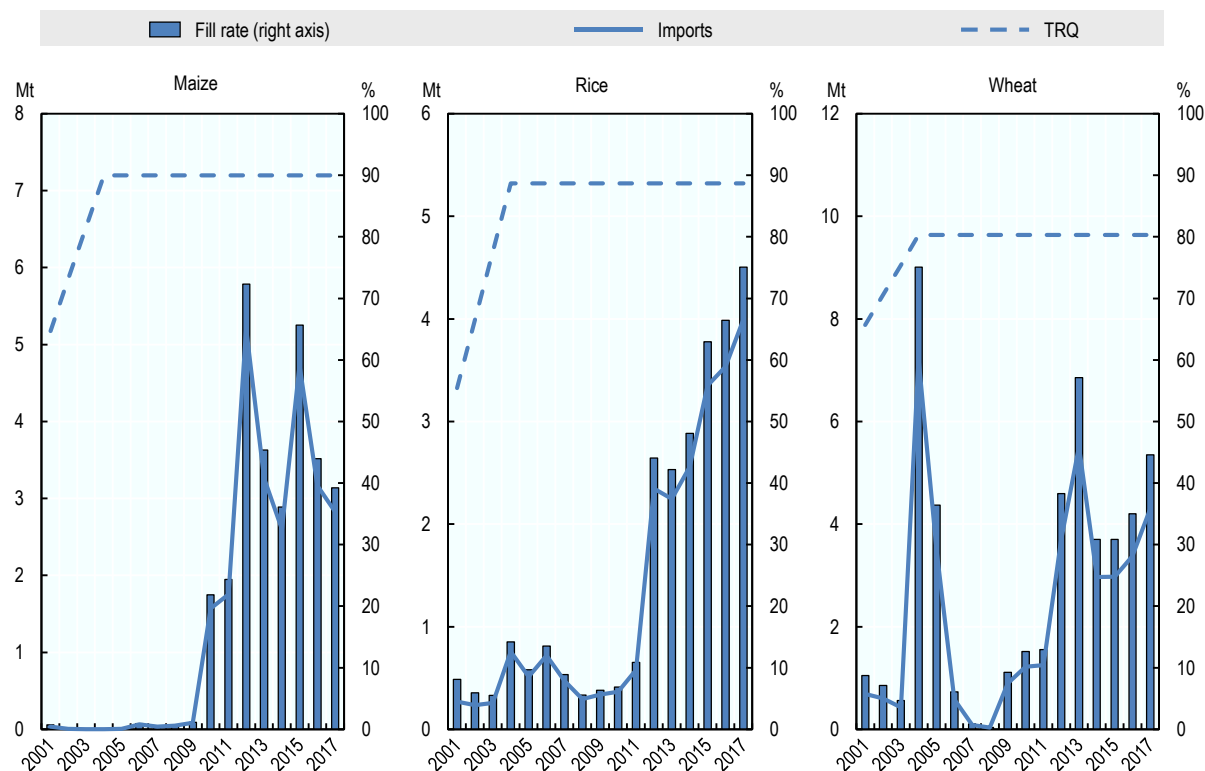
2.3. China's TRQs and grain imports

When China joined the WTO in 2001, it agreed to implement a Tariff Rate Quota (TRQ) system for maize, rice and wheat, with in-quota tariffs of 1% and out-of-quota tariffs of 65%. The initial TRQ levels set in 2001 were raised each year until they reached their final level in 2004. The final quota levels were 7.2 million tonnes for maize, 5.32 million tonnes for rice and 9.636 million tonnes for wheat. These TRQ levels have not changed since 2004.

Figure 2.6 shows the TRQ levels as well as the imported amounts of maize, rice and wheat since 2001. The figure also shows the quota fill rate, which is the total amount of imports divided by the total TRQ volume. For all three commodities the quota has never been filled, i.e. the fill rate was below 100%. For maize and wheat, the fill rate has been around 40% over the last few years, while the fill rate for rice has been increasing since 2013 and reached 75% in 2017.

China's role in global grain imports has become more important in recent years. As shown in the left panel of Figure 2.7, China was mainly a net-exporter of maize, rice and wheat until 2008 but became a net-importer for all three commodities from 2011 onwards. Whereas its share in global maize and wheat imports has averaged around 3% in recent years, China's role in global rice imports has increased considerably and it now accounts for more than 10% of global rice imports (right panel of Figure 2.7). The importance of imports for domestic consumption, however, is still rather low, with the share of imports in domestic consumption averaging at 1%, 4% and 3% for maize, rice and wheat, respectively, during the last five years.

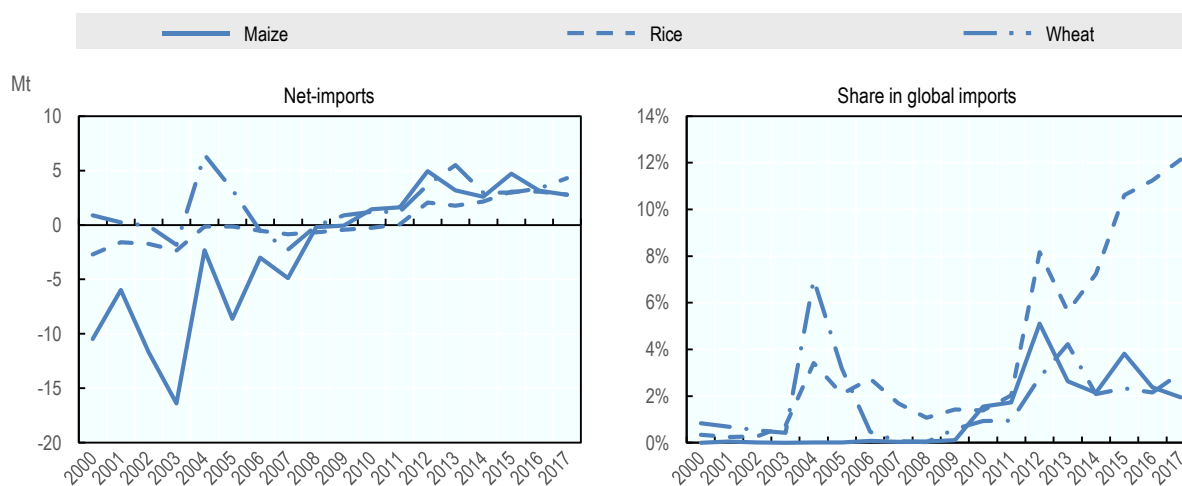
Figure 2.6. Maize, rice and wheat imports, TRQs and quota fill rates, 2001-2017



Note: The fill rate is calculated as the total amount of imports divided by the total TRQ volume.

Source: Imports from UN Comtrade (2019), TRQs from WTO (2019b).

Figure 2.7. China's net imports of maize, rice and wheat and its share in global imports, 2000-2017



Source: UN Comtrade (2019).

3. Methodology

3.1. Scenario description

This report uses scenario analysis to examine the medium-term impacts of changes in China's support price and import policies. The baseline for this study assumes that the current policy situation remains in place for the next ten years, namely that there are support prices for rice and wheat, area payments for maize, and under-filled TRQs for maize, rice and wheat. The scenarios assume that the support prices for rice and wheat and the area payments for maize are eliminated and replaced by non-commodity specific area payments⁶. The scenarios do not introduce other types of compensatory payments since the analysis of Kimura, Gay and Yu (2019) already compared the impacts of various alternative forms of support (see Box 3.1 for a summary).

In a first step, the scenarios assume that China keeps administering its TRQs for maize, rice and wheat as it has done until now, namely in a manner that inhibits the filling of each TRQ. These scenarios are called the "underfilled" scenarios⁷.

In a next step, the scenarios assume that China administers its TRQs in a manner that does not inhibit the filling of the TRQs. These scenarios allow for the full utilisation of the tariff quota or imports above the quota levels at the higher out-of-quota tariffs depending on the international and domestic grain price relationship ("filled" scenarios).

In a final step, the scenarios examine what would happen if China were to remove its TRQs for grains and keep the low in-quota tariff of 1% as the MFN tariff ("No TRQ" scenarios). At present, there are no indications that China is considering removing its TRQs. However, implementing these scenarios would give an idea of the potential international impacts of grain trade liberalisation in China coupled with the removal of support prices.

Table 3.1 summarises the baseline and the different sets of scenarios. All scenarios assume that support prices are eliminated and that there are only non-commodity specific area payments. The scenarios differ in their assumptions about China's import policies. As indicated above, given that there is a lot of uncertainty regarding the actual level of grain reserves in China, the baseline and each of the scenarios consider a minimum and maximum stock level version in order to provide bounds for the potential market impacts.

⁶ Non-commodity specific area payments were obtained following the methodology in Kimura, Gay and Yu (2019). More specifically, they are calculated by distributing the anticipated reduction in market revenues of farmers for the three crops across their harvested areas. For maize, the foregone revenues were based on USDA estimates, while for rice and wheat they were obtained assuming a 25% reduction of market price support.

⁷ These scenarios hence explicitly examine what would happen if China were not to comply with the ruling of the WTO panel.

Table 3.1. Definition of policy scenarios

	Support price policy and compensatory payments	TRQ	Stock
0. Baseline	Support prices for rice and wheat No support price for maize, area payments for maize	TRQs for maize, rice and wheat under-filled	Minimum stock level Maximum stock level
1. Underfilled" scenario	No support prices for maize, rice and wheat	TRQs for maize, rice and wheat under-filled	Minimum stock level Maximum stock level
2. Filled" scenario		TRQs for maize, rice and wheat filled	Minimum stock level Maximum stock level
3. "No TRQ" scenario	Non-commodity specific area payments	No TRQs for maize, rice and wheat, instead 1% MFN tariff	Minimum stock level Maximum stock level

Note: Underfilled TRQs refers to a situation where TRQs are administered in a manner that inhibits the filling of the TRQs. Filled TRQs refers to a situation where TRQs are administered in a manner that does not inhibit the filling of the TRQs

Box 3.1. China's grains policy: impacts of alternative reforms options

The report by Kimura, Gay and Yu (2019) assesses the impacts of recent reforms in grain policies and future reform options in China on multiple dimensions using two complementary agriculture sector modelling tools, PEM and Aglink-Cosimo.

Five policy reform scenarios for wheat, maize and rice are simulated. The reference scenario maintains price support policies as applied in 2015. The first scenario replaces price support with a commodity-specific area payment (reflecting recent policy developments), while the second scenario replaces price supports with non-commodity specific area payments, which have the potential to be rolled out more widely. The third scenario supposes that payments are linked to a historical, rather than current, area. The fourth scenario considers the implications of no area payments at all, while the fifth scenario introduces commodity-specific area payments accompanied by a period during which public stocks are released.

Removing domestic price support programmes leads to lower domestic grain prices and reduces domestic production. While the recent change in China's food security policy foresees a moderate level of imports, the simulation results show that China would maintain more than 80% of self-sufficiency in wheat and maize and more than 95% in rice. This result holds even in the third and fourth reform scenarios, which break the direct link between support payments and production by replacing price supports with a historical area payment (third scenario) and even without any payment (fourth scenario). On the other hand, the increase in China's grain imports could increase international prices for wheat and rice, by up to 5% in these scenarios. This would slightly offset the effects of removing price support on domestic production.

Replacing price support with area payments coupled with production (first, second and fifth scenarios) would allow China to maintain a self-sufficiency rate of more than 90%. The impact on the world market would be lower, at least temporarily, if China were to reduce the level of grain stocks in the course of policy reform (fifth scenario). A gradual approach to reforming market price support with compensatory payments smooths the potential impacts on domestic and world commodity markets and on domestic farm income.

3.2. Model selection

The scenario analysis is conducted with the OECD-FAO Aglink-Cosimo model. This model is a recursive-dynamic partial equilibrium model, which is used to simulate developments of annual market balances and prices for the main agricultural products consumed, produced and traded worldwide.

For the OECD report on the *Economic Effects of Public Stockholding Policies for Rice in Asia* (OECD, 2018), adjustments were made to Aglink-Cosimo in order to better model rice stocks and public stockholding policies. As a result of these changes, the model now features a version that incorporates the different procurement and distribution channels of public stocks, separates private from public stocks, and includes stocks norms, procurement prices and subsidised prices.

The current analysis is based on this newly developed framework and makes several further adjustments to reflect the specifics of this study. More specifically, the model was extended to incorporate maize and wheat stock equations, and a distinction between temporary and central public stocks was introduced, while the explicit modelling of the procurement and distribution channels was dropped. Annex A describes in detail the changes that were made to Aglink-Cosimo for the current study.

3.3. Assumptions for the baseline projections

The baseline in this study is based on the 2019 version of the OECD-FAO Aglink-Cosimo model. It assumes that the macroeconomic conditions and the policies that were in effect in China during the base year 2018 will be maintained over the projection period 2019-2030. In terms of support prices, the baseline assumes that the support prices for rice and wheat will remain constant in nominal terms over the next decade, maintaining their 2018 levels. This in turn means that support is assumed to decrease in real terms. For maize, the baseline assumes that during the projection period the area payments for maize will remain constant at their 2018 levels and that the support price for maize will remain abolished.

Figure 3.1 illustrates how stock levels for maize, rice and wheat are modelled under the baseline. As mentioned in Section 2.1.1, China's public stocks are composed of temporary, central, and local stocks. The temporary public stocks are built with grains purchased under the price support schemes. These support prices were introduced in 2004 (for rice), 2006 (for wheat) and 2008 (for maize); and the price support for maize was eliminated in 2016. Some information on temporary stock levels, procurement and release volumes and prices has been published, but data on central and local stock levels are not available. This study makes no distinction between the central and local stocks and assumes that local stock is part of the central public stock. Private stocks in China are not surveyed.

To obtain the breakdown into public and private stock levels as displayed in Figure 3.1, several assumptions were made that vary according to three distinct periods. The first period is the period before the introduction of the price support schemes, the second period starts with the introduction of the price support schemes and ends in 2018, and the third period is the projection period 2019-2030. Since the price support schemes were introduced in different years for rice, wheat and maize, the first and second periods differ for the three commodities.

In the period before the introduction of the price support schemes, there are only two types of stocks: private stocks and central public stocks. Since the central stock is a rotation stock, it is assumed that it remains constant over time at around 20% of food consumption for wheat and for rice. In the case of maize, the central stock is assumed to be around 25% of total consumption, given that a large share of maize is used for feed and biofuels. The private stock is calculated as the residual from the total stock level.

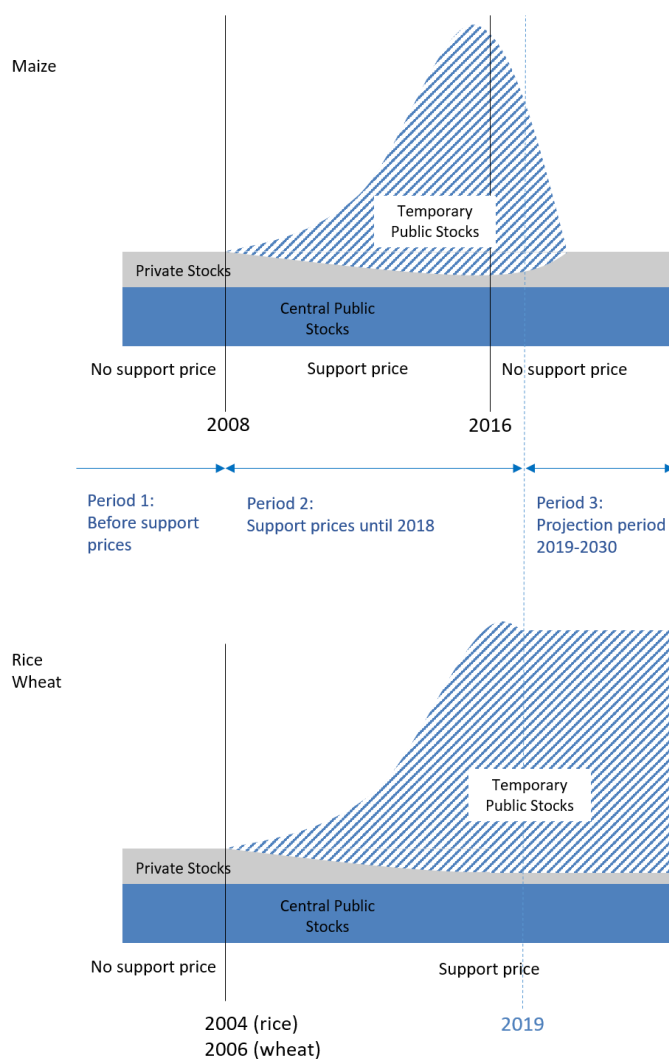
In the second period, which starts with the introduction of the price support schemes and ends in 2018, there are three categories: private stocks, central public stocks and temporary public stocks. During this period, the level of public stocks increases significantly, while private stocks are assumed to decrease because of the crowding out effect. The central public stocks are assumed to remain stable compared to

the period when there were no support prices, and the temporary stocks are calculated as the residual. Therefore the majority of the increase in total (and public stocks) is driven by the expansion of the temporary stocks. Additionally, in the case of maize, the decrease in total stocks from 2016 onwards is the result of the abolition of the price support program and the destocking of the temporary reserves.

For the projection period, the study assumes that all types of stocks for rice and wheat will remain at levels similar to their 2018 levels. For maize, the destocking process of the temporary reserves is assumed to be finalised during the first years of the projection period, after which total stock levels will stabilise.

To examine the importance of stock level assumptions in the baseline, two baselines are developed for this study. The first one assumes a maximum stock level (*max baseline*) and the second one a minimum stock level (*min baseline*). These two levels were obtained by comparing the maximum and minimum reported total stock levels by the different agencies (see also Figure 2.3). The max and min baselines also distinguish between the different types of stocks as shown in Figure 3.1. Under the max baseline, the central public stock, private stock and temporary public stock are all assumed to be larger than under the min baseline and they are obtained as described in the paragraphs above.

Figure 3.1. Evolution of maize, rice and wheat stocks under the baseline



The min baseline and the max baseline not only reflect the different stock level assumptions, but also differ in their historic and projected production and consumption levels. More specifically, the lower stock levels under the min baseline are assumed to be associated with relatively lower production and consumption levels. To develop the min and max baselines, two different references were used. The min baseline is based on the 2018 Agricultural Outlook baseline, which had relatively lower production and consumption levels than the 2019 Agricultural Outlook baseline. This latter baseline takes into consideration the upward revision of the production and consumption figures in light of the agricultural census of 2018. This also explains why public central stocks are higher under the max baseline compared to the min baseline, since public central stocks are calculated as a share of consumption, i.e. the relatively higher consumption values under the max baseline result in higher central stocks.

Imports of rice and wheat are projected to remain at their 2018 levels for the next decade. Given that the TRQs are assumed to remain in place under the baseline, this will translate into stable quota fill rates as well. Maize imports are projected to decline in the early years of the projection period, because the final stages of destocking of the temporary maize stocks will lead to a high availability of maize in the domestic market which will reduce the demand for maize imports. However, once the temporary maize stocks are depleted, maize imports are projected to return to levels similar to the 2017-18 average.

3.4. Limitations of the model and data

As indicated in Section 2, revisions of Chinese agricultural data can be quite substantial. By developing two baselines, which respectively incorporate maximum and minimum stock levels and higher and lower production and consumption levels, this study addresses potential biases that can be the result of over- or underestimated agricultural data. The data and model, however, still have some limitations that have to be taken into consideration when analysing the results. First, Aglink-Cosimo does not distinguish between different varieties of maize, rice or wheat but uses one aggregate number for each commodity. Second, the parameters in the new model equations are not based on estimates, but are obtained from the literature and using plausibility considerations. Third, given the annual nature of the model, it is not possible to do perform any inter-annual analysis. Fourth, the analysis is based on the 2019 version of Aglink-Cosimo, which uses 2018 as the base year. This implies that changes that occurred to China's markets or policies in 2019, such as for example the increasing impact of African swine fever on maize and the feed market, are not incorporated in the baseline.

4. Results

This study examines the impact of removing the support prices for rice and wheat in China by comparing the baseline, which assumes support prices for rice and wheat remain in place over the next decade, with several scenarios that assume support prices for rice and wheat are eliminated and their stocks significantly reduced.

The scenarios vary in their assumptions regarding China's TRQ regime (see also Table 3.1). Under the baseline and the "underfilled" scenarios, China is assumed to keep administering its TRQs as it did until 2018, namely in a manner that inhibits the filling of the TRQs⁸. Under the "filled" scenarios, China is assumed to administer its TRQs in a manner that does not inhibit the filling of the TRQs. These scenarios allow for the full utilisation of the tariff quota or imports above the quota levels at the higher out-of-quota tariffs, depending on the relationship between the international and domestic grain prices. Under the "no TRQ" scenarios, China is assumed to abolish its TRQs and only implement a 1% MFN tariff.

⁸ Annex A explains how this was implemented in Aglink-Cosimo.

The baseline and three sets of scenarios are all conducted under two stock level assumptions: a minimum and maximum stock level assumption. As explained in the previous section, the baselines under the minimum and maximum stock level assumptions also differ in their production and consumption levels, which is reflected in the scenarios as well. For simplicity reasons, the two stock level assumptions will be referred to as “min” and “max”.

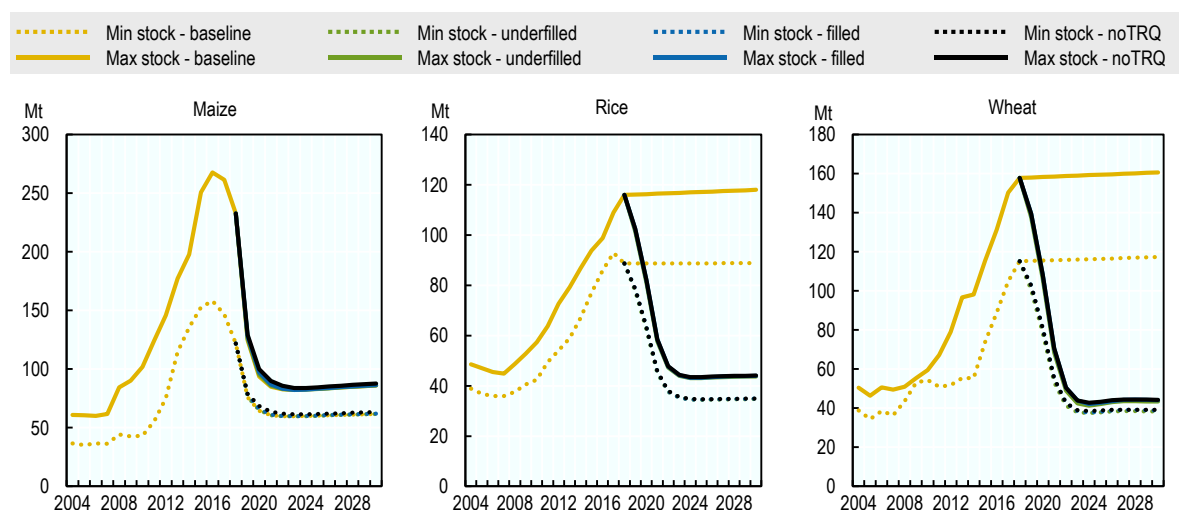
This section describes the impact of the different scenarios on stocks, imports, domestic prices, production, consumption and international prices of the three commodities. These impacts are illustrated with figures in the subsequent sub-sections. The final sub-section presents a table that summarizes the results of the analysis.

4.1. Impact on stocks

Figure 4.1 shows the evolution of total stock levels under the min and max baseline as well as under the scenarios for the three commodities. For maize, the total stock levels under the baseline and the scenarios are very similar since China abolished the support price for maize in 2016 and started destocking from then onwards.

In the case of rice and wheat, the total stock levels under the scenarios differ significantly from those under the baseline. More specifically, under the baseline, the stock levels are assumed to remain similar to their 2018 levels over the projection period, while under the scenarios total stocks are assumed to start declining in 2019 and after several years reach levels similar to before the introduction of the support prices. That is, the temporary public stocks that were built exclusively with rice and wheat purchased at support prices are completely depleted following the elimination of the support prices.

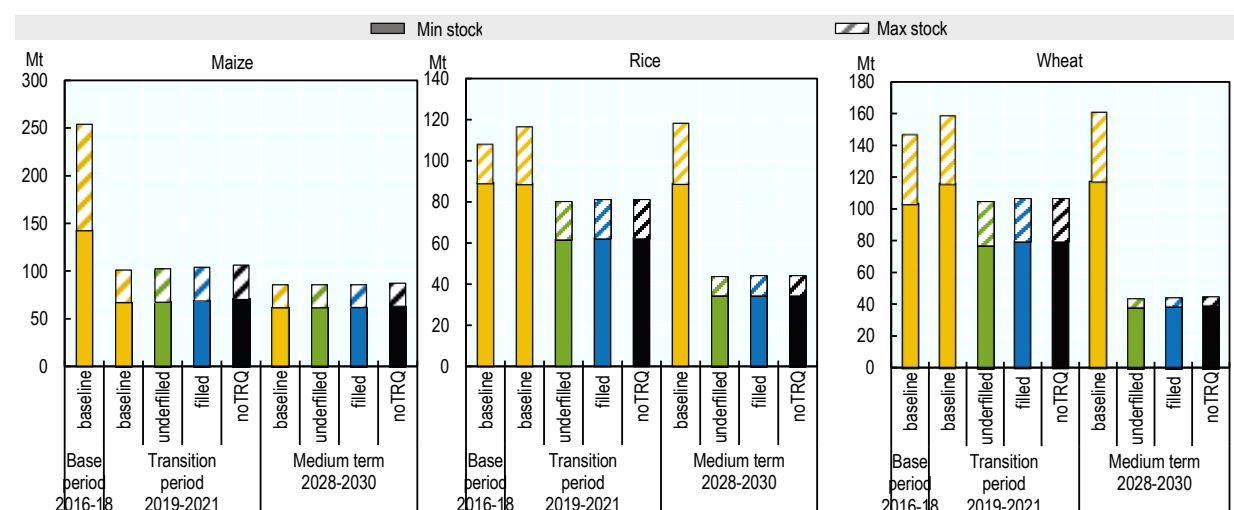
Figure 4.1. Maize, rice and wheat stock levels under baseline and scenarios, 2004-2030



Notes: "Min stock" and "Max stock" refer to the minimum and maximum stock level assumptions, respectively. "underfilled" refers to the scenarios that assume the TRQs are administered in a manner that inhibits the filling of the TRQs. "filled" refers to the scenarios that assume the TRQs are administered in a manner that does not inhibit the filling of the TRQs. "no TRQ" refers to the scenarios that assume that grain TRQs are abolished and instead a 1% MFN is applied.

Source: OECD simulations.

Figure 4.2. Maize, rice and wheat average stock levels under baseline and scenarios during the base period, transition period and medium term



Notes: "Min stock" and "Max stock" refer to the minimum and maximum stock level assumptions, respectively. "underfilled" refers to the scenarios that assume the TRQs are administered in a manner that inhibits the filling of the TRQs. "filled" refers to the scenarios that assume the TRQs are administered in a manner that does not inhibit the filling of the TRQs. "no TRQ" refers to the scenarios that assume that grain TRQs are abolished and instead a 1% MFN is applied.

Source: OECD simulations.

Figure 4.1 illustrates how total stocks evolve over time and highlights the differences between the min and max stock level assumptions and the difference between the baseline and the scenarios. Since it is difficult to distinguish between the different scenarios, Figure 4.2 represents the same information for three specific periods. In the remainder of this section, most of the results will be presented in the three period format to better illustrate the differences between the scenarios. The three periods show three-year averages for the base period (2016-18), the transition period (2019-21), and the medium term (2028-2030). The base period is only relevant for the baseline since the scenarios are modelled to start in 2019, the beginning of the projection period. The transition period reflects the period of destocking and the medium term presents the average values at the end of the projection period, thereby providing an idea of the medium term effects.

4.2. Impact on imports

If China were to remove its support prices for rice and wheat, then producers would have lower incentives to grow these crops. A reduction in production could in turn lead to a higher demand for imports. China's imports are currently limited through its TRQs, which are 7.2 million tonnes for maize, 5.32 million tonnes for rice and 9.636 million tonnes for wheat. Since the introduction of the TRQs, China has underfilled its import quotas with fill rates of around 40% for maize and wheat during the last years, and 75% for rice in 2017.

Since China is such a large producer and consumer of maize, rice and wheat, a change in domestic policies could affect international markets, and these impacts would be even more pronounced if China were to allow more imports. To quantify the potential impacts, the scenarios in this study were designed to examine what would happen under different import regimes.

Figure 4.3 shows how imports would evolve under the baseline and scenarios. In the case of maize, the baseline and the “underfilled” scenarios display similar trends since they both already incorporate the elimination of the support price and assume that the TRQ remains underfilled. During the first year of the transition period, China still offloads large amounts of its temporary public stocks of maize and this increase in availability in domestic markets brings down the demand for maize imports. Once the temporary maize stocks are depleted, demand for imports is projected to increase. Under the baseline, import levels are projected to return close to their 2018 levels over the medium term. Imports under the “underfilled” scenario will remain below the baseline because the domestic prices of maize as well as of rice and wheat are lower under the “underfilled” scenario compared to the baseline (see below), which lowers the demand for maize imports vis-à-vis the baseline.

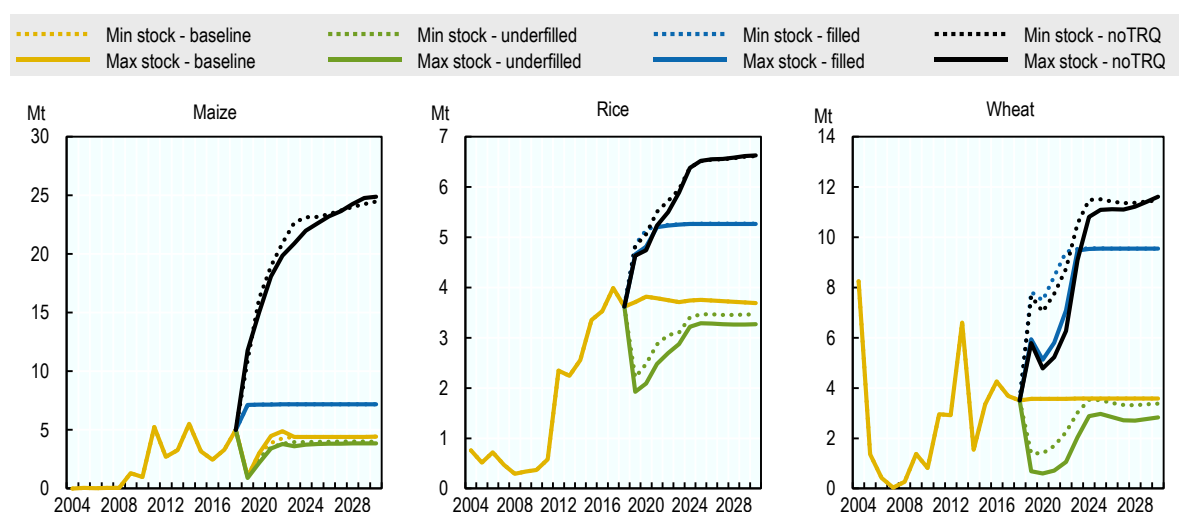
Maize imports under the “filled” and “no TRQ” scenarios will increase already during the transition period, because even though domestic prices fall, the relationship between the domestic and international prices will be such that it remains advantageous to import. Under the “filled” scenario, imports are projected to reach the TRQ level in 2019 and stabilise at this level for the entire projection period. The “no TRQ” scenario illustrates the potential jump in imports if China were to liberalize completely. Imports under the “no TRQ” scenario are projected to reach over 24 million tonnes by the end of the projection period, which is more than five times the level of imports under the baseline.

Rice and wheat imports are projected to demonstrate similar developments for the baseline and scenarios. Under the baseline, imports are projected to remain relatively constant from 2018 onwards. Under the scenarios, imports during the transition period will be affected by the removal of support prices and the associated destocking, which will lead to an oversupply in the domestic market of rice and wheat. Under the “underfilled” scenario, this oversupply will lower imports during the transition period since this scenario assumes that China keeps processes in place that inhibit the filling of its TRQs. Under the “filled” and “no TRQ” scenarios, this oversupply will also affect imports, but the international and domestic price relationship will be such that it is advantageous to increase imports. Therefore, under the “filled” and “no TRQ” scenarios, imports will increase during the transition period, but the increase will be limited by the oversupply in domestic markets.

Towards the end of the transition period, growth in rice imports is projected to slow down while wheat imports are even projected to decline under the “filled” and “no TRQ” scenarios. This is due to the assumption that the destocking process will be the strongest in absolute terms at the end of the transition period⁹. During that period, the temporary stocks will be completely depleted and large amounts of rice and wheat will end up in the domestic market. Furthermore, during this period the projected rice and wheat imports under the “filled” scenario will exceed those under the “no TRQ” scenario because of the huge jump in maize imports under the “no TRQ” scenario which reduces the import demand for rice and wheat.

⁹ In recent years, the National Grain Trade Center has published the weekly or monthly auction records for temporary stocks. The records detail the production year, date of auction, the amount put up for auction, the amount actually sold and the price at which it was sold. Records of the auctioning process of temporary stock show that during most auctions, only a share of the amount that was put up for auction was actually sold. Since these commodities will deteriorate if they are stored too long, the assumption is that towards the end of the transition or destocking process, relatively larger quantities will have to be released.

Figure 4.3. Maize, rice and wheat imports under baseline and scenarios, 2004-2030



Notes: "Min stock" and "Max stock" refer to the minimum and maximum stock level assumptions, respectively. "underfilled" refers to the scenarios that assume the TRQs are administered in a manner that inhibits the filling of the TRQs. "filled" refers to the scenarios that assume the TRQs are administered in a manner that does not inhibit the filling of the TRQs. "no TRQ" refers to the scenarios that assume that grain TRQs are abolished and instead a 1% MFN is applied.

Source: OECD simulations.

Over the medium term, rice and wheat imports under the "underfilled" scenarios will stabilise at levels below the baseline. The relatively lower imports under the "underfilled" scenarios compared to the baseline are due to the lower domestic prices for rice and wheat under the "underfilled" scenarios vis-à-vis the baseline. Rice and wheat imports under the "filled" scenarios are expected to stabilise at their respective TRQ levels over the medium term. In the absence of TRQs, rice and wheat imports are projected to be, respectively, two and three times higher than the baseline levels by 2030.

The actual level of stocks affects rice and wheat import levels mainly during the transition period. The lower imports under the max scenarios compared to the min scenarios is due to the fact that more rice and wheat can be released from the relatively larger stocks.

The impact of the "no TRQ" scenarios can be put into global perspective by comparing China's share in global imports under the baseline and the "no TRQ" scenarios by 2030. China's share in global imports by 2030 under the baseline is projected to be 2% for maize, 6% for rice and 2% for wheat. Under the "no TRQ" scenario, these shares increase to 12% for maize, 10% for rice and 5% for wheat.

4.3. Impact on domestic prices

The baseline assumes that the support prices for rice and wheat will remain constant in nominal terms over the projection period. As a result, producer prices for rice and wheat are projected to remain at levels close to these support prices, which will act as a floor price – just as they did in recent years (see Section 2). In the case of maize, the abolition of the support price in 2016 led to a large drop in domestic producer prices, as illustrated in Figure 4.4. The scenarios for rice and wheat show that similarly large declines in domestic producer prices are projected following the modelled elimination of support prices in 2018. Consumer prices will demonstrate similar developments as the producer prices since both prices are projected to follow parallel trends over the projection period.

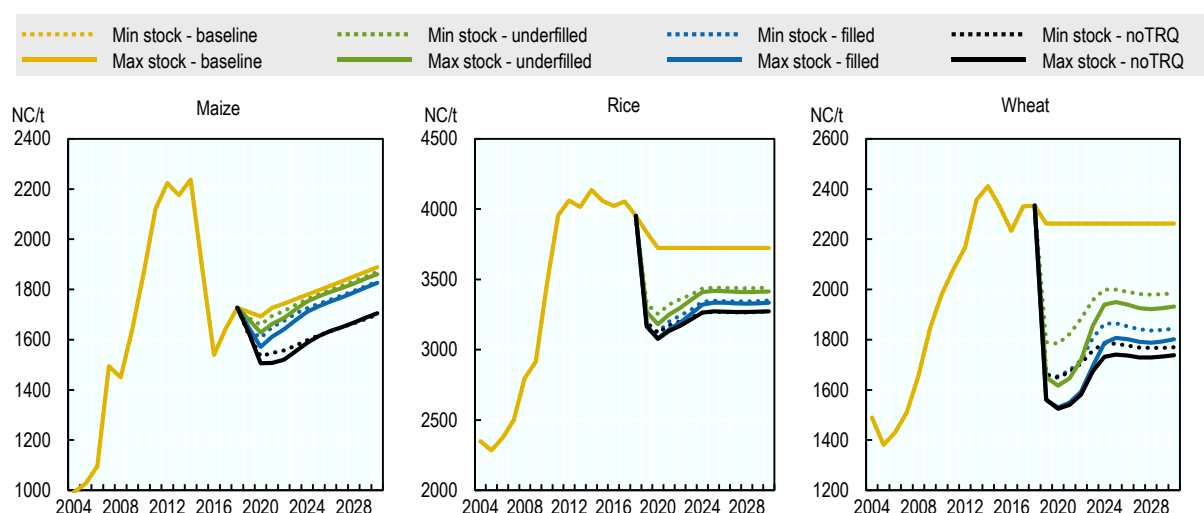
Producer prices for maize are slightly lower under the "underfilled" scenario compared to the baseline, even though both scenarios incorporate the previously eliminated support price for maize and assume the

same fill rates of the TRQs. The difference between the two is a result of cross price effects. That is, under the scenarios, the support prices for rice and wheat are eliminated, which brings down prices of rice and wheat. The lower prices for substitutes will hence exert a downward pressure on maize prices. Maize producer prices under the “filled” and “no TRQ” scenarios are even lower and reflect the different import regimes, with domestic prices falling significantly under the “no TRQ” scenario as a result of higher maize imports.

For rice and wheat, the baseline already incorporates the lower support prices in 2019, which in turn lowered producer prices in 2019. For the remainder of the projection period, the support prices for rice and wheat are assumed to remain constant under the baseline, which translates into a constant producer price. Under the scenarios, domestic prices of rice and wheat drop significantly during the transition period as a result of the destocking of temporary stocks, which floods the market with abundant amounts of rice and wheat. During this transition period, domestic prices will be relatively higher under the “underfilled” scenario than under the “filled” and the “no TRQ” scenarios because under the former scenario imports will be lower than under the latter two scenarios (see above). Once the temporary stocks are depleted, imports pick up and the effect on domestic prices becomes more apparent. Over the medium term, prices under the scenarios will remain below the baseline and the difference with prices under the baseline is more pronounced as more imports are allowed.

The price projections are slightly higher under the min stock level assumptions than under the max stock level assumptions, for all scenarios. This is especially the case during the transition period because then higher quantities of stocks are pushed onto the market under the max stock level assumption. Over the medium term, the difference between the max and min becomes smaller. The relative difference between the min and max scenarios is more pronounced for domestic prices of wheat because the difference between the min and max stock level is also relatively larger for wheat than for rice.

Figure 4.4. Maize, rice and wheat domestic producer prices under baseline and scenarios, 2004-2030



Notes: NC/t stands for National Currency per tonne. "Min stock" and "Max stock" refer to the minimum and maximum stock level assumptions, respectively. "underfilled" refers to the scenarios that assume the TRQs are administered in a manner that inhibits the filling of the TRQs. "filled" refers to the scenarios that assume the TRQs are administered in a manner that does not inhibit the filling of the TRQs. "no TRQ" refers to the scenarios that assume that grain TRQs are abolished and instead a 1% MFN is applied.

Source: OECD simulations.

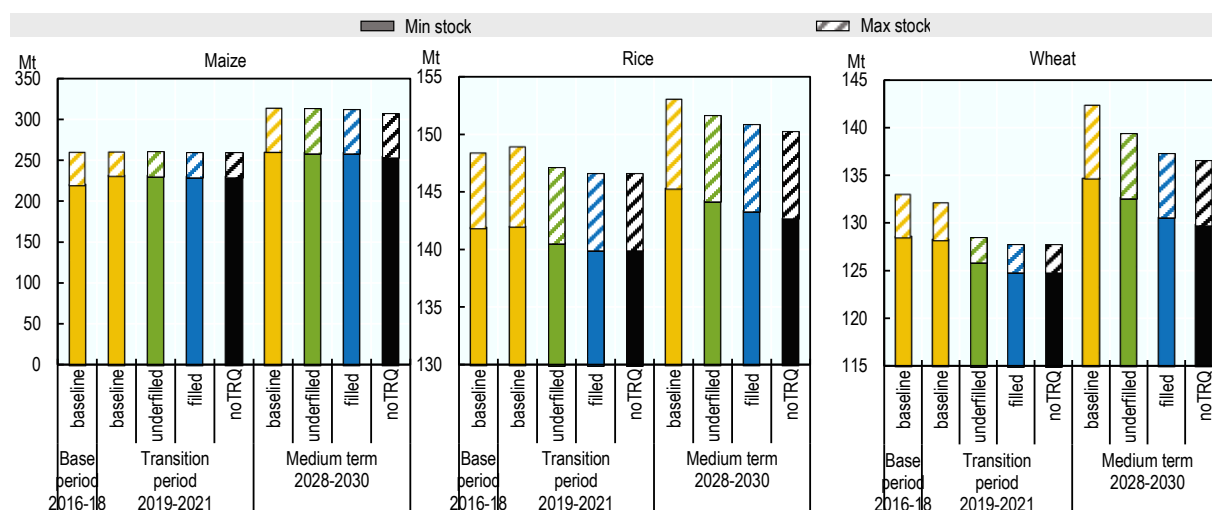
4.4. Impact on production

As noted above, when the support price for a crop is eliminated, farmers' incentives to plant the crop are reduced and this then leads to a reduction in production. The introduction of non-commodity specific area payments partly compensates this effect, but the scenarios still assume a drop in production. This assumption is based on what happened in the case of maize, where the support price was replaced by area payments in 2016 and production went down in the following years. Since the production response for maize already occurred during the base period, maize production during the transition period is comparable between the baseline and the scenarios. Over the medium term, maize output is projected to be slightly lower under the scenarios than the baseline because of the cross-price effects of rice and wheat, both of which become cheaper in the medium term. In addition, the higher imports under the "filled" and "no TRQ" scenarios further dampen production (Figure 4.5).

Rice and wheat production mirror their domestic price evolution. That is, production is lower under the scenarios than under the baseline during the transition period because supply is large and prices are low due to the destocking. The production decline is relatively stronger under the "filled" and "no TRQ" scenarios because under these scenarios imports increase during the transition period. Production picks up in the following years, but the impact of the import policies is clearly reflected in the projected output for the three scenarios. More specifically, over the medium term, production is projected to be higher under the "underfilled" scenario, followed by the "filled" and the lowest production response is expected under the "no TRQ" scenario.

In Figure 4.5 the axes do not intersect at the zero production level for rice and wheat in order to clearly demonstrate the differences between the scenarios and the min and max assumptions. For all three commodities, production is higher under the max than under the min stock level assumptions because in order to build and maintain larger stocks more output is needed. This is also reflected in the baseline, which – as mentioned in Section 3 – assumes higher production and consumption under the max than under the min stock level assumption.

Figure 4.5. Maize, rice and wheat average production under baseline and scenarios during the base period, transition period and medium term



Notes: "Min stock" and "Max stock" refer to the minimum and maximum stock level assumptions, respectively. "underfilled" refers to the scenarios that assume the TRQs are administered in a manner that inhibits the filling of the TRQs. "filled" refers to the scenarios that assume the TRQs are administered in a manner that does not inhibit the filling of the TRQs. "no TRQ" refers to the scenarios that assume that grain TRQs are abolished and instead a 1% MFN is applied.

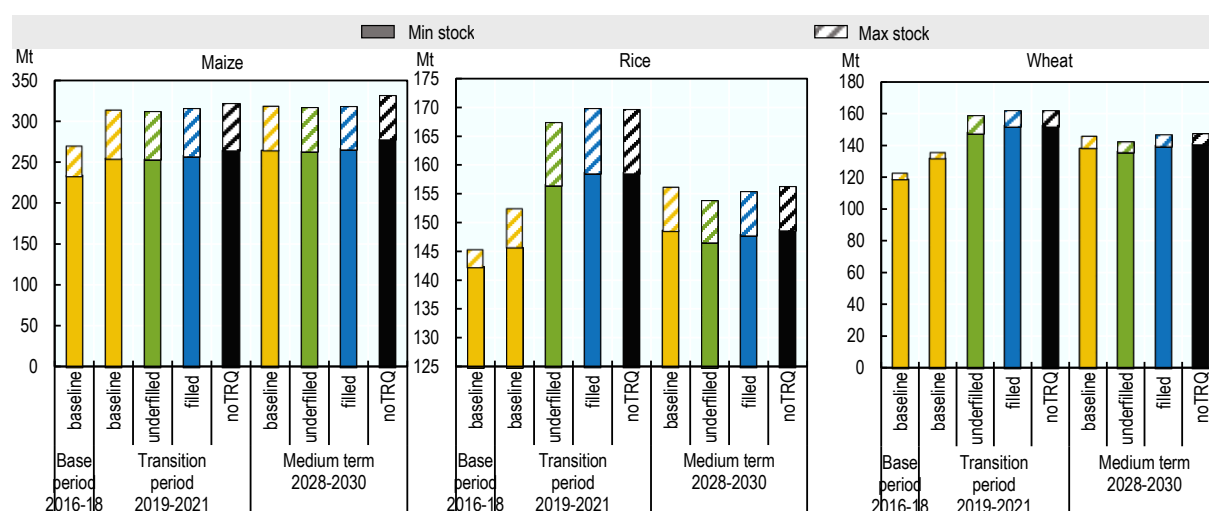
Source: OECD simulations.

4.5. Impact on consumption

Removing price support and allowing more imports affects the availability of a commodity. In Aglink-Cosimo, the term consumption is used to refer to all types of uses in the domestic market; it combines food use, feed use, industrial use, waste and stock losses. Total consumption of maize does not vary considerably between the baseline and the different scenarios. The largest impact on maize consumption is projected to occur over the medium term under the “No TRQ” scenario, where the higher imports will lead to increased consumption.

Rice and wheat consumption are expected to demonstrate similar trends under the scenarios. The effects for rice seem more pronounced than for wheat in Figure 4.6, but this is mostly due to a scaling issue, which was adjusted for rice in order to better illustrate the differences between the scenarios. Under the baseline, rice and wheat consumption are expected to increase steadily for the next ten years, with consumption levels higher under the max than under the min baseline. Under the scenarios, rice and wheat consumption are projected to peak during the transition period due to the destocking effect, which leads to more rice and wheat in the market. Consumption is higher under the “filled” and “no TRQ” scenarios than under the “underfilled” scenario because under the former two scenarios imports increase during the transition period, leading to lower consumer prices which stimulates additional demand.

Figure 4.6. Maize, rice and wheat average consumption under baseline and scenarios during the base period, transition period and medium term



Notes: "Min stock" and "Max stock" refer to the minimum and maximum stock level assumptions, respectively. "underfilled" refers to the scenarios that assume the TRQs are administered in a manner that inhibits the filling of the TRQs. "filled" refers to the scenarios that assume the TRQs are administered in a manner that does not inhibit the filling of the TRQs. "no TRQ" refers to the scenarios that assume that grain TRQs are abolished and instead a 1% MFN is applied.

Source: OECD simulations.

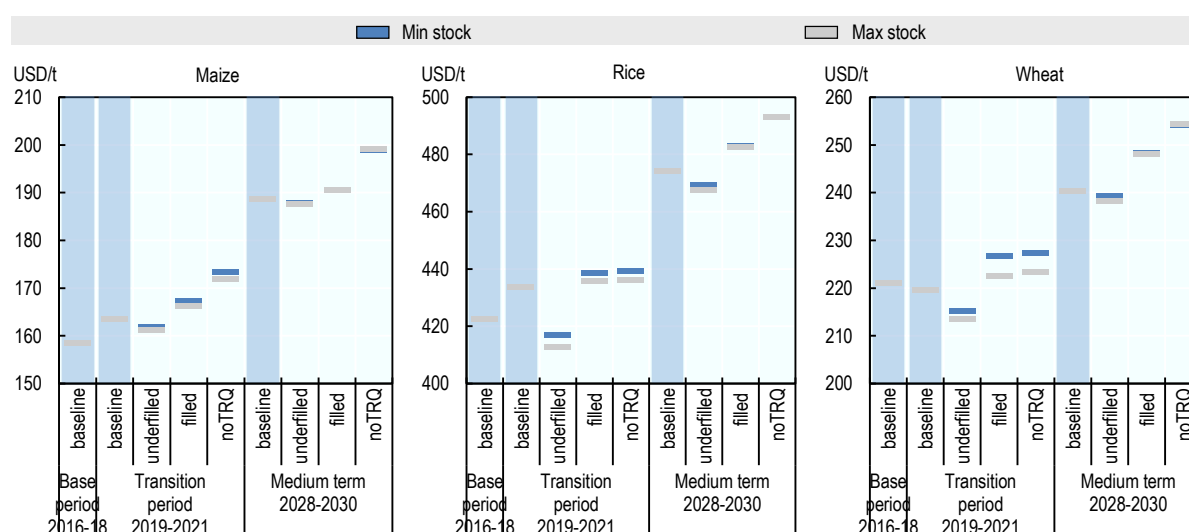
Over the medium term, rice and wheat consumption under the scenarios are expected to approach baseline levels. In the case of the “underfilled” scenario, total consumption will be lower than under the baseline because stock losses – which are calculated as a share of total stocks – are relatively higher¹⁰. As is the case with maize, consumption of rice and wheat will be largest in the medium term under the “no TRQ” scenario because of the higher imports.

4.6. Impact on international prices

China’s imports of maize, rice and wheat are currently restricted by its TRQs, which have traditionally been underfilled. If China were to increase its imports, as projected under the “filled” and “no TRQ” scenarios, then international prices would be affected. The scenarios also assume that support prices for rice and wheat are removed and that the stocks of these commodities are actively reduced during the period 2019–2021. As shown in Section 4.2, these assumptions also affect imports and hence international prices.

Figure 4.7 shows how international prices are projected to evolve under the baseline and the different scenarios for the three commodities. The blue lines indicate average prices under the min stock level assumption and the grey lines under the max stock level assumption. The axes do not intersect at zero to better show the differences in prices. Under the baseline, world cereal prices are projected to fall in real terms but increase nominally over the projection period.

Figure 4.7. Maize, rice and wheat average international prices under baseline and scenarios during the base period, transition period and medium term



Notes: "Min stock" and "Max stock" refer to the minimum and maximum stock level assumptions, respectively. "underfilled" refers to the scenarios that assume the TRQs are administered in a manner that inhibits the filling of the TRQs. "filled" refers to the scenarios that assume the TRQs are administered in a manner that does not inhibit the filling of the TRQs. "no TRQ" refers to the scenarios that assume that grain TRQs are abolished and instead a 1% MFN is applied.

Source: OECD simulations.

¹⁰ Stock losses are a component of total consumption and are calculated as a share of total stocks. Under the baseline, rice and wheat stocks are higher than under the scenarios, which assume temporary public stocks are depleted. Therefore, stock losses under the baseline are higher than under the scenarios. In the case of the “filled” and “no TRQ” scenarios, food use and feed use are higher than under the “underfilled” scenario (because of lower consumer prices) and hence compensate more for the lower stock losses.

Comparing the baseline with the “underfilled” scenario gives an idea of how international prices would be affected if the support prices for rice and wheat are eliminated and temporary stocks are depleted while keeping import policies unchanged. As described above, imports of maize, rice and wheat are projected to be lower under the “underfilled” scenario compared to the baseline levels. Under the “underfilled” scenario, the biggest drop in imports will occur during the transition period, which translates into the largest relative decline in international prices under the “underfilled” scenario compared to the baseline. Over the medium term, imports are projected to pick up under the “underfilled” scenario, but they will remain under the baseline levels, which is also reflected in the international price projections.

Imports of maize, rice and wheat are projected to increase under the “filled” and “no TRQ” scenarios during the entire projection period, which translates into higher international prices. The largest increase is expected to occur if TRQs are removed. More specifically, compared to the baseline, prices under the “no TRQ” scenario by 2030 are projected to be 4% higher for rice and over 5% higher for maize and wheat.

Import levels between the min and max stock assumptions for each scenario differ the most during the transition period. Accordingly, the difference between international prices under the min and max assumptions are most pronounced during this period. By the end of the projection period, the difference in prices under the min and max assumptions for each scenario are negligible.

4.7. Summary of results

Table 4.1 summarizes the results of the analysis by quantifying the average prices, imports, production and consumption under the baseline during the base period (2016-2018), the transition period (2019-2021) and the medium term (2028-2030) under the min and max stock level assumptions. The impact of removing support prices and destocking under different import policies is indicated by showing the relative changes in these variables under the three scenarios *vis-à-vis* the baseline.

Table 4.1. Impact on prices, imports, production and consumption

		Transition period (2019-2021)				Medium term (2028-2030)			
		Baseline	Underfilled	Filled	No TRQ	Baseline	Underfilled	Filled	No TRQ
Domestic price		NC/t	% change compared to baseline			NC/t	% change compared to baseline		
Maize	min	1710	-1.7%	-4.5%	-8.4%	1870	-1.0%	-3.0%	-10.0%
	max	1710	-3.1%	-5.8%	-9.5%	1870	-1.5%	-3.4%	-9.8%
Rice	min	3760	-12.3%	-15.6%	-16.0%	3724	-7.6%	-10.1%	-12.2%
	max	3760	-14.0%	-16.7%	-16.9%	3724	-8.4%	-10.6%	-12.2%
Wheat	min	2263	-20.5%	-26.4%	-26.6%	2263	-12.4%	-18.7%	-21.9%
	max	2263	-27.6%	-31.6%	-31.9%	2263	-14.9%	-20.7%	-23.4%
International price		USD/t	% change compared to baseline			USD/t	% change compared to baseline		
Maize	min	164	-1.0%	2.3%	6.0%	189	-0.4%	1.0%	5.4%
	max	164	-1.5%	1.6%	5.1%	189	-0.5%	1.0%	5.6%
Rice	min	434	-3.8%	1.2%	1.3%	474	-1.1%	1.8%	3.9%
	max	434	-4.8%	0.5%	0.6%	474	-1.5%	1.7%	4.0%
Wheat	min	220	-2.0%	3.2%	3.6%	240	-0.5%	3.3%	5.7%
	max	220	-2.8%	1.4%	1.7%	240	-0.9%	3.2%	5.8%
Production		kt	% change compared to baseline			kt	% change compared to baseline		
Maize	min	230721	0.0%	-0.3%	-0.6%	259779	-0.1%	-0.4%	-2.3%
	max	260211	0.0%	-0.3%	-0.5%	313038	-0.1%	-0.4%	-1.9%
Rice	min	141981	-1.0%	-1.4%	-1.4%	145249	-0.7%	-1.3%	-1.8%
	max	148892	-1.2%	-1.6%	-1.6%	153005	-0.9%	-1.4%	-1.8%
Wheat	min	128209	-1.8%	-2.6%	-2.6%	134626	-1.5%	-3.0%	-3.6%
	max	132155	-2.8%	-3.4%	-3.4%	142255	-2.1%	-3.5%	-4.0%
Consumption		kt	% change compared to baseline			kt	% change compared to baseline		
Maize	min	253731	-0.1%	1.4%	4.1%	263873	-0.3%	0.6%	5.3%
	max	312222	-0.3%	1.0%	2.9%	316874	-0.3%	0.5%	4.5%
Consumption		kt	% change compared to baseline			kt	% change compared to baseline		
Rice	min	145661	7.4%	8.9%	8.9%	148514	-1.3%	-0.4%	0.1%
	max	152410	9.8%	11.4%	11.3%	156107	-1.6%	-0.5%	0.1%
Wheat	min	131452	12.4%	15.9%	15.6%	137825	-1.5%	1.5%	2.2%
	max	135335	17.2%	19.7%	19.5%	145389	-2.4%	0.7%	1.5%
Imports		kt	kt	kt	kt	kt	kt	kt	kt
Maize	min	2627	2350	7150	15374	4406	4003	7177	24247
	max	2826	2160	7149	14959	4406	3845	7176	24644
Rice	min	3771	2520	5077	5131	3701	3459	5269	6598
	max	3771	2163	4891	4869	3701	3266	5266	6609
Wheat	min	3568	1495	7917	7485	3580	3349	9547	11425
	max	3568	666	5619	5263	3580	2765	9545	11417

Note: "Min" and "Max" refer to the minimum and maximum stock level assumptions, respectively. "Underfilled" refers to the scenarios that assume the TRQs are administered in a manner that inhibits the filling of the TRQs. "Filled" refers to the scenarios that assume the TRQs are administered in a manner that does not inhibit the filling of the TRQs. "No TRQ" refers to the scenarios that assume that grain TRQs are abolished and instead a 1% MFN is applied

5. Conclusion

In 2016, China removed its support prices for maize and started destocking its large public reserves of maize. This paper investigates what would happen if China were to also remove its support prices for rice and wheat and consequently reduce its public stocks of these two commodities. The analysis examines the impacts over the next ten years by comparing a baseline (or business-as-usual scenario) with different scenarios that incorporate potential changes to China's import policies.

More specifically, the baseline assumes that the current policy situation remains in place for the next ten years, namely that there are support prices for rice and wheat, area payments for maize, and that China keeps under-filling its TRQs for maize, rice and wheat. The scenarios assume that the support prices for rice and wheat and the area payments for maize are eliminated and replaced by non-commodity specific area payments. The scenarios differ in their assumptions about China's import policy.

There are three sets of scenarios. The first scenarios have the same assumption about China's import policy as the baseline; they assume that China keeps administering its TRQs as it has until 2018, i.e. in a manner that inhibits the filling of the TRQs ("underfilled" scenario). The second set assumes that China administers its TRQs in a manner that does not inhibit the filling of the TRQs and hence allows for full utilisation of the tariff quota or even imports above the quota levels at the higher out-of-quota tariffs depending on the international and domestic grain price relation ("filled" scenario). The third set of scenarios examines what would happen if China were to remove its TRQs for grains and keep the low in-quota tariff of 1% as the MFN tariff ("no TRQ" scenario).

To account for the uncertainty about China's actual stock levels, the baseline and the three scenarios are all conducted under a minimum and maximum stock level assumption. This approach provides bounds for the potential market impacts.

A drastic change in China's support price and public stockholding policy is expected to affect domestic and international markets significantly, especially during the transition period when temporary public stocks are depleted. Accordingly, the actual level of public stocks plays an important role during this period as larger volumes of reserves imply that more reserves would be released and hence the effects amplified.

If China were to preserve its current import policies ("underfilled") and hold the assumed minimum level of stock, then domestic prices of rice and wheat are projected to decrease on average by 12% and 21%, respectively, during the transition period (Table 4.1). If instead China were to hold maximum level of stock, then these price declines are projected to reach 14% for rice and 28% for wheat. However, if China were to allow imports to increase during the destocking period ("filled" and "no TRQ"), then the domestic price declines would be even more severe, reaching up to 17% for rice and 32% for wheat.

Domestic maize prices are also expected to be affected during the transition period. Even though the support price for maize was already abolished before the projection period, domestic maize prices will be lower under the scenarios than under the baseline. This is because there are still large temporary stocks of maize that are offloaded during the transition period and because the projected lower domestic prices for rice and wheat will exert a downward pressure on maize prices.

The lower domestic prices under the scenarios compared to the baseline during the transition period would lead to reduced incentives to grow these crops, which translates into lower production. In addition, as China destocks, domestic availability increases. In the "underfilled" scenarios, China is assumed to maintain its current import policy and hence this oversupply would reduce import demand for maize, rice and wheat. However, if China were to change its import policy, as under the "filled" and "no TRQ" scenarios, then it would already start increasing its imports during the transition period.

The different directions of import demand during the transition period under the "underfilled" scenario compared to the "filled" and "no TRQ" scenarios also affect international markets, with international prices

projected to decline under the “underfilled” scenario, whereas they would rise under the “filled” and “no TRQ” scenarios.

Again, stock levels will play a role during the transition period as relatively higher domestic stock levels will weaken additional import demand. The levels of China’s stocks are especially relevant for the international prices of rice and wheat under the “filled” and “no TRQ” scenarios: the price increase is projected to be around twice as large under the minimum compared to the maximum level assumption.

Over the medium term, domestic prices under the scenarios are expected to recover as stock levels stabilise and the market adapts to an environment without support prices. However, domestic prices under the scenarios are projected to stay below the levels under the baseline and the difference with prices under the baseline is more pronounced as more imports are allowed.

If China were to eliminate its support prices for rice and wheat, and remove its grain TRQs as modelled under the “no TRQ” scenario, then imports would increase significantly. Comparing the “no TRQ” scenario with the baseline, imports of maize in 2030 are projected to be more than five times higher, rice imports would almost double and wheat imports would be three times higher. Consequently, China’s role in global imports will also become more important. Whereas under the baseline China’s share in global imports in 2030 is projected to be 2% for maize, 6% for rice and 2% to wheat, it would increase to 12% for maize, 10% for rice and 5% for wheat under the “no TRQ” scenario.

International prices would also be affected if China were to change its support price and import policies. Whereas during the destocking period import demand is expected to be subdued due to increased domestic availability, it will increase significantly over the medium term. Comparing the “no TRQ” scenario with the baseline shows that international prices of maize and wheat in 2030 are projected to be more than 5% higher, and for rice 4% higher. These effects are similar to those obtained in the study by Kimura, Gay and Yu (2019).

The uncertainty around China’s actual stock levels would mainly affect markets during the transition period, when temporary stocks are depleted and released onto the domestic market. The larger stocks under the maximum level assumption imply that larger quantities will be released on the markets, leading to a relatively stronger drop in domestic prices and in imports than under the minimum level assumption. Over the medium term, however, stock levels would stabilise at either the maximum or minimum level and hence there would no longer be any significant difference in impact between the two stock level assumptions.

For China’s policy makers, this analysis has two important implications. First, the scenario results show that removing support prices would lead to lower domestic prices in the short term, and that these drops would be more pronounced as more imports enter the country. In order to avoid severe negative impacts on farm income during the transition period, policy makers could provide temporary support to farmers. However, this support need only be given for a limited duration, given that the analysis also shows that the market impacts dissipate over the medium term, with domestic prices and production recovering under the scenarios.

Second, policy makers should consider carefully how long the destocking period should last keeping in mind the costs and benefits of extending the destocking period. On the one hand, extending the destocking period could lead to lower fiscal revenues from the sales of the stored commodities as the quality of the commodities deteriorates the longer they are kept in storage.¹¹ A longer transition period can also increase

¹¹ The current analysis assumes that the bulk of the temporary public stocks of rice and wheat will be depleted in three years. This assumption is based on the recommendation by state grain authorities that stocks are kept in storage for maximum three years in order to guarantee their quality (GAIN-CH18015, 2018; State Administration of Grain et al., 2001; State council, 2003). Nevertheless, temporary reserve auctions records published by the National Grain Trade Center indicate that certain amounts of the grains put up for auction have been stored for more than three years, but in that case are sold at lower prices.

the fiscal burden as it implies a longer period of temporary compensatory payments to farmers and of managing the temporary reserves. On the other hand, a slower destocking process would give farmers more time to adjust gradually to the new market environment and could spread and potentially weaken the severity of the price and production impacts.

Crucial in the policymaker's decision process about the amount of temporary support and period of destocking is the knowledge about the size and quality of the stored commodities. Here, the recent stock survey initiative launched in April 2019 will be helpful.¹² For producers and consumers in both domestic and international markets, transparency in the reporting of stock levels and stockholding policies is necessary to help them deal with the significant impacts they can face during the first years a new policy is implemented.

¹² China's State Council announced in July 2018 that a national inspection programme of grain reserves will be launched in April 2019, 10 years after the last national inspection programme of 2009. This will include an in-depth review of the quantity and quality of state-owned grain reserves managed by the new NFSRA, Sinograin, and COFCO. The government already conducted 20 pilot checks in 10 provinces between July 2018 and January 2019 (GAIN-CH18060, 2018).

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Annex A. Grain market representation for China in Aglink-Cosimo

Stock equations

The analysis in this report is conducted using the 2019 version of the OECD-FAO Aglink-Cosimo model¹³. This model is a comprehensive recursive-dynamic partial equilibrium model for global agriculture, which can simulate developments of annual market balances and prices for the main agricultural commodities.

In a recent study (OECD, 2018) the Aglink-Cosimo model was adjusted to better represent public stockholding activities for rice in Asia. In particular, the model now incorporates the different procurement and distribution channels of public stocks, separates private from public stocks, and includes stocks norms, procurement prices and subsidised prices.

The approach in the current study builds on those adjustments, but also introduces some changes. In the current approach, the distinction between procurement and distribution channels has been dropped for two reasons. First, the distinction of procurement and distribution channels did not add many insights to the analysed scenarios. Second, the data collection and consolidation requirements to generate time series of the buying and selling activities are very demanding while the robustness of the results is relatively low. The current approach also introduces several extensions. Namely, the approach covers maize and wheat in addition to rice, and it incorporates a further breakdown of public stocks into temporary public stocks and central public stocks.

Figure A A.1 illustrates the adjustments made to the model. The upper part of the figure shows how one domestic commodity is modelled in Aglink-Cosimo by illustrating the main linkages between endogenous and exogenous variables. The lower part of the figure shows the extensions made in OECD (2018) and highlights in red the additional adjustments that are incorporated in the current study.

The equations for private and central public stock levels are based on the standard stock equation in Aglink-Cosimo:

$$\begin{aligned} \text{LN}(\text{ST}..x) = & \alpha_{\text{ST}..x} + \beta_{\text{ST}..x,\text{QP}} * \frac{\text{LN}(\text{QP} + \text{ST}..x(-1))}{3 * \text{PP}} + \beta_{\text{ST}..x,\text{QC}} * \text{LN}(\text{QC}) \\ & + \beta_{\text{ST}..x,\text{PP}} * \frac{\text{PP}(-1) + \text{PP}(-2) + \text{PP}(-3)}{3} \\ & + \beta_{\text{ST}..x,\text{TRD}} * \text{TRD} + \beta_{\text{ST}..x,\text{ST}..PU} * \text{LN}(\text{ST}..PU + \text{ST}..PU(-1)) \end{aligned}$$

Where:

ST..x: ending stocks of stock type x (private or central public)

QP: quantity produced

QC: quantity consumed

PP: producer price (domestic clearing price)

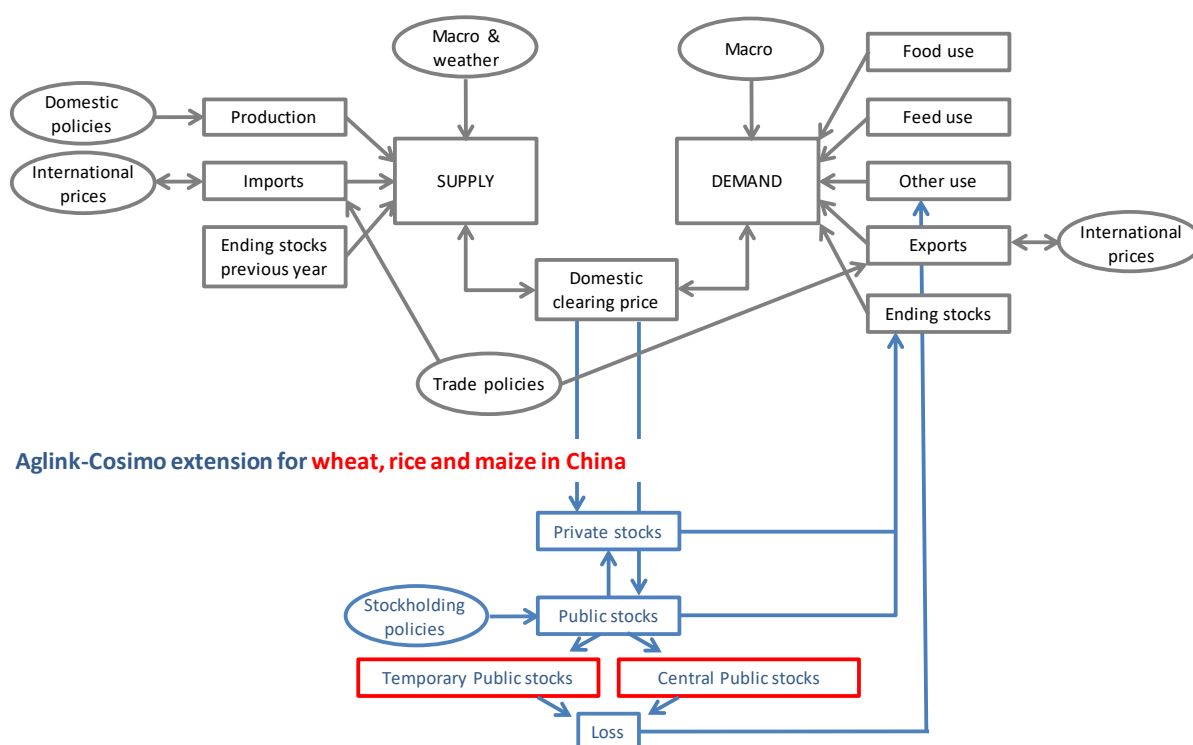
TRD: trend

α , β : equation-specific coefficients

¹³ The documentation of the Aglink-Cosimo model can be consulted at <http://www.agri-outlook.org/abouttheoutlook/Aglink-Cosimo-model-documentation-2015.pdf>.

Figure A A.1. Aglink-Cosimo model with stock equation extensions

Aglink-Cosimo overview of one commodity market in one country



Note: The rectangular shapes contain the endogenous variables while the oval shapes indicate the exogenous variables.

The general principle of these equations is that stock levels are higher if domestic supply is higher, domestic demand is lower or prices are lower compared to a three-year average price of previous years. Though both stock types are represented with the same equation type, parameters vary strongly. While central public stocks are assumed to have very low reactivity (elasticities) to the above-mentioned incentives, private stocks are assumed very reactive. The final component, namely the public stock levels of the current and previous years, only have a non-zero elasticity for private stocks. This represents the crowding out effect, i.e. private stocks decrease as public stocks increase.

The temporary stock equation is designed so that the Minimum Support Price (MSP) acts as a price floor for domestic prices:

$$ST..TMP = \left(\begin{matrix} 0, \\ MAX \left(\begin{matrix} ST..TMP(-1) + MAX(0, (MSP \varepsilon - PP) * 100) \\ -\mu * ST..TMP(-1) \left(\frac{3 * PP}{PP(-1) + PP(-2) + PP(-3)} \right)^\beta \end{matrix} \right) \end{matrix} \right)$$

Where:

ST..TMP: ending stocks temporary stock
MSP: Minimum Support Price
 $\alpha, \beta, \mu, \varepsilon$: equation-specific coefficients

Temporary stocks start from previous year's levels ($ST..TMP(-1)$). The inner MAX condition represents the procurement activity. As soon as the domestic price PP tends to fall below the MSP corrected by a calibration factor ϵ , any quantity will be procured. This is guaranteed by the strong multiplicand (100) attached to the difference between the two prices.

The last part of this equation represents the distribution, which is represented by a certain share (μ) of last year's stock levels, corrected by the actual price level relative to that of the previous three years to represent that also temporary stock distribution might be price-dependent. A calibration factor multiplied to this term (not shown here) allows perfect calibration to observed stock levels.

Tariff Rate Quotas

Modelling Tariff Rate Quotas (TRQ) for grain markets in China is a challenging task. As explained in Section 2, China has consistently under-filled its TRQs for maize, rice and wheat, even during periods when the domestic price of these commodities has been higher than the international prices at the in-quota tariffs. From a theoretical point of view, TRQs should be filled under this price arbitrage. That implies that other obstacles exist which are not easy to measure and which do not allow more imports to enter the Chinese markets.

The general representation of TRQs in Aglink-Cosimo is with a smoothed price linkage function that calculates the applied ad valorem tariff as a weighted average between the in- and out-of-quota tariffs with a steep slope at the TRQ level (Liapis and Britz, 2001).

If the observed import quantities are clearly below the TRQs, only the preferential tariff is relevant. This in turn means that the TRQ does not play a role in the import behaviour in China and an abolition of TRQs would have no quantity effects. To analyse the "filled" and "no TRQ" scenarios, some assumptions had to be made. To reflect the unobserved trade costs that might prevail today, the in-quota tariff was increased to 50% of the out-of-quota (MFN) tariff under the baseline and the "underfilled" scenario. Under the "filled" and "no TRQ" scenarios, the in-quota tariffs are then reduced back to their initial values. This procedure guarantees that imports can increase to TRQ levels under the "filled" scenario (or go beyond the TRQ levels should the international price times the out-of-quota tariff be lower than the domestic price) and can exceed these levels under the "no TRQ" scenario.

Note on rice imports

The *OECD-FAO Agricultural Outlook* includes since several years the AMIS-FAO time series for rice imports. These import records differ from those shown in Figure 2.6, because they also include imports that enter the country without being officially recorded. In 2017, for example, AMIS-FAO data on rice imports were around one third higher than those of UN-COMTRADE. To be in line with the UN-COMTRADE records used in this study, the import variable was split into official and unofficial imports. For the historical values, the unofficial imports are calculated as the difference between the Outlook and UN-COMTRADE data, while for the projection period they are calculated as a constant share (30%) of total import projections in the *Outlook*. The tables and figures in this study therefore only refer to the official imports, while the market balance for rice used in the Aglink-Cosimo model contains both official and unofficial imports.