Which role for storage policies in managing grain price instability?
Some insights from a thought experiment
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1. Introduction

Before 2008, we were living in a world of surpluses. In this context, public stocks were mainly viewed as a source of distortions: by supporting production prices, they were thought to generate surpluses; by being released on international markets they were assumed to depress prices. It was therefore logical to put disciplines on public stocks and it is exactly what did WTO’s Agreement on Agriculture (AoA): purchases for public stocks are included in the Aggregate Measurement of Support which is capped, often at a low level for developing countries (DCs) because they almost always had a low level of AMS spending when they signed the AoA. Because food security issues were not thought to be related to availability but only a problem of access, stocks seemed unnecessary in the policy equation: trade and cash transfers were considered to be enough to guarantee food security in a less expensive and less distortive way than public stocks. And at that time, because of the surpluses, supporting agriculture was not in the agenda and the possible detrimental effect of price instability on agricultural investments was therefore not considered at a problem.

Since 2008, we are living in a new context. A structural change occurred and prices became higher and much more unstable than the previous two decades: we are now aware that food shortages may occur. Many experts think that the low level on global stocks plays an important role in this structural change (Wiggins and Keats; 2010; Wright, 2010; Bobenrieth et al., 2012) and in fact some experts even predicted the current structural in 2005 based on the observation that the changes in agricultural policies in the USA, the EU and China had generated a strong decrease in the level of global stocks (Mitchel and Levallée, 2005). Other experts attribute the structural change to increasing shocks on supply or demand due to factors such as the development of biofuels (which strengthen the relation between energy prices and food prices), the increasing food demand of Asian countries, climate change and the financialization of agricultural futures markets. In all cases, it seems that we need more stock either because the reduction in stock level is the source of the problem or because the increased magnitude and frequency of shocks on supply and demand require more stocks to buffer them.

However, the answer is not so simple. In spite of the numerous reports produced since 2008 on the “food reserves” issue (Lin, 2008; Von Braun and Torero, 2008; Demek et al., 2009; Abbott, 2010; Wright, 2010; FAO et al., 2011; HLPE, 2011; OECD, 2011; World Bank, 2012), it is difficult to have a clear idea on what should and should not be done regarding stocks. From the point of view of the international community, there are in fact two questions: Should it recommend (and support) DC storage policies or on the contrary bound their use...
(for instance by maintaining strong disciplines on public stocks at the WTO)? Should it build international grain reserves?

The present paper aims to contribute to this debate by providing a though experiment whose methodology is presented in the next section. After considering to what extent we would be able to manage grain price instability if we were living in a World without storage policies, we will consider what can be expected from adding storage policies. The last section will compare storage policies based on public stocks versus on subsidizing private storage. The main arguments presented will be illustrated with data from Mali (West Africa).

2. Methodology

In order to analyze the role (if any) that should be played by storage policies, we will develop a thought experiment. We will imagine we are living in a world without storage policies (or with minimal storage policies: small emergency reserves to manage import timelines). To what extent can the remaining alternative policies provide a « satisfying » solution to food security issues stemming from grain price instability? To what extent adding storage policies can improve the situation?

To develop this thought experiment we should first specify what we mean by “storage policies” and “alternative policies”. In previous works, we identified 4 possible strategies to manage food price instability, depending on i) whether they aim to reduce price instability or to reduce its effects and ii) on their modality of action which can be based on the market or on public interventions (see table 1).

Table 1. Possible strategies to manage food price instability

<table>
<thead>
<tr>
<th>Goal Modality of action</th>
<th>Reduce $\Delta P$</th>
<th>Reduce the effects of $\Delta P$</th>
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<tbody>
<tr>
<td>Market-based</td>
<td>A. Improving food markets by improving</td>
<td>B. Risk hedging tools</td>
</tr>
<tr>
<td></td>
<td>• Production (more responsive to prices and less dependent on natural hazards)</td>
<td>• Futures</td>
</tr>
<tr>
<td></td>
<td>• Trade (better spatial arbitrage)</td>
<td>• Options</td>
</tr>
<tr>
<td></td>
<td>• Private storage (better temporal arbitrage)</td>
<td>• …</td>
</tr>
<tr>
<td></td>
<td>• Consumption and other uses (more flexible)</td>
<td></td>
</tr>
<tr>
<td>Based on public interventions</td>
<td>C. Public interventions to stabilize prices</td>
<td>D. Targeted transfers to vulnerable households</td>
</tr>
<tr>
<td></td>
<td>• Production stimulus packages (land reserves; input subsidies when needed)</td>
<td>• Cash transfers (or vouchers)</td>
</tr>
<tr>
<td></td>
<td>• Trade policies (subsidies or restrictions on M or X)</td>
<td>• In-kind transfers</td>
</tr>
<tr>
<td></td>
<td>• Buffer stocks</td>
<td>o based on imports (commercial M or aid)</td>
</tr>
<tr>
<td></td>
<td>• Consumption policies (ex: B. Wright’s proposal on biofuels)</td>
<td>o based on national-regional security stocks</td>
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</table>

Source: adapted from Galtier (2013a)
Each of these 4 strategies can be implemented through different tools that targets different variables. For instance, the A-strategy whose aim is to stabilize prices by improving grain markets can target production, trade, storage or consumption. If we consider all the tools of all the strategies, it appears that we can play only on these for 4 variables.

Therefore, we can define 4 types of policies:

- **production-based policies** whose aim is either to provoke a structural change in production (A-strategy) or to provoke a specific response in a given context, for instance boosting production in t+1 when the harvest is bad in t (C).
- **storage-based policies** whose aim is to increase the level of storage in order to better absorb surpluses and make up for deficits. Storage policies may target private stocks (A), public buffer stocks (C) or emergency reserve (whose aim is to feed food transfers).
- **trade-based policies** whose aim to improve the compensation of surpluses and deficits between regions and countries zither by stimulating trade (A) or by regulating imports and exports (C).
- **consumption-based policies** whose aim is to guaranty that the most essential needs are satisfied. It can proceed by different ways: by forbidding some uses in periods of scarcity (see B. Wright’s proposal to remove biofuels mandates when food prices increase too much), by providing food transfers to satisfy some uses or by providing cash transfers in order to maintain the purchasing power of specific economic agents (for instance poor households).

Our though experiment consists in imagining a World without storage policies (or with minimal storage policies: small emergency reserves to manage import timelines). This “without storage policies” scenario is in line with what is recommended by the mainstream doctrine and with the current state of WTO rules.

Another thing we need for our though experiment is defining our performance criterion. We know that grain price instability can affect food security by two channels: directly by hitting consumers and indirectly by hitting farmers. In fact, protecting farmers against the risk of price collapse in order to stimulate their willingness to invest and to increase their access to credit may be very important for long run food security (Timmer 1989). However, by lack of space, this aspect will not be covered by the present article (which will concentrate on the direct effect of grain instability on consumers). Regarding the direct effects, grain price spikes may induce a reduction in poor households’ i) grain consumption (with consequences on caloric intake), ii) consumption of other foods (with consequences on nutriment intake), iii) health expenditures (with consequences on nutrition) and iv) savings, capital and resilience (with consequences on their ability to face future shocks like grain price hikes, as we have learned from recent food crises in the Sahel and the Horn of Africa).

The relevant performance criterion to capture all these effects is that **grain price instability should be managed in a way that allows poor consumers to maintain their consumption levels in basic food products (calories) without affecting too much their purchasing power in order to allow them to maintain their food consumption diversity, health expenditures and ability to face future crises.** Off course, our analysis will consider food security issues at the
global level, meaning that it will take into account the (positive and negative) spillover effects of national policies on the rest of the world.

Keeping in mind the above-explained performance criterion and definitions of “storage policies” and “alternative polices”, we are now ready to develop our thought experiment. The first step of the analysis will be to imagine that we are living in a World without storage policies. What would happen? Would we be able to manage grain price instability by through the remaining alternative policies? The second step will be to consider if adding storage policies is likely to allow us to overcome some of the limitations identified during the first step. The third step will consist in comparing what can be expected from alternative types of storage policies (building public stocks versus subsidizing private storage).

3. The though experiment: living in a world without storage policies

3.1. What can be expected from production-based policies?

The main idea of these policies is to rely on production response, by strengthening ex ante production’s ability to respond to price incentives or by stimulating it when necessary. This in particular is the case for input subsidy programs (especially those activated only when prices soar). It is doubtful that such programs can be really effective. Firstly, they are set up in an emergency and may face logistic problems that compromise their effectiveness (see the stimulus packages for rice production used by many West African countries in 2008). This problem may be resolved by setting up a structural scheme to subsidize inputs where subsidies are increased in times of crisis (see Indian and Chinese schemes: OECD, 2009; Dawe, 2010). Also, even when logistic problems are overcome, these programs may not have the expected benefits: producers may resell the inputs or not use them in the right manner. Or the weather may be unfavorable. Finally, even if these programs do have the expected effect on production, this will only occur several months later\(^1\). These input subsidy programs activated only when prices soar also have another drawback: by amplifying the supply response to price rises they may cause a cobweb effect\(^2\).

3.2. What can be expected from consumption-based policies?

Contrary to the 3 other types of policies (based on production, storage and trade) whose aim is to act on the supply side to guaranty a satisficing level of availabilities, consumption policies act on the demand side to organize the rationing by prioritizing some kind of uses. Broadly speaking, we can consider 4 types of uses/users: poor human beings (for whom it is

\(^1\) Although this timeline can sometimes be reduced by expectations: if economic actors expect the coming year to provide a bumper harvest, this encourages them to sell their stocks, what helps drive prices down before the new harvest hits the markets.

\(^2\) The same problem arises if land reserves are built up that are only cropped when prices soar (following the proposal put forward by A. Sarris to stabilize international prices).
difficult to afford buying more expensive calories through other products than grains), rich human beings (who do not have the same constraints), animals (feed) and cars (biofuels).

How can consumption policies prioritize some uses? A first way to proceed is to forbid some uses in periods of scarcity. A good example of this approach is B. Wright’s proposal to remove biofuels mandates when food prices increase too much (Wright, 2010). However, biofuels is a very special case because biofuels are currently profitable only because of the public support they receive (subsidies, mandates). It is therefore uncertain whether this mechanism can be transferred to other uses (in fact, it is even uncertain whether it can work for biofuels, since until now the governments are reluctant to implement it). A second way to proceed is to implement direct interventions to satisfy some uses. In-kind transfers (usually implemented in situation of emergency) are a good example of this approach. A third way to proceed is to procure cash transfers to poor households in order to maintain their purchasing power in periods of price increases. The idea here is that, as users are competing to get scarce food products, providing an additional income to poor household contribute to help them not to be excluded of the consumption by grain price hikes.

What can be expected from consumption policies regarding food security goals? We have to keep in mind that food security goals not only mean guaranty that the most essential needs for grain are satisfied but also that the purchasing power of poor consumers is not too much affected (otherwise food security may be affected through a reduction in food diversity or health expenditures).

Adjusting consumption by reducing the use of food products for biofuels is not an option for the great majority of DCs where biofuel production is almost zero. Applying the same strategy to feed seems difficult (moreover for many grain consumed in DCs —such as rice or millet- are not used to feed animals).

It seems therefore that the unique option we have to channel the different uses of grain is recourse to cash transfers or in-kind transfers. Can this tool be effective to guaranty the grain consumption level and the purchasing power of the poorest? To answer this question, we have to consider the role played by grain in the caloric intake and expenditures of the different social classes. Let’s consider the case of Mali (West Africa). In this country, it has been estimated that 64% of the household budget is devoted to food, and this rises to 77% in the poorest rural quintile (Bocoum, 2011). Expenditures devoted solely to grain are on average 18.4% of total budget for urban households and 34.9% for rural households (see table 2). This rises to above 44% for the poorest rural households! Moreover, grain provides most of the calories in the diet, and this for all social categories. A large proportion of the Malian population is therefore affected by rises in grain prices, and this is particularly true given that incomes are very low: 72% of the Malian population lives on less than 2 USD daily, and 36% on less that 1 USD (Gérard et al., 2008). In this context, to effectively protect food insecure consumers, food or cash transfers would have to cover a great part of the population in the country. Cash transfers are even likely to generate a further increase in
prices, affecting by this way the consumption and the purchasing power of non-recipient poor households.

Table 2: Proportion of grain in the diet and household expenditures in Mali

<table>
<thead>
<tr>
<th></th>
<th>Proportion of grain in dietary calories</th>
<th>Proportion of grain in food expenditures</th>
<th>Proportion of grain in total expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average for rural households</td>
<td>86.0%</td>
<td>51.1%</td>
<td>34.9%</td>
</tr>
<tr>
<td>Average for the poorest 20% of rural households</td>
<td>88.6%</td>
<td>57.6%</td>
<td>44.3%</td>
</tr>
<tr>
<td>Average for the richest 20% of rural households</td>
<td>82.0%</td>
<td>44.1%</td>
<td>26.5%</td>
</tr>
<tr>
<td>Average for urban households</td>
<td>73.1%</td>
<td>31.9%</td>
<td>18.4%</td>
</tr>
<tr>
<td>Average for the poorest 20% of urban households</td>
<td>78.6%</td>
<td>38.5%</td>
<td>27.3%</td>
</tr>
<tr>
<td>Average for the richest 20% of urban households</td>
<td>68.0%</td>
<td>27.4%</td>
<td>13.6%</td>
</tr>
</tbody>
</table>

Source: Bocoum (2011)

In fact, in Mali and other Sahel countries, in spite of the protection provided by targeted transfers, many households had to dip into their savings or sell assets in order to maintain their grain consumption levels, thus losing capital and resilience (as particularly highlighted by the 2005 crisis in Niger, see Michiels and Egg, 2008). This household decapitalization process questions the effectiveness of targeted transfers activated only in periods of emergency (as some households fall into the poverty trap and suffer from chronic malnutrition) and its sustainability (the cost of managing the Niger 2010 food crisis was twice that of managing the 2005 crisis in the same country, see Michiels et al., 2011). And this particularly that the frequency of crises has recently increased (over the last 10 years, Niger experienced food price crises in 2002, 2005, 2008, 2010 and 2012), and is likely to increase even more in the future (due to climate change and increased instability of international markets).

3.3. What can be expected from trade-based policies?

To analyze trade policies, a distinction should be made between tradable goods (traded on international markets) and non-tradable goods (traded only on local markets).

The case of non-tradable goods

Strictly speaking, non-tradable goods are not traded abroad. Therefore no trade policy is possible for this kind of goods.

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3 The situation can be even worse if one takes into account the fact that targeting is always imperfect (some vulnerable households being overlooked while some non-vulnerable households receive aid).
However, in practice, it is very difficult to find purely non-tradable grains (except maybe the case of teff in Ethiopia): most of the goods considered as non-tradable because they are almost not traded on international markets (such as millet, sorghum, yam, cassava) are in reality traded on a regional scale. For instance, there is clearly a regional market for millet and sorghum in West Africa. Does this mean that a country is able to regulate the price on this type of goods on its domestic markets by regulating its imports and exports with its neighboring countries? It’s difficult in practice. For 3 reasons. The first one is that in the same regions production risks are often correlated (for instance 2005 and 2012 grain price crises affected all Sahel countries at the same time). Second because countries are often members of free-trade agreement or custom unions with their neighbors. Third, because most DCs have many difficulties to control informal trans-border trade: their borders are particularly porous because of smuggling activities and corruption. Evasion of the grain export bans decided by many West African countries during the 2007-2008 clearly illustrates this porosity (Staatz et al., 2008).

Maybe another way to proceed is to stabilize the price of non-tradable by applying trade policies to tradable goods with whom they are substitutable. Is this approach workable? The problem is that tradable and non-tradable grains are often only partially substitutable. This can be illustrated by the case of Mali (see graph 1). In 2005, when the price of millet soared because of a poor harvest (the "locusts crisis"), substitution with imported rice halted the rise (4 months before the new harvest hits the market), but only after the price of millet had doubled (for a more detailed analysis, see Galtier et al., 2010)!

Graph 1. Can rice imports mitigate the instability of millet, sorghum and maize prices in Bamako, Mali?
Source: Observatoire du Marché Agricole

Therefore, it seems than policies based on production, consumption or trade are not really able to manage the problem of grain price spikes when these grains are non-tradable. To a certain extent the same conclusion may apply for grain market isolated from international markets for other reason (see for instance the case of landlocked countries).

**The case of tradable goods**

For tradable goods, international markets can be a way to stabilize domestic markets (although it can also be a source of instability for them). We will first analyze the “spontaneous effect” of international markets (case of free trade) before considering “proactive” trade policies that aim to regulate imports and exports.

Let’s begin with **the situation of free trade**. There are strong arguments in favor on this option. It seems that removing all barriers to trade allows the maximum use of current availabilities. In the same line of ideas, it seems that free trade allows the maximum compensation between surpluses and deficits all over the world, therefore diversifying the production risk and stabilizing international prices. However, many factors are limiting this stabilizing effect for grains: supply is often concentrated in the same geographical area (see the example of maize and rice), transport costs are high, international markets are thin (10% on average, 7% for rice) for grains and international markets and correlated shocks do exist (panics, speculative bubbles).

On the other side, in a situation of free trade, countries are fully exposed to the instability of international markets without means to protect themselves.

But, considering food security issue, the most decisive argument is linked to the following question: in a situation of free trade for grain, if there is a scarcity, what types of uses will be reduced to adjust the demand to the limited supply? Biofuels? Probably not: because of mandates (unless Wright’s proposal is adopted), the demand for biofuels is highly rigid (see HLPE report on biofuels). Feed? It is highly uncertain: cattle breeders from the North may have a rigid demand if they are covered on futures markets. And their purchasing power is much higher than the one of DC consumers (all the more that they often receive cash transfers (see the case of the EU CAP). Human consumption of rich people (able to get more expensive calories from other foods)? Probably not: many works based on households surveys or econometrical estimations show that the more countries (and households) are rich, the more their demand for grain is rigid (see for instance Pinstrup-Andersen et al. 1976; Timmer and Alderman, 1979; Timmer, 1981; Pitt, 1983; Alderman, 1986 and 1988; Behrman et al. 1988; Bouis, 1996; Seale et al. 2003). This result (which is illustrated by graph 2) simply means that in case of shortage and price spike, the adjustment will be made by the reduction in the consumption of poor countries (and inside countries of poor households).
Graph 2. In case of shortage and price spike, the adjustment is made by the reduction in the consumption of poor countries

Therefore, there is no guaranty that in a situation of free trade the most crucial needs will be prioritized. Can proactive trade policies lead to a more satisficing allocation of basic food products?

Theoretically, “proactive” trade policies regulating imports and exports to stabilize domestic markets have the potential to channel basic food products to the poorest countries. Exporting countries can restrict their exports to impede their domestic price to increase too much and importing countries can, to a certain extent, reach the same result by subsidizing imports. Off course, it comes at a cost (especially for importing countries), and this cost may question the sustainability of these policies (see Soulé et al., 2008 for the case of West African countries). In some cases, the effectiveness of these policies is not guaranteed because private importers may not pass the subsidy they receive in their selling price, especially in the situation (very common in DCS) where the grain importing sector is oligopolistic (see Galtier 2013a for more details on this). Anyway, this kind of proactive

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4 On some occasion, these policies may also be circumnavigated because of re-export trade: a famous example of this is Benin that for many years re-exported rice to Nigeria during the period that it prohibited or heavily taxed rice imports (see Galtier and Tassou, 1998).
trade policies can be highly effective in stabilizing domestic prices, as illustrated the effectiveness of the policy implemented by India in 2008 (see graph 3). As 25% of undernourished people in the World are living in India (Daviron and Douillet, 2013, p. 36), this policy is likely to have contributed to channel basic foods to people who most need them.

Graph 3. Effectiveness of trade policies to stabilize prices on domestic markets: the case of India in 2008.

However, there is a price to pay. And this price is huge. By banning its rice exports in order to stabilize the price of wheat, the Indian government transmitted the food price crisis from the maize and wheat markets to the rice market. In fact, the Indian export ban generated a bubble of export bans and panic imports, each measure taken by a government provoking a further increase in the international price of rice, leading other countries to take the same kind of measures (Christiansen, 2009; Slayton, 2009; Headey and Fan, 2010; Headey, 2011), as illustrated by the graph reproduced below. According to Headey (2011), around 50% of the bubble is due to export bans and 50% to panic imports.
Off course, this kind of bubble does not always happen when export restriction policies are implemented. It is likely to happen only when the country that bans its exports is a big country (whose exports account for a significant share of the quantities traded on international markets) or when there is a correlated shock leading many countries to implement the same policies at the same time.

In order to prevent this kind of bad scenario to happen again, the proposal has been made by 10 international organizations (FAO et al., 2011) to change the rules of the WTO in order to forbid export bans (which are currently allowed for food products). However, implementing this solution would leave exporting countries without protection against the instability of international prices. It would mean coming back to the free trade solution that (as we have seen) does not guaranty that in a situation of free trade the most crucial needs will be prioritized. Maybe it would lead to a less inefficient situation than the bubble of panic export and export bans (as stated by Anderson, Ivanic and Martin, 2012), but anyway it would lead to an ineffective solution regarding food security issues. Moreover the
probability of such a change of rules to be endorsed by the WTO and effectively enforced is very low\textsuperscript{5}.

It appears that, in a world without storage policies, it is very complicated to face food security issues induced by price hikes. Policies based on production and consumption are not enough to guaranty that food insecure households will be able to maintain their grain consumption level without incurring a significant decrease in their purchasing power (which is likely to generate food security problem through the reduction in food diversity, health expenditure and households’ resilience). Policies based on trade can be effective in preventing price hikes on domestic grain, but by so doing they export instability on international markets. Although this kind of policy may seem efficient at the country level, they are clearly ineffective from a global perspective.

To what extent adding storage policies could allow us to improve this pessimistic picture?

4. Can we better manage grain price instability by adding storage policies?

Can the situation be improved thanks to storage policies? In this section, we will consider storage policies from a general point of view as policies whose aim is to increase the level of stocks (different types of storage policies will be compared in the next section). We will successively consider the case of closed economies and the case of open economies.

4.1. The case of closed economies

We will say that an economy is closed for a given commodity if it cannot import or export the considered commodity. It is the case of non-tradable goods: Ethiopia is a closed economy for teff and West Africa is almost a closed economy for millet and sorghum (but Mali is not as it can trade millet and sorghum with its neighboring countries). Global markets are also closed economies because as they aggregate all supply and demand, they don’t have an external market to trade with.

For closed economies, apart from production and consumption policies (that, as we have seen, are not really effective), storage policies are the unique available option to manage price instability because, by definition, no trade policy can be used for these economies.

\textsuperscript{5} The lesson of the G20 negotiation is that many countries are against. From the initial proposal to forbid export bans, the G20 agreement only keep the proposal to forbid export bans on WFP food aid. Moreover, even this proposal has not been endorsed by the WTO. In addition, if new rules were adopted, it would probably be difficult to enforce them as for many exporting countries, the dilemma would be “complying with the rules of the WTO versus maintaining prices at a reasonable level to avoid food insecurity and social instability”.

Can storage policies be effective in managing price instability? In other words, which effect on prices can be expected from an increase in the level of stocks? Two approaches are possible. The first one consists in analyzing the correlation between prices and stocks (or stocks to use ratios). As this correlation is usually low (see Gilbert’s article in this book), some experts inferred that stocks are not a good target to stabilize prices (OECD, 2011). The second approach consists in analyzing which levels of stocks are compatible with price hikes. Theoretical models (William and Wright, 1991) showed that a low level of stock-to-use ratio is a necessary condition for price hikes and this result has been confirmed empirically for international grain markets (OECD, 2011; Bobenrieth et al., 2012 and graph 5). Therefore, a policy that would succeed in holding stocks above a minimum level would theoretically be sufficient to avoid price hikes. Of course, the situation is in fact more complex: the localization of stocks has to be taken into account as well as their nature (private vs. public stocks, we will come back to this point in the next section).

Graph 5. Grain price hikes only occur when global stocks are low (the case of the international maize market)

Sources: IMF for prices and USDA PSD for stocks

In practice, is it possible to hold stocks above the level required to avoid price spikes? A very famous result is that if we wait an infinite time, with a random supply, a moment will appear when stocks will be exhausted (Townsend). This result has sometime be interpreted as the proof that stocks are only able to manage price collapses (it is always possible to absorb
surpluses by building stocks) but that they are not adapted to manage price hikes (because they may be exhausted). No doubt that stocks can better avoid price collapses that price hikes (William and Wright, 1991), but does this means that they are useless to manage price hikes? As stated by Newbery and Stiglitz (1981), the criterion should be the probability of success of stocks balanced with their cost: if stocks can avoid or reduce many price hikes (although not all), they may still be very useful.

4.2. The case of open economies

Open economies refer to tradable goods, including “only regionally tradable” goods if one considers national policies (Mali is an open economy for millet and sorghum whereas West Africa is almost a closed economy for these goods).

For these economies, trade policies can be used and we have seen that, they can be very effective to stabilize domestic prices. However, it is not always the case: in some countries, the pass through of import subsidies (or tax removals) by grain importers proved to be often uncertain, partial and delayed (see Soulé et al., 2008). Moreover, these trade policies may destabilize international prices and, by this way, affect other countries (as happened with the wheat export ban implemented by India in 2008, see section 3). Can storage policies provide an alternative (more cooperative) solution to manage grain price instability?

For open economies, domestic prices usually reflect prices on international or regional markets. Does this means that, storage policies cannot be effective in managing prices? No: because of i) transport costs from the ports to the country hinterland and ii) differences in quality, domestic prices are partially disconnected from international prices: since they remain in the band determined by the export parity price and the import parity price, they are driven by internal factors. This means that there is a potential role for national storage policies in stabilizing domestic prices, especially when the parity price band is broad (what is for instance the case for landlocked countries).

Is it possible to do more with storage policies? The answer is yes, on the condition that initiatives are taken to move parity prices. Basically, for a country there are two ways to do this: implementing a trade policy to complement its storage policies or cooperating with other countries. The first strategy is easy to understand: if a country spends money in increasing its level of stocks, to get the benefits of this policy in a period of bad harvest, it may have to restrict exports in order to reduce the leakages of subsidized grain to other countries (when these restrictions are legal -neighboring countries are often members of free-trade agreement or custom unions – and may be implemented effectively). The second strategy (cooperation) is probably more interesting: it may mean that countries can coordinate their storage policies or even build a common storage policy. This strategy can

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Note the parallel with economic stimulus packages whose benefits can be absorbed by other countries through the increase of imports of the country that implements it. The solutions may be increasing import
be implemented at the regional level, as illustrated by the initiatives developed by ECOWAS countries to coordinate the use of national public stocks (RESOGEST) and to build a regional grain reserve. Another example is the ASEAN+3 rice reserve. This approach can also be implemented at an international scale where both the coordination of national reserves (Lin, Galtier) and the building of international reserves as been envisaged (Wright, 2010; OECD, 2011). Note that these two strategies can be combined: countries can develop national storage policies and at the same time build common storage policies at a larger scale.

To illustrate what can be the value-added of storage policies, let’s consider again the mechanism of bubbles and panics, as it occurred in 2008 on the rice market (graph 6). There are several ways to break the vicious cycle between price increases, expectations that prices will continue to increase and policies to cope with this expected increases, policies that –as export bans and panic imports- contribute to generate a further increase in international prices. We have already seen one of them: forbidding export bans (to break the relationship between expectations of price increases and export restriction measures). As we already mentioned it, the relevance and the feasibility of this policy are questionable. Another approach would be to disseminate information on stocks (to break the relationship between price increases and expectations of price increases). This approach has been implemented through the Agricultural Market Information System (AMIS) proposed by the G20 and hosted at FAO. However, its relevance is also questionable (if global stocks are low, transparency on stocks can even generate speculation and panic), as well as its feasibility (many governments do not know the level of private stocks in their country -see Abbott, 2013- and some of them are reluctant to communicate data on their public stocks).

Graph 6. To what extent can storage policies contribute to avoid bubbles and panics?

levies, coordinating economic stimulus packages with other countries (the main commercial partners) or implemented this policy at a regional level (for example the EU).
What can be the contribution of storage policies in solving the problem? For exporting countries, storage policies cannot be an alternative to trade policies: the only way these countries have to protect themselves from price hikes is to restrict their exports. But for importing countries, storage policies are likely to reduce panic imports. Would it be enough to break the vicious cycle? It is an open question but if we remember that, in 2008, around 50% of the bubble was due to export bans and 50% to panic imports (Headey 2011), there is as much to expect from national public stocks as to the prohibition of export bans by the WTO. How to boost national storage policies in grain importing DCs? Some of them seem to be willing to do so. Therefore, relaxing WTO rules on public stocks may be an effective first step in that direction (note that the peace clause mentioned in the Bali agreement only covers existing public storage programs). Another (complementary) approach would be to build grain reserve at the international level. The main advantage of this option is to offer a “second line of defense” in the case national storage policies and WTO disciplines are not sufficient.

Storage policies received a lot of criticism. It is said that country storage policies are likely to depress international prices if part of the stocks are periodically sold at low prices on international markets (thanks to export subsidies). This has been the main criticism addressed by the USA to the G33 proposal during the Bali WTO negotiation in 2013. This risk is real (as illustrated by the US and EU past policies) but it has to be balanced with the risk of grain price hikes allowed by the lack of storage policies (as the one that occurred in 2008).

The idea to build international grain reserve has been even more criticized. It has been discussed (and rejected) by two recent reports commissioned respectively by OECD (2011) and the International Grain Council (Wright, 2010). The main argument against this idea seems to be the failure of International Commodity Agreements or ICAs (OECD, 2011). However, ICAs mainly failed because their real goal was not to stabilize but to support prices (Gilbert, 1996; OECD, 2011) which led some of them to generate such surpluses that storage schemes found themselves on the verge of bankruptcy (e.g. cacao agreement) while others were dropped due to the diverging interests of producer and consumer countries (e.g. coffee agreement). It cannot therefore be concluded from their failure that international public stocks are not able to stabilize grain international prices (HLPE, 2011): on the contrary, the ability of ICAs to effectively support prices over a few decades seems to show that it is possible to reach the far more modest goal of stabilizing prices (around their mid-term trend value). Other arguments (more convincing) have been advanced like the risk of speculative

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7 In spite of the fact that, for countries, stabilizing prices through trade policies is often less costly than using buffer-stocks (see Jha, and Srinivasan, 1999 and ODI 2010). But, since the 2008 crisis, many countries don’t trust anymore the international markets to supply them.
attacks and, for the case of maize, the existence of an alternative policy based on regulating biofuels mandates (Wright, 2010). To what extent these considerations overcome the benefits to be expected from international reserves? It is an open question. Maybe, such reserves would be relevant only for rice because for this commodity there no future markets (therefore a much lower risk of speculative attack) and no opportunity to buffer price hikes by regulating biofuels mandates, due to the low substitutability between rice and maize or wheat (Gilbert, 2012).

To sum up, we have many reasons to think that storage policies may increase significantly our ability to manage grain price instability to improve food security, both for tradable and non-tradable grains. It is not possible however to give a definitive answer on this subject because this would imply to quantify the costs and benefits of storage policies (what is extremely difficult to do) but we may suspect that the benefits are likely to exceed the costs at least for some region of the World (those submitted to very frequent grain price hikes such as the Sahel and the Horn of Africa) and for some commodities (for instance rice versus maize or wheat). It is therefore worth to consider the type of storage policies which could provide the expected benefits in the most efficient way.

5. Which type of storage policies would be more efficient: building public stocks or subsidizing private storage?

Building public stocks is the “classical” storage policy implemented. Public stocks can take the form of buffer-stocks (category C on table 1) or emergency reserves (category D). In the first case, their aim is explicitly to stabilize prices whereas in the second case, stocks are used to feed targeted food transfers programs. In practice however, the difference is not always so clear: many public stocks are used to guaranty a floor price to farmers and to feed food transfers programs. And both types of stocks may affect prices depending on the quantities injected on the market see Dorosh and Ahmed, 2009). When well-managed (and complemented by the necessary trade policies), public stocks policies succeeded in stabilizing grain domestic prices, as illustrated by the case of Indonesia (Timmer, 1996).

However, the effectiveness of public stocks in stabilizing prices has been questioned. The main criticisms are that public stocks i) may be exhausted and therefore unable to guaranty ceiling prices (all the more that they can be subject to speculative attacks) and ii) crowd out private storage as private stakeholders may be reluctant to hold stocks if they fear that a release of public stocks may drive the prices down. The risk of stocks being exhausted (which applies to all storage policies, public stocks but also policies based on subsidizing private storage) can be reduced by increasing the size of stocks. But as it also increases the cost of the storage policy there is clearly a trade-off here, meaning that the optimal storage policy should include a non-zero risk of failure. The crowding out effect on private storage may mean that public stock only substitute for private stocks and can even result in a decrease in
the level of (private + public) stocks and increased price instability (Chapoto and Jayne, 2009). This mainly occurs when interventions are not predictable (Jayne, 2012). Therefore the use of public stocks should be based on clear rules, typically when the price reach a predefined ceiling or when some food security indicators (provided by Early Warning Systems) switch into the red. The crowding out effect on private storage can also happen if the ceiling price is set at a too low level. The fixing and updating of intervention prices (floor price and/or ceiling price) is therefore crucial for the success of price stabilization policies. And that is the reason why some countries set up multi-stakeholders discussion forum (linking the ministries and representatives of the different categories of market players) to discuss the triggers and modalities of public interventions on grain markets (for the case of Madagascar, see David-Benz 2013).

The cost of public stocks has also been emphasized. It is true that in some countries this cost proved to be very high, as is the case in Zambia where some years the public stocks bought more than 25% of all the maize produced in the country. However, a successful price stabilization can be reach with much smaller public stocks: in Indonesia, the public stock (BULOG) succeeded in stabilizing the price of rice by buying only 8.2 percent of average rice production and it was never more than 10 percent (Timmer, 1996)\(^8\). What resulted in 1991 (a year of intensive activity of BULOG) in a cost of about 0.11% of total GDP and 1.2% of the National Budget (Timmer, 2013).

Subsidizing private storage has been recently presented as alternative to public stocks (see Gouel and Jean, 2012; Gouel and Martin in this book). At first glance, this option is attractive as it seems that it may be more effective than public stocks (because it would not crowd out private storage) and less costly (because private storers are often more efficient). However, things are more complex.

The first difficulty with subsidizing private storage seems is to implement it on the ground. What should be subsidized exactly? Interest rate? But it is a macroeconomic variable and if one implements credit programs targeted to grain marketing, it would be difficult to control that the credit is actually used to store grains (we had a lot of bad experiences in this area). Should we subsidize storage facilities? It is surely possible when the State has its own (unused) storage facilities. But it is not always possible and is likely to be unfair (risk to subsidize only some –big- traders). Should we subsidize hedging tools? They are almost not used for grain in DCs. Phytosanitary products? But they are very few used and they always accounts for a very small share of the storage cost. Maybe a way to proceed would be to subsidize warehouse receipt systems (WRS). But, this operon seems to be difficult to implement for now, as WRS did not succeed in attracting a significant share of the grain traded, in spite of the external support they received in many developing countries (see for instance the case of Eastern and southern African countries). Therefore, it seems extremely

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\(^8\) The “secret” is that BULOG did buy almost half of the deviation in production (from trend), see Timmer (1996).
difficult to transfer subsidies to grain storers, and even more to guaranty that the money received will result in increasing the quantities stored.

There is another to be skeptical on the potential effectiveness of subsidizing private storage. In some occasions, private storage is the problem, not the solution. It is particularly the case in situations of panics or speculative bubbles provoking stock hoarding. Empirical cases have been reported (Sen, 1980; Ravallion, 1987) and simulations showed that these situations are likely to occur in DCs: for instance, in Pakistan, a 2-week increase in consumer stocks would be sufficient to generate a 46% increase in price (see Dorosh and Rashid, 2012). This kind of situations highlights the fact that private stocks and public stocks are not equivalent: for instance in Pakistan, according to Dorosh and Rashid (2012), a small amount of public stocks would be sufficient to stop panics and bubbles.

Last but not least, this policy may prove to be expensive (for India, the necessary subsidy would be 97% according to Gouel and Martin in this book), maybe more than managing public stocks.

Subsidizing private storage is also likely to generate more distortions than public interventions triggered by predefined and transparent floor and ceiling prices, especially if the way chosen to transfer the subsidies results in excluding some categories of storers (for instance if the choice is to subsidize WRS, it would exclude farmers and traders living far from the accredited warehouses or unable to reach the minimum quantity required, usually several metric tons).

### 6. Concluding remarks

The though experiment developed in this article shows that, in a world without storage policies, it would be very complicated to face food security issues induced by price hikes: policies based on production and consumption are not sufficient to guaranty that food insecure households will be able to maintain their grain consumption level without incurring a significant decrease in their purchasing power (which is likely to generate food security problems through a reduction in their food diversity, health expenditures and resilience). Policies based on trade are not effective for isolated markets (see the case of non-tradable grains), and when they are effective, they are likely to export instability on international markets, by this way affecting other countries.

Adding storage policies can be very useful to manage grain price instability on isolated markets. For tradable grains, storage policies can provide a more cooperative solution, as national storage policies can partly substitute for destabilizing trade policies and as common

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9 Maybe bubbles and panics can be solved without public stocks if the government can implement requisitions on private stocks. However, this kind of measures (even strictly regulated: restricted to situation of severe crisis and, of course and compensated by paying the storers) are likely to crowd out private storage.
Storage policies can be built either by coordinating national storage policies or by building regional or international reserves. Storage policies can take the form of public stocks or subsidies to private storage. Although the second option may seem attractive, it should be considered with many cautious as it raises very challenging implementation issues (much more than public stocks) and as its effectiveness in situation of bubbles and panics is questionable (in fact, subsidizing private storage can even increase stock hoarding).

However, to give a definitive answer to these questions is extremely complicated as it would require quantifying the costs and benefits of storage policies and their alternatives (including the spillover effects on other countries). Models can be a way to do this but the results of current models should be taken very carefully as they rely on unrealistic assumptions that bias their results (Galtier 2013b). For instance, the result that private storage is efficient in stabilizing prices relies on the assumptions that storers are assumed to be risk neutral and to build perfectly rational expectations (what excludes bubbles and panics by construction). Moreover, they do not include the implementation and governance issues in spite of the fact that past experience showed that policies’ effectiveness and costs proved to depend a lot on the way they are implemented (Jayne). And if public stocks, private storage subsidies and their alternatives (trade policies, targeted cash transfers, input subsidies…) raise huge problems of implementation, these problems are likely to be much higher for some of these policies (especially for subsidies to private storage).

In spite of its limitations, can our though experiment provide some policy implications? A first of implications are related to WTO rules. Current rules allow export restrictions without limitation (although they may have a strong destabilizing effect on international prices) but severely restrict public stock10 (in spite of the fact that they are likely to contribute to stabilizing international prices by increasing the level of global stocks). It is true that country storage policies may depress international prices (if part of the stocks is periodically sold on international markets at subsidized prices), but this risk has to be balanced with the risk of grain price hikes allowed by the lack of storage policies (as the one that occurred in 2008). A second set of implications is related to international grain reserves. The arguments advanced against this idea (like ICAs’ failure) are not really convincing. Therefore this idea probably deserves to be studied carefully.

Two important aspects of the stock issue were not included in the present article and would require further research. The first one is the potential role of storage policies in preventing price collapses. It is a very important topic for different reasons. First, because holding prices above a floor is likely to have very important consequences on long run food security because they can boost farmer investment (Timmer 1989). Second, as we already mentioned it, because storage policies are likely to be more effective in preventing collapses than hikes.

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10 All the more than the rules used to calculate the contribution to AMS of public stocks’ purchases strongly overestimate the real amount of subsidies they provide (Galtier 2013c).
Third because there is a strong interrelation between managing price collapses and price spikes: if stocks are used to guaranty floor prices, they are available in period of scarcity to protect consumers. The second aspect that needs to be included in the analysis is the role of local public stocks (cereal banks) in complement of national, regional and international stocks analyzed in the present article.

7. References


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