The E15 Initiative

STRENGTHENING THE GLOBAL TRADE AND INVESTMENT SYSTEM FOR SUSTAINABLE DEVELOPMENT

Looking for a Permanent Solution on Public Stockholding Programmes at the WTO: Getting the Right Metrics on the Support Provided

Franck Galtier

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ABSTRACT

The World Trade Organization (WTO) rules on public stockholding programmes have been under discussion among member countries for quite some time and are likely to be at the heart of the WTO Ministerial Conference in Buenos Aires in December 2017. This article proposes a new approach to advance toward a permanent solution on public stockholding programmes. This approach is based on splitting WTO rules into two components: i) the rules that specify how the support provided by public stocks should be calculated; and ii) the rules that define how WTO disciplines on support should be calculated. It focuses on the first, more technical, component. The author provides a systematic analysis of the biases in current WTO rules for estimating the support provided to farmers through public stockholding programmes and puts forward a proposal to correct them.

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LIST OF ABBREVIATIONS AND ACRONYMS

AMS   aggregate measure of support

AoA   Agreement on Agriculture

ASCM   Agreement on Subsidies and Countervailing Measures

CIF   cost insurance and freight

ERP   external reference price

EU   European Union

FERP   fixed external reference price

FOB   free on board

GATT   General Agreement on Tariffs and Trade

LCU   local currency units

PP   parity price

US   United States

WTO   World Trade Organization

INTRODUCTION

WTO rules on public stockholding programmes are defined by the Agreement on Agriculture (AoA) that entered into force with the establishment of the World Trade Organization (WTO) on 1 January 1995. These rules are part of domestic support disciplines, as public procurement at administered prices is viewed as a way to provide farmers with a price support. The support provided by public stockholding programmes should be accounted for with the other forms of non-exempted domestic support.

However, WTO rules on public stockholding programmes have been questioned by some member countries. In 2012 and 2013, India and the G33 proposed modifications to these rules (Bellmann et al. 2013), which were consequently debated during the Bali Ministerial Conference in December 2013. However, the Bali conference failed to produce an agreement on this issue: members simply agreed on a peace clause exempting the already existing public stockholding programmes from legal challenges until a "permanent solution" is found (WTO 2013; Diaz-Bonilla 2014). The need to find a permanent solution to the issue of public stockholding for food security purposes was reaffirmed in December 2015 during the Nairobi Ministerial Conference (WTO 2015; Glauber 2016). This issue is likely to be at the heart of the next WTO Ministerial Conference in Buenos Aires in December 2017, in a context marked by the US-China grains dispute (WTO 2016; Yu 2017).

In this article, we propose a new approach to advance toward a permanent solution on public stockholding programmes. This approach is based on splitting the problem into two components:

- Component 1: Rethinking the rules that specify how the support provided by public stockholding programmes should be calculated, and

- Component 2: Rethinking the WTO disciplines on providing support.

Both aspects have been questioned by member countries. However, separating these two components may be a way to progress toward a permanent solution. Indeed, the first component is mainly technical: estimating the domestic support actually provided by public stockholding programmes is a matter of facts, and good faith people should agree quite easily on this issue. The second component is more political, as it is not related to how the world is, but rather to how it should be, and countries' interests are obviously divergent on this issue.

This article is focused exclusively on the first component. An extensive literature highlighted the gap between the economic and WTO measures of domestic support (Brink 2011; Diaz-Bonilla 2013; Glauber 2016; Hoda and Gulati 2007 and 2013; Josling 2015; Konandreas and Mermigkas 2014; Matthews 2014; Montemayor 2014; and Orden et al. 2011a). This gap is a huge problem, because — if the real support and the support calculated and bounded by the WTO diverge a lot — WTO rules will be at a loss to fulfil their economic objectives, such as reducing distortions while allowing countries to implement the policies they need to improve their food and nutritional security (Matthews 2014; Orden et al. 2011). In this article, we build on the above-cited works to provide a systematic analysis of the biases in current WTO rules and propose a simple solution to correct them. Our hope is that it will help to reach a permanent solution on the rules for estimating the support provided to farmers through public stockholding programmes. We also hope that getting the right metrics on the support will facilitate the discussions on the second component (the disciplines).

We will successively present: some basics on the ways public stockholding programmes provide support to farmers (section 2); WTO rules defining how the support provided to farmers by public stockholding programmes should be calculated (section 3); the biases in these rules (section 4); and an estimation (for the case of maize) of the effect of these biases on the gap between the real and the calculated support, which proved to be huge (especially for developing countries) (section 5). This will lead us to discuss the different possible solutions to solve this problem and show that the only satisficing solution is designing new rules for estimating the support provided (section 6). Section 7 proposes a simple formula to get the right metrics on the support provided by public stockholding programmes. In section 8, we compare this solution with other solutions previously proposed by member countries and experts. Section 9 provides concluding remarks.

SUPPORT PROVIDED TO FARMERS THROUGH (FOOD SECURITY) PUBLIC STOCKS

As part of their public stockholding programmes for food security purposes, governments buy food products (mainly grains or other staple products, such as milled cassava in some countries) and sell them (sometimes at a subsidized price) or distribute them for free to food insecure households. Their expected effects on food security are maintaining food insecure households' access to food (by transferring

them food and/or by mitigating food price increases) and, sometimes, providing farmers remunerative prices to reduce rural poverty and stimulate their investments in food production.

These programmes may provide support to farmers either directly (by paying a high price to suppliers) or indirectly through the effect of associated interventions on the domestic market price. Neither of these two effects are obvious or systematic. Many public stockholding programmes do not buy at a price higher than the market price even when they use an administered price (ICTSD 2016). Also, the effect of the associated interventions on the domestic price is rather ambiguous: it depends on the ratio between the quantity removed from the domestic market through public stock procurement (which exerts an upward pressure on the domestic price) and the quantity released by the government in the form of sales or free distribution (which exerts a downward pressure on the domestic price). It may, therefore, occur (especially in years of crisis) that the quantity released is higher that the quantity removed from the domestic market, resulting in a reduction of the domestic price. Indeed, the relationships are even more complicated, because the effect of public stockholding programmes on the domestic market depends not only on the quantities removed and released, but also on other parameters. In particular, the effect of associated interventions may be partly or fully compensated by an adjustment in imports or exports: for instance, the quantity removed from the domestic market through public stockholding procurement can be compensated by an increase in imports or a decrease in exports. Therefore, depending on the country situation and the way these programmes are used, public stockholding interventions can result in decreasing or increasing the domestic price (Deuss 2014; European Commission 2017; World Bank 2012).

The support provided by public stockholding programmes is the sum of:

- the support directly provided to the farmers who sell their production to the public stockholding programme: equal to the product of the quantity sold to the public stockholding programme ($Q_{SOLD\ TO\ PS}$) by the price difference between the procurement price (P_{PROC}) and the price that would have prevailed on the domestic market without public stockholding intervention (P'_D)

- the support indirectly provided to the farmers who sell their production on the domestic market: equal to the product of quantity sold on the domestic market ($Q_{SOLD\ ON\ DM}$) by the price difference between the domestic price (P_D) and the price that would have prevailed on the domestic market without public stockholding intervention (P'_D).

Thus, the support provided by public stockholding programmes is given by the following formula:

$$S = (P_{PROC} - P'_D)\ Q_{SOLD\ TO\ PS} + (P_D - P'_D)\ Q_{SOLD\ ON\ DM} \qquad (1)$$

The problem with this formula is that the value of P_D' is unknown: P_D' cannot be observed, because it is not a real price, but a counterfactual one (the price that would have prevailed on the domestic market in the absence of public stockholding interventions). We must, therefore, replace P_D' by a proxy. But, which proxy? As public stockholding interventions may affect domestic prices, the only option is to use an external reference price (ERP). But which ERP? The best ERP is what economists call the parity price (PP). The PP is the price that should prevail on the domestic market in the situation without quantitative restrictions on external trade and without any intervention by public stockholding programs. For importing countries, the PP is equal to the c.i.f. import price plus import taxes (or minus import subsidies) plus transport cost from the port to the domestic market. For exporting countries, PP is equal to the f.o.b. export price minus export taxes (or plus export subsidies) minus transport cost from the domestic market to the port. By replacing P'D with PP in formula 1, we get:

$$S = (P_{PROC} - PP)\ Q_{SOLD\ TO\ PS} + (P_D - PP)\ Q_{SOLD\ ON\ DM} \qquad (2)$$

WTO RULES DEFINING HOW SUPPORT PROVIDED BY PUBLIC STOCKS SHOULD BE CALCULATED

According to the AoA (WTO 1994), the support provided by public stockholding programmes to the producers of a specific commodity should be estimated as the product of i) the difference between the procurement price (P_{PROC}) and the FERP and ii) the quantity of production "eligible" ($Q_{ELIGIBLE}$):

$$S_{WTO} = (P_{PROC} - FERP)\ Q_{ELIGIBLE} \qquad (3)$$

Several debates emerged among experts and WTO members on the way to interpret these definitions of FERP and $Q_{ELIGIBLE}$. The different ways of interpreting the FERP and $Q_{ELIGIBLE}$ may significantly affect the estimated support and countries' compliance with their WTO commitments, as shown by Brink (2014) for the case of rice, wheat, cotton, and sugarcane in India, and by Konandreas and Mermigkas (2014) for specific country-commodity pairs.

The FERP "shall generally be the average free on board (fob) unit value for the basic agricultural product concerned in a net exporting country and the average cost insurance and freight (CIF) unit value for the basic agricultural product concerned

in a net importing country in the base period" (WTO 1994, Annex 3, Article 9), the base period being 1986-88 for the countries that joined the WTO at the outset. Some experts and countries argued that the FERP should be considered as a real price (instead of a current price), meaning that the FERP should be corrected by the country inflation rate since the base period. However, the AoA does not support this interpretation, because the case for inflation is dealt with in another article of the AoA (Article 18.4), which mentions that "in the review process Members shall give due consideration to the influence of excessive rates of inflation on the ability of any Member to abide by its domestic support commitments." Although some experts considered this article gives countries the right to update the base period FERP with the domestic inflation rate (Hoda and Gulati 2013), the dominant view is that this is not the case: Article 18.4 only mentions "excessive rates of inflation" and deals more with considerations to be taken into account when assessing the situation of countries that have been unable to comply with their commitments than with calculating the support itself (WTO 2014). It seems, therefore, that the FERP should be considered as a current price. Another debate is related to the currency that should be used to express the FERP. It is unclear whether countries i) can choose to express the FERP in their own currency or another (for instance the US dollar) or ii) have to use the currency they used in their first notification of the domestic support, when they notified their aggregate measure of support (AMS) for the base period (Brink 2014; Diaz-Bonilla 2014; Matthews 2014). Nothing in the AoA helps to choose between these two competing interpretations. We will, therefore, consider that the FERP is the price that was prevailing during the base period (it should not be corrected for inflation) and simulate both the case where the FERP is expressed in the local currency and the case where it is expressed in US dollars.

The quantity eligible ($Q_{ELIGIBLE}$) is defined by the AoA as "the quantity of production eligible to receive the applied administered price" (Annex 3, Article 8). Some countries notify total national production, while others notify only the quantity actually procured by the public stockholding programme. Another interpretation (proposed, for instance, by Hoda and Gulati 2007) is that the relevant quantity is the share of production that is marketed (i.e., not self-consumed by farmers). Another view is that, if the authorities gave prior notice of the quantity they wanted to buy, $Q_{ELIGIBLE}$ would be this quantity. Therefore, we have four different interpretations of $Q_{ELIGIBLE}$ (classified here from the smallest to the largest quantity): the quantity actually procured by the public stockholding programme, the quantity to be purchased announced by the authorities, the marketed share of national production, and total national production.[1] The jurisprudence shed some light on this debate: the only decision on domestic support made by the WTO Appellate Body (known as the "Korea beef case") confirmed that "production eligible refers to production that is 'fit or entitled' to be purchased rather than production that was actually purchased" and that if the quantity to be procured is announced in advance, this quantity should be considered as the eligible production

(WTO 2000b, §120 and 121). (WTO 2000b, §120). It, thus, appears that, according to the WTO Appellate Body, $Q_{ELIGIBLE}$ should be the total national production, unless the quantity to be procured is announced in advance (in this case, $Q_{ELIGIBLE}$ is this quantity).

BIASES IN WTO RULES

There is usually a huge gap between the economic measure of the domestic support provided by public stockholding programmes (presented in section 2) and the WTO measure of this support (presented in section 3). As mentioned above, an extensive literature highlighted this gap (Brink 2011; Diaz-Bonilla 2013; Glauber 2016; Hoda and Gulati 2007 and 2013; Josling 2015; Konandreas and Mermigkas 2014; Matthews, 2014; Montemayor 2014; and Orden et al. 2011a). To show this gap may be huge and identify the biases that produce it, let us begin by presenting a numerical example. We consider the case of a country where the public stock agency purchases grain at a procurement price equal to 125, while the domestic price (in line with the current international price) is 100. From the quantity produced (equal to 100), 10 is sold to the public stockholding agency; 40 is sold on the domestic market; and 50 is self-consumed by farmers. Let us assume that public stock procurement, by reducing the quantity available on the domestic market, results in increasing the domestic price from 100 to 110. The support actually provided is equal to 650: 250 provided to the farmers who supply the public stock ([125 -100] x 10) plus 400 provided to the farmers who sell their production on the domestic market ([110 – 100] x 40).

However, the support calculated according to WTO rules can be significantly different, because the price support is calculated by using a reference price related to the international price during a past reference period (assumed to be equal to 50 in the numerical example) instead of the current parity price (equal to 100). Moreover, this price support is applied to all national production, without differentiating between the share self-consumed by farmers, the share sold on the domestic market, and the share sold to the public stockholding agency. In this example, the support estimated according to WTO rules is therefore equal to 7500 ([125 – 50] X 100), more than 11.5 times the real amount of support provided.

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[1] Note that in all cases, the semantic meaning of "eligible" implies that only quantities that fulfil the conditions to be sold to the public stock should be included (e.g. specific qualities, specific categories of farmers, specific regions of the country).

The gap between the real support and the support estimated following WTO rules stems from three biases in WTO rules:

- Bias B1, resulting from using the unit value of imports or exports over a fixed past period (1986-88 for most countries) as the external reference price (ERP), instead of using the current PP.

- Bias B2, resulting from using the procurement price P_{PROC} instead of the price prevailing on the domestic market P_D to estimate the price support received by the farmers who sell their production on the domestic market. The implicit assumption is that the public stock procurement price P_{PROC} makes the domestic price P_D. It may be the case in some situations, but this is not always the case because the quantity procured (Q_{PROC}) may be too small to affect the domestic price P_D or may be compensated by i) the

quantity released in the form of sales or free distributions ($Q_{RELEASED}$) or ii) an adjustment in imports or exports. It may even occur that public stockholding interventions result in decreasing P_D (when $Q_{RELEASED} > Q_{PROC}$).

- Bias B3, resulting from the use of total national production instead of the quantity sold to estimate the support received by farmers. The implicit assumption behind WTO rules is that farmers sell all their production (no self-consumption). Obviously, this is often far from the reality in developing countries, especially for grain and other staple food products.

The effect of these different biases on the estimated support is displayed in Figure 2 below (by using the same numerical example as in Figure 1).
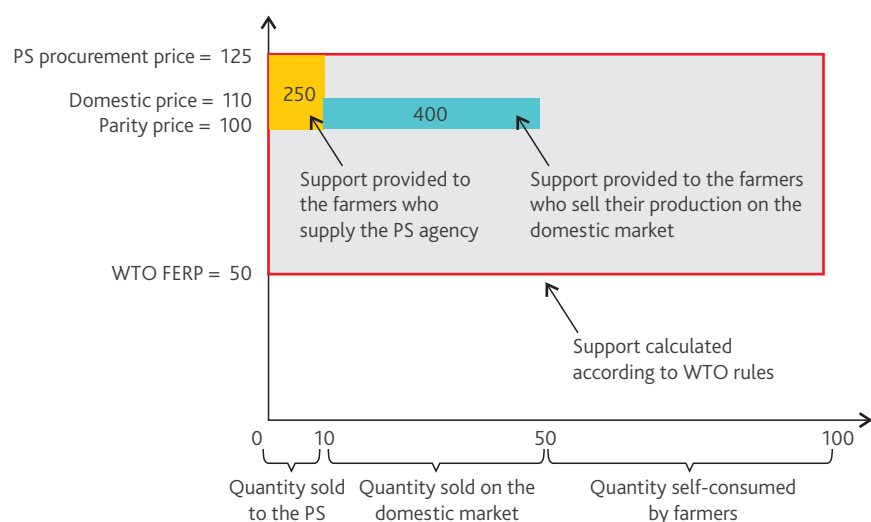
FIGURE 1:

Numerical illustration of the gap between the real support and the support estimated according to WTO rules

Source: Author
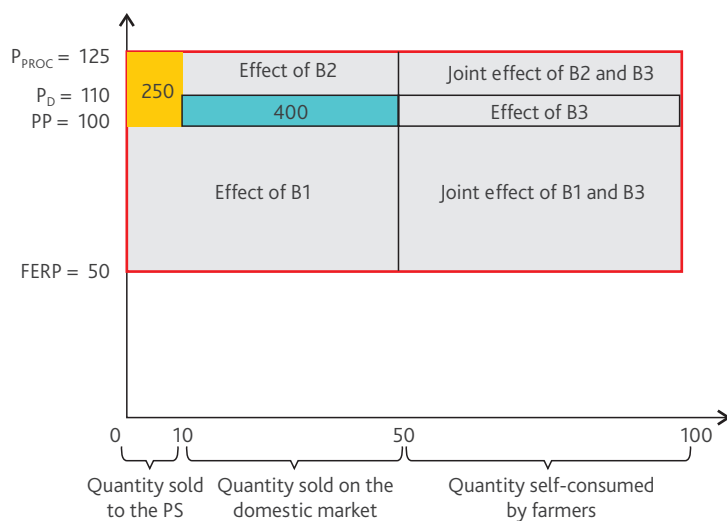
FIGURE 2:

Illustration of the effect of biases B1, B2, and B3 on the support estimated according to WTO rules

LEGEND:

- Support provided to the farmers who supply the PS
- Support provided to the farmers who sell their production on the domestic market
- Support calculated according to WTO rules
- Effect of the biases in WTO rules

Source: Author

4

MAGNITUDE OF THE GAP BETWEEN THE REAL SUPPORT AND THE SUPPORT ESTIMATED ACCORDING TO WTO RULES (ESTIMATION FOR THE CASE OF MAIZE)

In the numerical example above, the support estimated according to WTO rules (S_{WTO}) is about 11.5 the real amount of support provided (S). However, we have to go beyond this example and investigate the magnitude of the gap between S and S_{WTO} in the real world. We choose to do this analysis for the case of maize, a commodity strongly related to food security issues in African, American, and some Asian countries.

MAGNITUDE OF B1

B1 results from the gap between the current PP (related to the current international price) and the WTO FERP. In the numerical example above, we assumed that the FERP accounts for only 50 percent of the PP. How far is that assumption from reality? Figure 3 below shows the dynamics of the

international maize price. It appears that during the period 1986-88 (which is the "base period" for most countries), the maize price was about 57 percent of its 2016 level. This means that for most countries the effect of bias B1 would be of the same order of magnitude as shown on Figure 2.

It should be noted, however, that the situation is not the same for all countries. This is because the base period depends on when a country became a member of the WTO. Of the 133 WTO members subject to domestic support disciplines (all WTO members except the 28 members of the European Union (EU), because domestic support disciplines are calculated and notified at the EU level), 106 have 1986-88 as a base period — these countries have been members since the beginning of the WTO, because they were already members of the General Agreement on Tariffs and Trade (GATT). The other 27 members have a more recent base period. For instance, the base period is 1996-98 for China, 1999-2001 for Vietnam, and 2006-08 for Russia. This means the gap between the real support S and the support estimated according to WTO rules S_{WTO} can be very different, depending on when the country became a member of the WTO. For countries with a base period corresponding to years of high maize price, the FERP can be more than the current international price, meaning that for these countries, bias B1 may result in underestimating the real amount of support provided, while for the vast majority of countries it results in strongly overestimating the support provided.

The heterogeneity between countries may even be much stronger, because, as explained in section 2, it is unclear whether countries are allowed to use a FERP expressed in US dollars. If countries have to express the FERP in their own currencies, the gap between the FERP and the current international price stems not only from changes in the international maize price, but also changes in the country's exchange rate. For countries whose exchange rates with the US dollar have decreased between the base period and now,

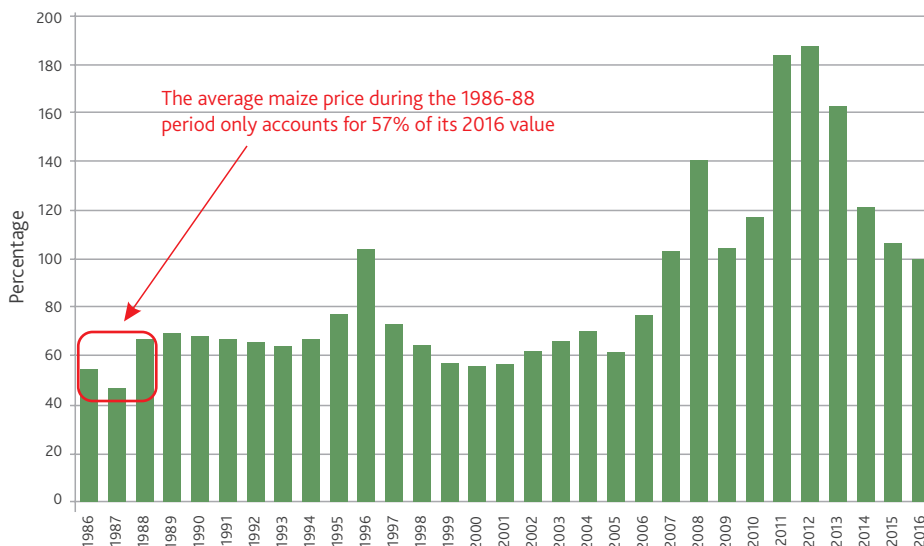The average maize price during the 1986-88 period only accounts for 57% of its 2016 value

FIGURE 3:

Dynamic of the international price of maize (annual prices are expressed in percentage of the 2016 price)

Source: US Department of Agriculture; World Bank.

the gap between the FERP and the current international price is likely to be much wider. Figure 4 below shows the magnitude of the FERP (expressed as a percentage of the current international price) when the FERP is expressed in local currency units. As expected, for high-income countries, the FERP expressed in local currency units is of the same order of magnitude as the FERP expressed in US dollar (about 50 percent of the current price). This reflects the fact these countries' currencies have remained stable (on average) compared with the US dollar. However, for low-income countries, the situation is different: because their currencies' exchange rates with the US dollar decreased over time, the FERP of these countries (when expressed in local currency units) accounts for less than 20 percent of the current international price. Therefore, when countries have to use a FERP expressed in their own currencies, the effect of bias B1 is likely to be higher for low-income countries.

MAGNITUDE OF B2 TRADE POLICIES AND FOOD SECURITY

Bias B2 stems from the gap between the procurement price and the price prevailing on the domestic market. B2 results from assuming that the farmers who sell their production on the domestic market benefit from the procurement price (or, in other words, the procurement price makes the price on the domestic market). In fact, as explained in sections 2 and 4, this may occur in some occasions, but is not always the case. The quantity procured by the public stockholding agency may not be enough to affect the domestic price or may be compensated by the quantity released from the public stocks in the form of free distribution or sales.

Do we have any reason to think bias B2 may be higher for specific categories of countries? The answer is undetermined. On the one hand, in many developing countries, a significant part of the quantity stored is likely to be released on the domestic market in the form of free distribution or sales, thereby mitigating or nullifying the effect of public stockholding procurement on the domestic price. But, on the other hand, as in many developing countries, a significant part of maize production is self-consumed by farmers (see below) the same quantity procured by the public stockholding programme is likely to have a stronger effect on the domestic price: when 50 percent of the production is self-consumed, if the public stockholding agency purchases 10 percent of the production, it results in removing 20 percent of the quantity traded on the domestic market.

MAGNITUDE OF B3

Bias B3 arises because WTO rules have not taken into account the fact that, in many developing countries, a significant part of the production is self-consumed by farmers. The share of production self-consumed by farmers of course does not generate a support for farmers (whatever the level of the public stockholding programme procurement price and whatever the level of the domestic market price). In the numerical example above, we assumed that 50 percent of maize production is self-consumed by farmers. How far is that assumption from reality? No systematic data exists on the self-consumption rate by country and commodity. However, we have been able to gather data for maize in many sub-Saharan African countries (see Table 1). This table shows that the percentage of production self-consumed by farmers can be well above 50 percent in many African countries (in Eastern and Southern African countries, the self-consumption rate is about 80 percent).

19,10%	32,11%	38,75%	50,27%	55,97%
Low income	Lower middle income	Upper middle income	High income: OECD	High income: non-OECD
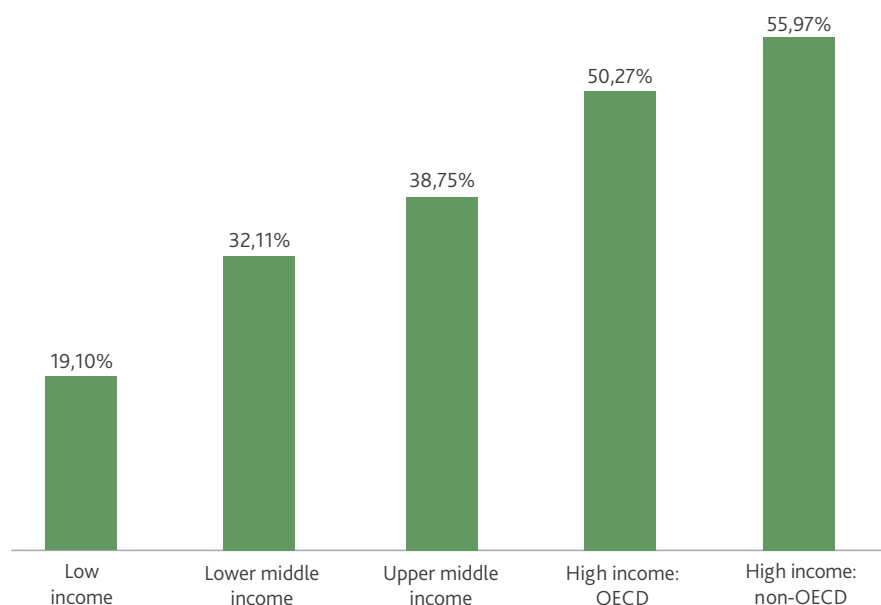
FIGURE 4:

Fixed external reference price (expressed in local currency unit) as a percentage of the current international maize price (by country income group)

Sources: US Department of Agriculture and World Bank for maize price data; World Bank for exchange rate data and country income groups; WTO for member countries' base periods.

Percentage of maize production self-consumed by farmers (for selected African countries)

Western Africa + Chad and Cameroon		Eastern and Southern Africa	
Benin (2011)	35%	Kenya (2007)	78%
Burkina (2003)	51%	Malawi (2007)	79%
Cameroon (2007)	52%	Mozambique (2005)	84%
Côte d'Ivoire (2008)	60%	Zambia (2008)	86%
Ghana (2006)	27%		
Guinea (2007)	78%		
Liberia (2007)	66%		
Mali (2011)	53%		
Mauritania (2008)	60%		
Niger (2011)	8%		
Nigeria (2003)	39%		
Senegal (2010)	31%		
Sierra Leone (2003)	57%		
Chad (2011)	36%		
Togo (2011)	58%		

FIGURE 5:

Real and estimated support (comparing the situation of a developed country and a developing country)

LEGEND:

- 🟧 Support provided to the farmers who supply the PS
- 🟦 Support provided to the farmers who sell their production on the domestic market
- ▭ Support calculated according to WTO rules
- ▦ Effect of the biases in WTO rules

(a) Developed country

(b) Developing country
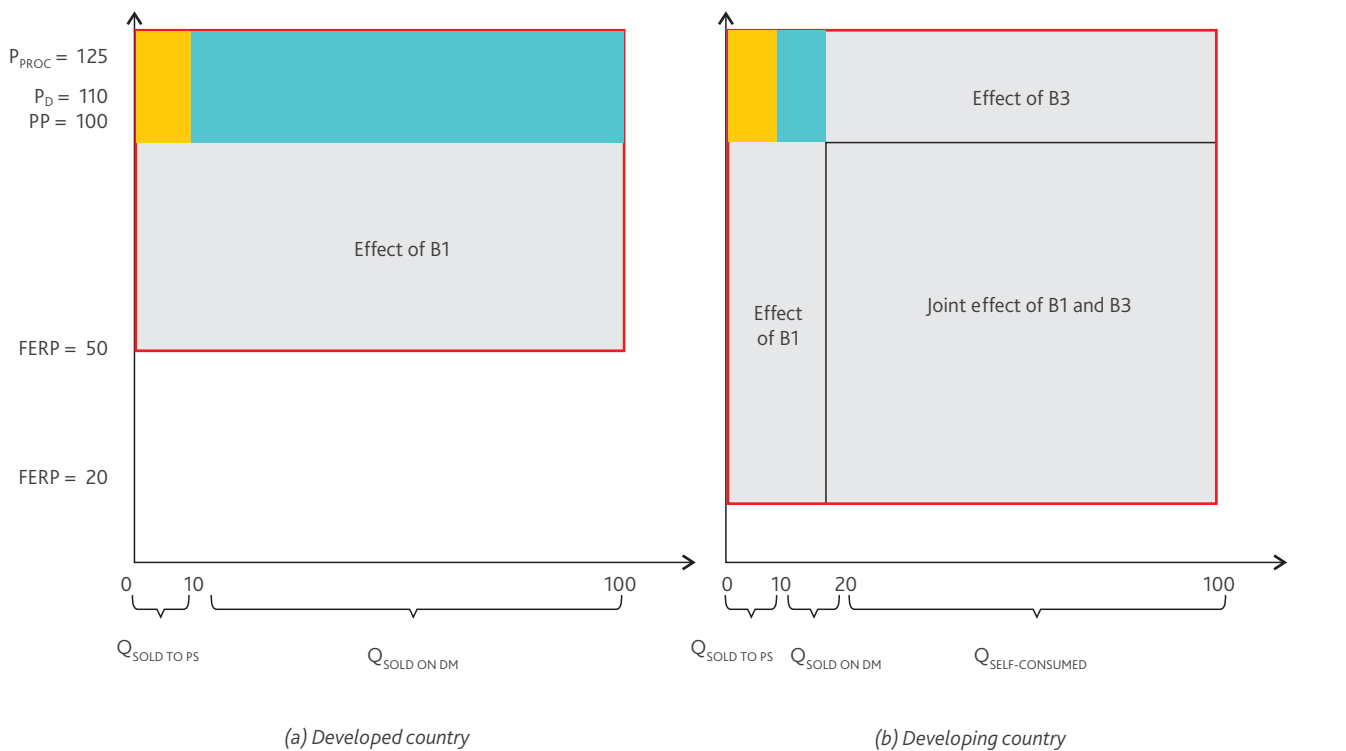
Source: Author

MAGNITUDE OF THE GAP BETWEEN THE REAL SUPPORT AND THE SUPPORT ESTIMATED ACCORDING TO WTO RULES

Putting together all the figures presented above we can get an estimation of the gap between the real support S and the support calculated according to WTO rules S_{WTO}. We consider the case of two countries: a developed country and a developing country. Both procured 10 percent of national production at a price higher that the PP by 25 percent. Let us assume that, in both cases, this results in increasing the domestic price up to the level of the public stock procurement price (therefore B2 = 0). However, both the real support S and the support calculated according to WTO rules S_{WTO} are likely to be different for the two countries (see Figure 5).

The real support S provided is not the same for the two countries: in the developed country, 100 percent of the production is marketed (the 90 percent not sold to the public stockholding agency are sold on the domestic market) while in the developing country 80 percent of the production is self-consumed by farmers (from the 20 percent marketed, half is sold to the public stockholding agency, and half is sold on the domestic market). Therefore, the real support S provided by the public stockholding programme in the developed country is 2500 (25 x 100), while in the developing country it is only 500 (25 x 20).

Moreover, the support calculated according to WTO rules S_{WTO} is also different: the FERP for the developed country accounts for 50 percent of the current international price, while for the developing country it accounts for only 20 percent (because the exchange rate of its currency with the US dollar strongly decreased between the base period and now). Therefore, for the developed country, the support calculated according to WTO rules is 7500 ([125 – 50] * 100) whereas it is 9500 for the developing country ([125 – 20] * 100).

The overall result is that for the developed country, the support estimated according to WTO rules accounts for 3 times the real support (S_{WTO} = 3 S) while for the developing country, it accounts for 19 times the real support (S_{WTO} = 19 S).

THE NEED TO RESHAPE WTO RULES TO GET THE RIGHT METRICS ON SUPPORT PROVIDED BY PUBLIC STOCKHOLDING PROGRAMMES

The analysis presented above not only shows that WTO rules are biased, but also that the three biases in WTO rules significantly affect the calculated support (the support calculated according to WTO rules S_{WTO} usually accounts for several times the real support S). Maybe more important, the effect of the biases in WTO rules are not the same for all countries: the gap between S_{WTO} and the real support S is likely to be much wider for developing countries.

Many proposals to solve this problem have been made by member countries and experts. The proposed solutions can be classified into three categories:

1. *Play on the ambiguities of WTO rules.* As explained in section 3, there are many ways to interpret the formula that defines how the support provided by public stockholding programmes should be calculated. The ambiguities are related to the FERP and the eligible quantity. The different ways of interpreting the FERP and the eligible quantity may significantly affect the estimated support and countries' compliance with their WTO commitments, as shown by Brink (2014) for the case of rice, wheat, cotton, and sugarcane in India; by Konandreas and Mermigkas (2014) for specific country commodity pairs; and by Montemayor (2014) for food staples in five developing countries. Some member countries and experts made proposals based on interpreting the rules in a way that results in reducing the gap between the real support provided and the support taken into account by the WTO. More precisely, it has been proposed:

• to use as a measure of the eligible quantity i) the quantity actually procured; ii) the quantity announced to be procured (Diaz-Bonilla 2014); or iii) the marketable quantity (Hoda and Gulati 2007; and Montemayor 2014), instead of the national production;

• to update the FERP with the country inflation rate (Diaz-Bonilla 2014; Hoda and Gulati 2013; Konandreas and Mermigkas 2014);

- to express the FERP in US dollars instead of in national currency units (Diaz-Bonilla 2014; Montemayor 2014; Konandreas and Mermigkas 2014).

2. *Relax the disciplines on domestic support.* Several ways can be used. First, the support provided to farmers may be exempted of WTO disciplines in specific cases. For instance, when the food is purchased from low-income or resource-poor producers (as proposed in November 2012 by an informal proposal of the G33, see WTO 2012), when the quantity procured does not exceed a given percentage of local production (Montemayor 2014), or when the country is a least-developed country (Glauber 2016). Second, the maximum allowed level of non-exempted support may be increased (for instance, by increasing the level of the *de minimis*, as proposed by a group of countries in May 2013, see Bellmann et al. 2013). Third, the right can be given to countries to go beyond their domestic support ceiling when justified by specific circumstances (safeguard clause).

3. *Change the rules on how the support provided by PS programmes should be calculated.* Many proposals have been made in that direction. They will be presented in sections 7 and 8.

Solutions based on the first strategy (playing on the ambiguities of WTO rules) are highly risky. If a country is challenged, the Panel or the WTO Appellate Body may well consider the country used a wrong methodology to calculate the support provided by public stockholding programmes. In fact, this is exactly what happened during the Korea beef case. The government of South Korea argued that the quantity eligible is the quantity actually purchased because this is the quantity for which there is available money to pay the public procurement price (WTO 2000a, §371). But, the Panel (and then the Appellate Body) explained that this argument is not acceptable and recalculated the support provided. The Panel argued that the quantity eligible is the marketable quantity ("it is marketable production as a whole which benefits from this type of [price] support," WTO 2000a, §832). However, the decision made by the WTO Appellate Body (after South Korea appealed the decision) did not make any mention of the marketable quantity, but rather stated that "production eligible refers to production that is 'fit or entitled' to be purchased rather than production that was actually purchased" and that if the quantity to be procured is announced in advance, this quantity should be considered as the eligible production (WTO 2000b, §120 and 121).

The proposal to update the FERP with the inflation rate has been made by several experts (Diaz-Bonilla 2014; Hoda and Gulati 2013; and Konandreas and Mermigkas 2014). It was also part of the proposal made in September 2013 in a "non-paper" proposed by a subset of G33 members. Countries and experts who support that option base their arguments on article 18.4 of the AoA. This article mentions that "in the review process Members shall give due consideration to the influence of excessive rates of inflation on the ability of any Member to abide by its domestic support commitments." The fact that only "excessive" rates of inflation are mentioned led the authors of the September 2013 non-paper to propose taking into account rates of inflation exceeding 4 percent when estimating the support provided by public stockholding programmes. However, it seems that Article 18.4 deals more with considerations to be taken into account when assessing the situation of countries that have been unable to comply with their commitments than with calculating the support itself, as argued by some experts (Brink 2014) and clarified by WTO Committee on Agriculture (WTO 2014).

The proposal has also been made to express the FERP in US dollars instead of national currency units (see for instance Glauber 2016). Whether countries have the right to do so or not is unclear. It is in fact a rather technical debate: the text of the AoA says both that the support should be calculated by "taking into account the constituent data and methodology used in the tables of supporting material incorporated by reference in Part IV of the member's Schedule [meaning country notification for the base period]" (Article 1.a.ii) and that it should be calculated "in accordance with the provisions of this Agreement, including Article 6, and with the constituent data and methodology used in the tables of supporting material incorporated by reference in Part IV of the Member's Schedule" (Article 1.h.ii). While the first formulation ("taking into account") seems to give countries some flexibility, the second one ("should be in accordance to") seems much more restrictive. The Appellate Body decision during the Korea beef case clarified that the right wording is "in accordance with" for the text of the Agreement (with its annexes), but is only "taking into account" regarding the methodology used by countries for their first notification (related to the base period). According to Diaz-Bonilla (2014), this means that a change in the currency used by a country to notify its FERP is acceptable. But, Brink (2014) disagrees with this interpretation. This has many implications, because "only a handful of developing countries have specified FERPs or AMS ceilings in foreign currency in their commitments (Argentina, Brazil, Columbia, Costa Rica, Turkey, and Venezuela)" (Matthews 2014). Therefore, if Brink's interpretation is correct, many developing countries have to express the FERP in their own currency units, which results in strongly increasing the bias in the calculated support (see Figure 4).

It therefore appears that playing on the ambiguities of WTO rules is a highly risky strategy. The only solution of this kind that is maybe not too risky is using the quantity announced in advance to measure the eligible quantity (because this interpretation is supported by the jurisprudence stemming from the decision of the WTO Appellate Body during the Korea beef case). However, this option is not satisfactory, as it may allow countries to strongly underestimate the real support provided (especially when all the marketed quantity benefit from the price support while only the announced quantity would be accounted for). Indeed, in Indonesia, the public stocks agency (BULOG) succeeded in stabilizing the price of rice on the domestic market while buying always less than 10 percent of the national production (Timmer 1996).

Of course, it would be possible to render these strategies less risky by promoting a collective clarification on the right interpretation of what are the FERP and the eligible quantity. However, this would require a new agreement between countries at the WTO level. And, in this case, it seems much more relevant to agree on rules that allow removing all the biases instead of agreeing on ways to only reduce them.

Solutions based on the second strategy (relaxing the disciplines on public stockholding programmes) are not appropriate to compensate the biases in the estimation of the support provided. This is because the effect of the biases on the gap between the real support S and the calculated support S_{WTO} is different for each country-commodity pair (see Figure 5). If the gap between S and S_{WTO} was the same for all countries and all commodities, it would be possible to compensate the effect of the biases by adjusting the level of the ceiling. However, as we saw in Figure 5, this is far from being the case. This does not mean there is no justification for relaxing the disciplines on public stockholding programmes, but this certainly means that relaxing the disciplines is not an adequate solution to compensate the biases in WTO rules.

Solutions based on the third strategy (modifying the rules that define how the support should be calculated) are therefore the only ones that may allow establishing fairness between countries by fully correcting the biases in WTO rules. A simple solution to get the right metrics on the support provided by public stockholding programmes is presented in section 7. Section 8 highlights the links between this solution and other solutions previously proposed by member countries and experts.

A PROPOSAL OF NEW RULES FOR A FAIR ESTIMATION OF THE SUPPORT PROVIDED BY PUBLIC STOCKHOLDING PROGRAMMES

Getting an unbiased estimate of the support provided by public stockholding programmes means eliminating biases B1, B2, and B3. As shown in section 2, this can theoretically be done by considering:

- the share of production self-consumed by farmers does not benefit from any price support

- the quantity sold to the public stockholding programmes benefits from a price support equal to the procurement price minus the PP of the considered commodity (P_{PROC} − PP)

- the quantity sold on the domestic market benefits from a price support equal to the price prevailing on the domestic market minus the PP of the considered commodity (P_D − PP)

In other words, the theoretical solution is applying formula (2):

$$S = (P_{PROC} - PP)\, Q_{SOLD\ TO\ PS} + (P_D - PP)\, Q_{SOLD\ ON\ DM} \quad (2)$$

However, this formula cannot be used by the WTO, because it uses the PP, which is only known at the end of the year (the PP depends on the average unit value of imports or exports during the year). For countries to choose the parameters of interventions under public stockholding programmes (especially P_{PROC}) with satisfactory knowledge of the support they will generate, countries need prior knowledge of the ERP that will be used in the calculation. The ERP, therefore, cannot be the PP: it should be a predictor variable of PP.

We propose to use PP* as a predictor variable of PP. The variable PP* is defined as follows:

- for net importing countries: the average unit value of imports during the last completed year plus import taxes or minus import subsidies

- for net exporting countries: the average unit value of exports during the last completed year minus export taxes or plus export subsidies

Taking into account import or export taxes or subsidies is necessary to avoid attributing an effect to public stockholding programmes due to taxes or subsidies. Let us assume, for instance, two countries A and B where the import of the considered commodity is taxed at 20 percent. As the international price is 100, the import price cost (or PP) is 120 in both countries. Let us assume that in country A there is no public stockholding programme, while in country B there is one with interventions that do not affect the domestic price. In both countries, the support provided is exactly the same, and the tool used to provide it is also the same (a 20 percent tariff on imports). Not including the import tax in the estimation of the support provided by the public stockholding programmes would result in assuming that country B provides domestic support while country A does not. As stated by Matthews (2014, 17), in this case, the price support provided by public procurements "is not additional to that provided by the border protection alone so that its incremental trade-distorting effect is minimal."

The formula to estimate the support provided by public stockholding programmes therefore becomes:

$$S_{WTO} = (P_{PROC} - PP^*) \; Q_{SOLD\ TO\ PS} + (P_D - PP^*) \; Q_{SOLD\ ON\ DM} \quad (4)$$

With:

P_{PROC} = PS procurement price

PP^* = average unit value of imports during the last completed year plus import taxes or minus import subsidies (for net importing countries) or average unit value of exports during the last completed year minus export taxes or plus export subsidies (for net exporting countries)

P_D = average price on the domestic market during the considered year

$Q_{SOLD\ TO\ PS}$ = quantity sold to the PS

$Q_{SOLD\ ON\ DM}$ = quantity sold on the domestic market

P_{PROC} and $Q_{SOLD\ TO\ PS}$ are theoretically public data (which should be notified by countries to the WTO). P_D can be observed: it is the average producer price calculated as the annual average of the prices collected on rural markets (the main points of sale for farmers). This data is already used in country notifications to calculate the value of production (and therefore the *de minimis*). $Q_{SOLD\ ON\ DM}$ is the share of production sold by farmers on the domestic market. It can be estimated as the share of production that is neither self-consumed by farmers nor sold to the public stockholding programmes. The quantity self-consumed by farmers is usually estimated by applying a ratio r to the estimated production. This ratio r – farmers' self-consumption rate – is estimated with household survey data (in most countries, research institutes or the country statistical organisation regularly produces this kind of data). In other words, $Q_{SOLD\ ON\ DM}$ can be estimated by applying the following formula: $Q_{SOLD\ ON\ DM} = Q_{PRODUCED} - r\ Q_{PRODUCED} - Q_{SOLD\ TO\ PS}$. Finally, the PP can be calculated easily with data on i) country average unit value of imports or exports during the preceding year and ii) country import or export tax (or subsidy) rate.

Formula (4) therefore provides a simple way to estimate as accurately as possible the support provided by public stockholding programmes. It is imperfect, however, because the external reference price PP^* is based on the import or export unit value of the preceding year and the price may have changed substantially meanwhile. Therefore, some countries may be in difficulty if the international price increases sharply between Y-1 and Y, or if the country's exchange rate with the US dollar fell significantly between Y-1 and Y. Another limitation is that PP^* does not include the transport cost between the border and the domestic market (these costs may be substantial, especially for landlocked countries, see FAO 2014 for an example). To solve these two problems, we propose two (complementary) options:

- Introduce an abatement: the support bound by the country at the WTO should not be the support S_{WTO}

estimated with formula (4) but let us say 70 percent of S_{WTO} for landlocked importing countries and 80 percent of S_{WTO} for other countries. The logic behind this abatement is the same as the one used to determine whether drivers are complying with the speed limit. As the measurements taken by speed cameras are imperfect (in France the margin of error is around 10 percent), drivers are given the benefit of the doubt if they are flashed at a speed higher than the speed limit but lower than the speed limit plus the margin of error for speed cameras.

- Include a safeguard clause exempting countries from WTO disciplines on domestic support when i) their exchange rate has collapsed during the year, or ii) the international price has risen sharply during the year. Indeed, in these situations, a great part of the calculated support would not be due to PS interventions (but rather to the increase in the PP).

LINK WITH OTHER PROPOSALS

A simple way to compare proposals is to check the solution they suggest to correct the different biases B1, B2, and B3.

CORRECTING B1.

Our proposal to remove bias B1 is replacing the FERP by a predictor variable of the current PP: PP^*, which is based on the PP of the preceding year.

This proposal is quite close to a proposal made by Diaz-Bonilla (2013) and supported by different experts (such as Glauber 2016 and to some extent Matthews 2014). Their proposal is that, if the public procurement price is equal or inferior to the current PP, the support provided by the public stockholding programme should be assumed to be non-distortive (and, therefore, exempted from any discipline). Our proposal is very close to Diaz-Bonilla's proposal but more comprehensive. To illustrate why, let us consider the case of two countries A and B. Let us assume that the FERP is 50, the current international price is 100, and the import tax rate is 20 percent in both countries. Therefore, the current PP is 120 for both countries. If the procurement price is 120 for country A and 125 for country B, current WTO rules give a support of 70 for country A and of 75 for country B, while the real support provided by public stockholding programmes is 0 for country A and 5 for country B. The solution proposed by Diaz-Bonilla solves the problem of country A but left unchanged the problem of country B (the calculated support

would be equal to 75 while the real support is 5). Conversely, the methodology we propose solves the problem for both countries.

Our proposal is also close to the proposal made in September 2013 in a "non-paper" submitted by a subset of G33 members. Their proposal was "that developing countries could use a three-year rolling average to calculate how much their food stockholding purchases contributed towards their overall farm support limit, instead of benchmarking support against the external reference price. Countries should also be allowed to use last year's average price in the largest 1-3 suppliers of foodstuffs in the country" (Bellmann et al. 2013, p.2). What matters is using a good predictor variable of the PP of the current year: it can be the price of the preceding year, the rolling average of the three preceding years or other indicators based on past price. We propose to use the price of the preceding year, because it is the simplest indicator, and it is often the best predictor variable of the average price of the current year. What also matters is to implement complementary measures to take into account the transport cost between the border and the domestic market and the movement of international prices or exchange rates between the preceding year (or the average price of the three preceding years) and the current year. This is the reason why we propose to introduce an abatement and safeguard clauses (see section 7).

CORRECTING B2.

Correcting bias B2 means splitting apart within the marketed quantity the share sold to the public stockholding agency (which receives the public procurement price) and the share sold on the domestic market (which receives the domestic market price). Orden et al. (2011a, 15) are close to this idea when they state one of the main deficiencies in the WTO measurement of market price support is "the use of the administered [procurement] price instead of the prevailing domestic price to calculate the level of support per unit of output." However, to our best knowledge, we are the first to propose explicitly a complete solution to correct bias B2.

CORRECTING B3.

To correct B3, we propose to consider that the share of production self-consumed by farmers does not receive any support. In other words, the price support should apply only to the marketed share of national production, meaning the quantity eligible should be the marketable quantity. This proposal has already been made by experts (for instance, Hoda and Gulati 2013; and Montemayor 2014). It was also a key element of the Panel's decision in the South Korea beef case (however, as already mentioned, after South Korea appealed the Panel's decision, the Appellate Body did not make any mention of the concept of marketed or marketable quantity).

CONCLUSION

In this article, we propose a new approach to advance toward a permanent solution on public stockholding programmes. This approach is based on splitting WTO rules into two components: i) the rules that specify how the support provided by public stocks should be calculated and ii) the rules that define how WTO disciplines on support should be calculated. The article deals with the first component. It builds on the existing literature to provide a systematic analysis of the biases in current WTO rules and proposes a simple solution to correct them. Our hope is that it will help member countries define unbiased rules for calculating the support provided to farmers through public stockholding programmes.

We also hope that getting the right metrics on the support provided will facilitate the discussions on the second component (the disciplines). Many debates on the second component have already occurred among member countries and experts. Is it better to develop exemptions, to increase the maximum allowed level of non-exempted support, or to design safeguard clauses for countries facing special situations? Is it better to keep the current system for commitments on non-exempted supports (*de minimis* and AMS) or to develop a new approach? Options have been discussed for a long time at the WTO (WTO 2008). Many proposals have been made by member countries (WTO 2012; Bellmann et al. 2013) and experts. Analyses of these options have recently been produced (see, for instance, Glauber 2016; Greenville 2017; ICTSD 2017; Josling 2015, Konandreas and Mermigkas 2014; Matthews 2014; Montemayor 2014; Orden et al. 2011b). Apart from these reflections, a second body of analytic works may be very useful to make progress on the second component (the disciplines on public stockholding programmes). As the final objective is to find an equilibrium point between reducing domestic support and allowing countries to implement the policies they need to improve their food security, it is extremely important to clarify the role of public stockholding programmes in improving food security in developing countries. Syntheses on this question have been produced recently (Deuss 2014; European Commission 2017; World Bank 2012).

It should also be noted, as highlighted by different experts (Diaz-Bonilla 2013; Glauber 2016; Josling 2015), countries' public stockholding programmes can be challenged at the WTO on the basis of the AoA, as well as the Agreement on Subsidies and Countervailing Measures (ASCM). Getting the right metrics on the support provided to farmers through public stockholding programmes is, therefore, important for countries' compliance with not only the AoA, but also the ASCM.

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