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Alternative Policies to Buffer Stocks for Food Security

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Alternative Policies to Buffer Stocks for Food Security

Raphaël Beaujeu, OECD

Public stockholding remains a major concern in multilateral negotiations on agricultural trade liberalisation. This paper focuses on identifying alternative policies to buffer stockholding. It first positions buffer stocks within the range of policies aimed at price stabilisation and food security, with a view to identifying alternatives to meet the same policy objectives. The paper then examines the most direct alternative to public food stocks for price stabilisation, namely private stockholding. It explores experience with private stockholding to assess its effectiveness in achieving price stabilisation objectives and the necessary conditions for implementation. As the price stabilisation role of buffer stocks is also argued to be necessary for food security, the paper also explores alternative approaches that governments may take to meeting this food security objective through social safety nets. Some illustrative examples are explored to highlight key elements for successful implementation. The paper concludes with some observations regarding policy alternatives to buffer stocks.

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Executive summary

Public buffer stocks, aimed at price stabilisation and ultimately food security, are a feature of agricultural policy in a range of countries. Previous studies tend to show that buffer stock policies are rarely effective in achieving their objective of price stabilisation and, even where they are, the effect on food security for vulnerable households is weak at best. Such programmes generally also represent a significant cost to the public budget, and crowd out private sector activity in the storage market. Moreover, buffer stocks programmes have given rise to major concern in multilateral negotiations on agricultural trade liberalisation in view of their potential effects on international markets (OECD, 2015; AFD, 2014).

Against this background, this study seeks to explore alternative policies to buffer stocks. There are of course a range of policy objectives that governments may pursue in buffer stocks, and equally, a wide range of possible policy approaches that might be taken to achieve the aims of price stabilisation and food security. For the purposes of this paper, the focus is on the objective of governments to protect both producers and consumers from harmful effects of price volatility and two main possible approaches in identifying alternatives: (i) alternative policies aimed at ensuring price stabilisation for key commodities; (ii) alternative policies for protecting producers and consumers from long term food insecurity resulting from fluctuating prices, not by stabilising prices themselves, but by seeking to mitigate the impact of price fluctuations on households' income. The paper applies a case study approach to examine the effectiveness of selected alternative policies, with particular attention to the methods of implementation. On the basis of the case studies, the study makes some 'best practice' observations on the use and implementation of the alternative policies examined.

Support for private storage, if well designed, provides a less distortionary and cheaper alternative to buffer stocks. By stocking (destocking) when they predict price increases (decreases), storers contribute to reducing price volatility while reducing the cost to the public purse of storage costs. However, for private storage to be effective, governments must first remove other price stabilisation policies – including buffer stocks, which can crowd out private sector activity.

The effectiveness of support policies for private storage depends on their design and supporting environment. The case studies examined here show that interest rate subsidies have proved to be relatively less effective than other possible interventions. Both past design flaws and issues with the incentives created have shown that such programmes have not had sufficient impacts on price volatility to be considered effective. Conversely, past experience with the use of warehouse receipt systems suggests some promise. Experience in using such policies has seen the emergence of a group of certified operators subject to very low storage costs which has promoted the quantity of product stored. Critical however, are robust contractual arrangements (including enforcement) and certification of warehouses. Promoting transferability of rights over stored product through commodity exchanges can also bring additional benefits, if the market is sufficiently developed.

As for mitigation strategies, large scale adaptive safety nets providing predictable and regular transfers, such as the Productive Safety Program (PNSP) in Ethiopia, Progresa in Mexico, and the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) in India, have shown that they are capable of improving consumption and nutrition in vulnerable households significantly while creating the conditions conducive to a long term reduction in food insecurity for both producers and consumers. In Ethiopia, the programme has given rise to a significant increase in agricultural yields as well as an accumulation of production assets while in India, the increase in the general wage level resulting from the community work projects has encouraged producers to invest in new labour-saving technologies. In Mexico, beneficiaries invest a proportion of the transfers received in production activities, thereby offering them – five years down the road – a higher level of consumption than otherwise achievable. Further, in contrast to buffer stocks, experience shows that the potential crowding out effects on the private sector, that can be created through obligations such as work requirements, can be avoided if the necessary precautions are taken when the programme is designed.

Introduction

Public stockholding programmes are a feature of agricultural policy in a range of countries. The generic term "food stocks" covers several types of system, each fulfilling a specific function. In addition, a stock may be called by different names for the same function (e.g. buffer stocks may, in some cases, be called "regulation stocks" or "intervention stocks"). There is no one single stock classification used (OECD et al. 2011; World Bank, 2012). The present study distinguishes three types of public stocks: (i) buffer stocks, (ii) food safety net stocks, (iii) emergency stocks (Box 1).

Buffer stocks can seek to support or stabilise prices, also often with the stated aim of food security. For example, the Indian Food Corporation act 1964, refers to "Maintaining satisfactory levels of operational and buffer stocks of foodgrains to ensure National Food Security"[1]. Similarly, the mandate of the China Grain Reserves Corporation (Sinograin), in charge of managing the buffer stock, is "to help implement government regulation policies in order to secure grain market stability, and to safeguard national food security"[2]. Of the four dimensions of food security as defined by the FAO, buffer stocks can be aimed at addressing access to food and the stability of supplies, but are not directly concerned with the dimensions relating to the availability and use of foodstuffs (which can result from other risks, such as that of natural disasters limiting food supply).

Price stabilisation and food security objectives of buffer stocks policies are focused on producers when the policy is designed to maintain a floor price; on consumers when it is designed to maintain a ceiling price;, or on both producers and consumers when the aim of the policy is to stabilise prices. The ways in which buffer stock policies are designed also influence the type of food security that these policies seek to address. When a buffer stock is intended to maintain a specific price level, the aim of the policy may be to only reduce temporary food insecurity by limiting price changes on a short term basis. When a buffer stock is designed to stabilise prices, the aim of the policy also focuses on long-term food security insofar as price stabilisation can only be achieved over several years.

Recent empirical studies undertaken in Asia and Africa (OECD, 2015; AFD, 2014) have shown that buffer stocks policies rarely achieve their objectives of price stabilisation and food security. Reasons why these policies failed in stabilised prices vary across countries, but include an insufficient level of public stock to be able to influence market prices; the weak capacity of government to intervene in markets at the right time; and lack of transparency and clarity in the governance of the buffer stock policies. Moreover, these policies have been shown to have hidden costs, notably in terms of crowding out effect on private sector. Some national case studies indicated that stockholding programmes were associated with lower overall price volatility; however, in those countries where major reforms in trade policy had also been undertaken, trade most probably had a more significant impact on decreasing price volatility than stocks.

Box 1. Types of public food stocks

Buffer stocks can be used: (i) to maintain a floor price for producers, (ii) to maintain a ceiling price for consumers and (iii) to limit price fluctuations. By releasing stores when prices are too high or collecting stores when they are too low, public stocks could try to maintain the price in a "price band" in order to smooth price variations on the long term.

Food safety net stocks function as working stocks for regular food distribution programmes aimed at providing food safety nets for the impoverished and the chronically food insecure.

Emergency stocks are kept to provide assistance during transitory food shortages and crises, which are caused by sudden supply shocks, such as natural disasters.

While, given their purpose, buffer stocks only exist on a national scale, emergency stocks and food safety net stocks also exist at the local level and emergency stocks may also be held on a regional basis

Source: OECD (2015).

1. http://fci.gov.in.

2. http://en.sinograin.com.cn.

Even when buffer stocks policies are able to achieve their price stabilisation objectives, the effect on access to food for vulnerable households has been weak, if not negative. This is due to the fact that most of the benefits derived from price stabilisation are mainly received by non-poor consumers and producers and are "leaked" to high-income individuals.

Moreover, buffer stocks programmes have given rise to major concern in multilateral negotiations on agricultural trade liberalisation in view of their potential effects on international markets. As part of the agricultural negotiations at the WTO, a temporary "peace clause" on public stockholding was agreed in 2014 to grant exemptions to some countries from provisions in the Uruguay Agreement on Agriculture to allow them greater flexibility in the acquisition of food stocks for food security purposes, including buffer stock policies. It was agreed that the peace clause would remain in force until a permanent solution was agreed.

Against this background, this study seeks to explore alternative policies to buffer stocks. There are of course a range of policy objectives that governments may pursue in buffer stocks, and equally, a wide range of possible policy approaches that might be taken to achieve the aims of price stabilisation and food security. For the purposes of this paper, the focus is on the objective of governments to protect both producers and consumers from harmful effects of price volatility and two main possible approaches in identifying alternatives: (i) alternative policies aimed at ensuring price stabilisation for key commodities; (ii) alternative policies for protecting producers and consumers from long term food insecurity resulting from fluctuating prices, not by stabilising prices themselves, but by seeking to mitigate the impact of price fluctuations on households' income. The paper applies a case study approach to examine the effectiveness of selected alternative policies, with particular attention to the methods of implementation. On the basis of the case studies, the study makes some 'best practice' observations on the use and implementation of the alternative policies examined.

The study is organised as follows. Section 1 analyses alternative policies aimed at stabilising prices, focusing on private storage as an alternative to public buffer stock programmes. It notes that government support may be necessary to ensure an adequate supply of private storage and discusses, with the aid of case studies, how this might best be implemented. Section 2 then examines alternatives to buffer stocks aimed at ensuring food security by mitigating the effects of price volatility on incomes of vulnerable households. While a range of options is available, the focus of this paper is only on the social safety nets which aim at both producers and consumers and at helping vulnerable households with *ex ante* management of food security risks. Case studies highlight key design features of selected programmes.

1. Support for private stocks in response to demands for price stabilisation

1.1. Alternative price stabilisation policies

A wide variety of policy measures have been implemented by governments in an attempt to manage price movements. Measures used by governments vary not only in scope and complexity but also in their effectiveness and impacts on markets. One policy response has involved **introducing price regulation**. Price regulation can be achieved by controlling production through production quotas or by controlling foreign trade through taxes or subsidies and quantitative restrictions (quotas, bans or licenses) on imports or exports. Price regulation can also be implemented by means of stock control through buffer stocks. Depending on the situation, these can be floor prices, ceiling prices or a price band. Given the extensive literature which analyses the effectiveness of measures aimed at controlling production and foreign trade with regard to price stabilisation (and long-term food security), they are not re-examined here.

Other policy responses have sought to encourage **market-based price stabilisation mechanisms**. Clearly, broader features of the overall environment for agricultural policy, such as the availability of infrastructure (transport, communication and storage) and market institutions (grades and standards, commodity exchanges allowing demand and supply to be centralised) potentially facilitate spatial and temporal arbitrage by producers, traders and consumers and enable prices to be harmonised, thereby reducing their variability. A more direct alternative to public buffer stocks to address price stabilisation is private, profit-oriented storage operators. Given the questions over the effectiveness of public stocks in stabilising prices – and the high cost of these stocks for the public budget – it is worth examining the effectiveness of the private sector alternative. The effects of private storage on price volatility and the different methods available to public authorities to support private storage are examined below.

1.2. Typology of private stocks

Private stocks cover a wide variety of storage actions by private actors. Almost all goods can be stored, with the shelf life and cost varying according to perishability and bulk. In general, buffer stocks are designed to stabilise the price of staple products, usually cereals, and as such the analysis below focuses specifically on private cereals stocks. Moreover, cereals account for a large share of per capita daily calorie consumption among poor people in developing countries.

Private cereals stocks can be distinguished by whether or not the agent owns the stock and the infrastructure in which it is stored. Owners of goods may have their own warehouses or hire the services of professional storage operators. The owner of the good may also choose to stock cereals alone or combine their goods with those of other operators in the same warehouse. This strategy can offer a number of advantages, such as increased bargaining power with professional warehouse operators.

Another means of distinguishing the different types of private stock involves classifying them according to the motive – profit or precautionary – of the owner of the goods stored (Box 2).

Warehousing with a view to making a *profit* is based on the hope that the future price will be higher, with the difference being sufficient to cover the warehousing costs. This commercial activity is practised by dealers directly on a small scale or alternatively by traders on a large-scale through agricultural commodity exchanges; for example, In South Africa, the quantity of cereals stored and traded on the Johannesburg Stock Exchange represented 25% of the domestic production in 2012. Seasonal commercial warehousing is also adopted by farmers stocking production at the end of the harvest when prices are low to sell later in the year when the availability of products is lower and prices have increased.

*Precautionary stock*s can also account for a large proportion of private stocks, particularly in developing countries; for example, in the Philippines, precautionary stocks represented 60% of total private stocks in 2014. It is nevertheless difficult to evaluate accurately the level of precautionary stocks in different countries, primarily due to the paucity of statistical data (Box 2). The reasons underlying precautionary stocks are subject to debate. Some studies suggest households stock cereals to ensure calorie intake (Deininger et al., 2007). Others suggest that households stock cereals to serve as a liquid asset representing a relatively safe investment (Stephens and Barrett, 2011), especially where access to other forms of savings or investment is limited.

Box 2. Typology and measurement of private stocks

Commercial stocks: refers to all stocks held with a view to achieving a margin between the market price when the stock is acquired and the price when the stock is sold. The stock can be held by any type of private operator (traders, farmers or non-agricultural households), in-house or outsourced, individually or grouped.

Precautionary stocks: refers to all stocks held as part of a risk management strategy enabling the owner to smooth consumption or as a form of temporary savings. These stocks can be held by any type of private operator (traders, farmers or non-agricultural households), either individually or grouped. They are referred to by different names in different countries. In West Africa, for example, they correspond to family stocks.

At national level, stocks are estimated in two ways: through surveys of traders and farmers, or by considering stocks as a residual variable allowing supply and demand to be balanced.

The residual method can be problematic for several reasons. In particular, it requires an estimate about the levels of stocks at a particular point in the past; errors in that initial value irremediably lead to errors in subsequent estimates. More importantly, the residual approach requires reliable figures for the other elements of the balance. Even small inaccuracies, for example in production or utilisation, could give rise to relatively large errors in the estimation of stocks. Measurement of stocks using the residual approach is therefore prone to estimation error. The residual method also has the major weakness of not distinguishing between commercial stocks and precautionary stocks. These stocks are founded on very different rationales and therefore do not necessarily demonstrate the same response to a change in the economic environment.

Furthermore, when countries have public stocks, the residual method is no longer sufficient to obtain an estimate of private stocks. When public stock data are easily accessible, it is possible to obtain private stocks based on total stocks. However, this method does not allow the different types of private stock to be differentiated.

By contrast, regular and representative stocks surveys can yield higher quality information if well designed and targeted at the main stockholders. Moreover, better stocks figures from surveys could help improve knowledge for other elements in the balance, allowing estimation of other residual variables.

In November 2014, the inter-agency platform AMIS (Agricultural Market Information System), the main aim of which is to improve the transparency of information concerning agricultural markets, organised a meeting of experts on stock measurement practices. One of the conclusions was that estimating stocks using surveys is a relatively rare practice. Only

nine countries have tried surveys: the United States, Canada, the Philippines, Brazil, Australia, Argentina, Ukraine, the United Kingdom and Kazakhstan. Of these, surveys have not been conducted in Argentina since 2008 or in Australia since 2012 and Brazil only collects data from traders, not from farmers. Furthermore, even in these countries, the surveys are too recent to be used for serious temporal analyses.

Among developing countries, India and the Philippines publish long annual and monthly (Philippines) data series concerning the level of public stocks. However, only the Philippines has an online database on private stocks. This database, published by the National Food Authority (NFA) is an example in the field of data collection on storage. It provides annual and monthly storage data for rice and corn, differentiating between traders', household and state stocks. This information system can be cost-effective as stocks surveys are integrated into existing production surveys.

1.3. The effects of private stocks on price volatility

Most research concerning stockholding and price volatility relates to the effects of public stocks (starting with the early work of Wallace around 1926 to more recent framing by Newbery and Stiglitz, 1981). Research into the effects of private stocks only began in earnest during the 1980s.

The competitive storage model has highlighted the stabilising effect of commercial stocks on prices. It has become a reference model in that it allows the price dynamics of agricultural products to be reproduced and explained. The model includes three types of actors: consumers, producers and storers. In addition to supply from producers and consumer demand, market equilibrium depends on stock variation. This is determined by the behaviour of the storers: they stock when estimated future prices are higher than current prices and sufficiently high to cover storage costs,[3] but destock when they predict that future prices will not be high enough to cover storage costs.

Price volatility is primarily caused by the inflexible nature of supply and demand which characterises agricultural markets. The *commercial* storage behaviour described above increases the elasticity of supply and demand and so helps moderate price movements. With private stocks, the supply response is larger and faster. For example, in the event of a poor harvest, prices increase and traders destock, moderating the fall in supply due to the reduced harvest and thereby also contributing to containing the price increase. In the absence of stocks, the only solution is to wait for the next harvest for supply to respond to the price incentive. Private stocks therefore increase the elasticity of supply. In the case of falling prices, demand is more elastic as storers are willing to increase their purchases faster due to their speculative interest. Moreover, it is usually possible to stock more to absorb surpluses but once stocks are exhausted, it is not possible to continue destocking, creating differences in the effects during price falls versus rises (Williams and Wright, 1991).

By contrast, *precautionary* stocks are not necessarily released to the market when prices are high and withdrawn when prices are low. During periods when prices are low, households may rebuild their stocks in anticipation of high prices. In this respect, they do not differ from commercial stocks and their behaviour contributes to containing the fall in local prices. However, when a household is faced with a shock, it will sell or consume its stock even in periods when prices are low – especially in instances where stocks are held as a form of savings. Furthermore, when prices are high, households holding precautionary stocks do not necessarily sell. They may consume their stocks directly or continue to stock in order to be able to cope with any future setback. This precautionary behaviour, also termed the convenience yield (Kaldor, 1939), goes some way to explain why it is not uncommon to witness an increase in stocks despite a fall in prices being forecast. These effects mean that precautionary stocks (while meeting some food security needs) do not typically exercise the stabilising effect on prices offered by commercial stocks.

The final key result of the competitive storage model is that the introduction of private storage generates an increase in global wellbeing due to the price stabilisation achieved (Scheinkman et al., 1983). This welfare gain can result from an increase in either consumer or producer surplus, or from increases in both. The exact distribution of the gains depends on parametric choices (supply and demand elasticity, demand function curve) (Williams et al., 1984).

The stabilising effects of private stocks on agricultural prices predicted by the competitive storage model have been validated in a number of empirical studies (Box 3).

3. Includes physical and financial costs. See section 1.5.

Box 3. Empirical validation of the competitive storage model

Motivated by the food price crisis of 2007/08, numerous studies have analysed the link between private storage and price volatility. Balcombe (2011) analysed price volatility on the international market for nine agricultural products over the period 1962-2007. Price volatility was found to be explained, in part, by the level of total stocks. Stigler (2011) analysed the link between stock and price volatility on the wheat market in the United States over the period 1985-2009, also concluding that a fall in the level of stocks led to increased price volatility. By analysing the link between the price volatility of corn and that of ethanol in the United States over the period 1990-2010, Serra (2012) also showed that stocks reduced price volatility significantly. However, studies highlighting the specific impact of private stocks on price volatility are much scarcer. One of the reasons underlying this is the paucity of statistical data relating to private stocks (Box 2). By examining the effects of the fall in public stocks of non-fat dry milk in the United States at the beginning of the 1990s, Chavas (2002) showed that the average and variance of prices over the period 1970-2000 depended negatively on private and public stocks with the impact of the former greater than that of the latter.

Other investigations into the effects of private storage on price volatility have explored whether behaviour predicted by the competitive storage model leads to the same characteristics observed in actual price series. The introduction of storage creates a positive correlation in the deviations of the observed prices from the average or expected price. For example, an independent event that causes a one off price spike would, in the presence of storage, have a lesser effect when it occurred but the effect would persist over the following periods. In this way the deviations from the average price in subsequent periods would be related or correlated with one another. One method of testing the empirical validity of the competitive storage model could thus be to analyse the extent to which the model succeeds in reproducing the autocorrelation observed for real price series solely through private stocks.

Research exploring the effects of private storage in a simulated setting compared simulated and observed prices for 13 raw materials, both agricultural and non-agricultural. The first results obtained (Laroque and Deaton, 1992, 1995, 1996) show that the simulated series do not replicate the strong autocorrelation of prices actually observed, either because the competitive storage model does not correspond to the reality or because phenomena other than private stocks explain the autocorrelation of prices. Subsequent analysis, however, came to a different conclusion. Using the same data, Cafiero and Wright (2005, 2011) obtained comparable levels of autocorrelation of simulated and real price series by reducing the largely overestimated elasticity of demand and storage costs.

Despite empirical validation of the model, the debate remains open concerning the stabilising role of commercial stocks in practice. In particular, the stabilising role of private stocks with regard to prices depends considerably on the hypothesis concerning the operators' expectations[4]. The competitive storage model is based on the notion that the operators make their choices according to rational expectations and do not make systematic errors in their forecasts. The speculation of the storers therefore has a stabilising effect. In contrast, certain studies are based on the notion that the operators do not have information on future prices and that they systematically make errors in their forecasts. From this standpoint, all inter-temporal decisions – including private storage – interfere with the market as the forecasts are incorrect. (Appendix 1).

1.4. Public support for commercial storage as an alternative price stabilisation policy

Public support for commercial storage in the event of market failure

While private storage can be effective in reducing price stability, as certain authors have underlined, in certain situations, the level of private stocks could prove to be insufficient and government intervention to support private storage may be justified (Gardner, 1979). Two types of identified market failure are particularly relevant:

- **The presence of positive externalities from price stabilisation**. While motivated by profits, the actions of commercial storers can create benefits beyond those captured in market transactions. The food price crises and resulting effects on poverty and civil unrest in certain developing countries demonstrate that the gains resulting from increased price stabilisation are not only limited to commercial storers. In developing countries, risk aversion of consumers and the fact that households allocate a large proportion of their income food purchases suggests there is a *social gain* to be derived from stabilisation. In the presence of such spillovers, the volume of private storage may be lower than the optimal.

- **The presence of other market imperfections.** Poorly functioning markets, in particular financial markets, and poor quality infrastructure (warehousing, transport, communication, etc.) are likely to

4. Based on different hypotheses concerning the operators' expectations, some authors argue that public storage if more effective in stabilising prices than private storage. For a recent review of this debate, see Gérard et al. (2013).

increase storage costs. Similarly, fragmented information on prices will probably increase the risks to the profitability of storage activities.

Support for commercial storage compared to other stabilisation policies

A number of studies analysed different stabilisation policies in situations where such market failures exist. These analyses suggest that public support to private storage is the most efficient and cost effective price stabilisation policy available for governments.

Brennan (2003) analysed the functioning of the agricultural market in **Bangladesh**. Public intervention is argued to be justified by the existence of high storage costs leading to an insufficient volume of private storage. The author finds that to achieve the same level of price stability, the fiscal costs of a public buffer stockholding programme would be three times higher than that of providing support to private storage. Although the public storage policy generates public revenue at certain periods by selling when the price is high and buying when the price is low, this does not offset the cost of holding a large stock. Tasking the private sector with managing the stock by means of public support to private storage is therefore one means of reducing the fiscal costs of intervention.

Jha and Srinivisan (1999) studied the rice and wheat market in **India**. Household consumption depends on market prices and the subsidy level determined by the government. The government intervenes in the market by granting each household a fixed quota of cereals at a subsidised price and by stabilising prices by means of a buffer stock. The stocks held by the government are sufficiently large to influence world markets. Storers are also present and their behaviour is consistent with the competitive storage model. The authors conclude that public support to private storage provides for both greater price stabilisation per unit of public spending and greater increases in well-being per unit of public spending. A policy that aims to support private storage is also much less expensive than other stabilisation policies. However, the study also shows that beyond a certain level of stabilisation and thus support to private storage, well-being becomes negative.

Gouël et al. (2014b) also analysed the wheat market in **India**. The authors argued that public intervention was justified by the existence of incomplete markets and risk-averse consumers. Based on relative cost-effectiveness and effects on overall well-being, support to private storage was deemed preferable to the current discretionary public stockholding programme. The authors, however, show that the policy required to achieve an optimal level of stabilisation could not be implemented as it required numerous parameters, most of which were difficult to observe. It is therefore preferable to define policies based on simple rules where the maximisation of well-being depends on a limited number of observable variables. Among these simple rules is that support for private storage should be provided in the form of a constant subsidy per unit stored. This would allow the programme to achieve around 85% of the gains that would be achieved by an optimal policy[5]. Constant per unit subsidies also avoid some issues associated with targeting price bands which can give rise to stock accumulation as no goods are released until the ceiling price is reached.

1.5. Methods of supporting commercial storage

In addition to direct subsidies per unit stored, governments have additional levers at their disposal to encourage private storage aimed respectively at influencing the two variables of expected future prices and storage costs.

While future prices are dependent on the market, governments can, attempt to assist private operators to anticipate prices. Private storers base their anticipated prices on available information concerning the level of stocks, production and demand. The incentive to accumulate private stocks thus depends on the quality of the statistical data (Box 2) and the extent of government intervention on expected market developments.

The government can also attempt to reduce the *financial* costs of storage which account for a large share of total costs. Financial costs are made up of:

- *The loan interest rate*: If a producer contracts a loan, this will be repaid in part when the produce is sold. However, if the produce is stored, the loan is not repaid and interest payments continue.
- *The opportunity cost*: Even if no loans have been contracted, the opportunity cost of the profits foregone by the trader by opting to store produce for a period instead of selling and investing the revenue elsewhere. Studies have used interest rates for investments on the money market as a proxy,

5. A policy based on a simple rule involves fewer parameters, arguably making the policy less flexible or responsive to different stages of the economy.

estimated at 4% in 2014 in the West African Economic and Monetary Union member countries, 1% in the Philippines, 7% in India and 9% in Indonesia (World Bank, 2014; Central Bank of India, 2015).

Public authorities can also attempt to reduce the *physical* costs of storage comprising:

- *Initial spending* on storage infrastructure.
- *Current operating costs* of storage activity, in particular costs relating to maintenance and standardisation, security, transport, fumigation, etc.
- *Annual losses* resulting from the deterioration of the stock due to pests, parasites and natural weight loss through desiccation: these losses vary considerably according to the quality of the storage infrastructure – in excellent storage conditions, losses can be estimated at 2%.
- *The costs of rotating stocks*: this is the depreciation cost of the stock value linked to the ageing of the product. Upon resale, the product is older than that available on the market. The frequency of rotation depends on both the climatic conditions of the storage and the type of product stored.

There is limited available information concerning the physical storage costs of private storers. A recent study (WB, 2012b) indicates that the physical costs of storage in the private sector in the certain developing countries of North Africa total 12% of marketing cost on average. Other studies conducted in sub-Saharan Africa estimate the cost of private storage at around 10% (CILSS, 2014).

The case studies below explore how policies to support private storage have been implemented. However, it was not possible from the literature review to identify a causal links between the type of support, the impact on the level of private storage and the ultimate impact on price volatility.

Public subsidies

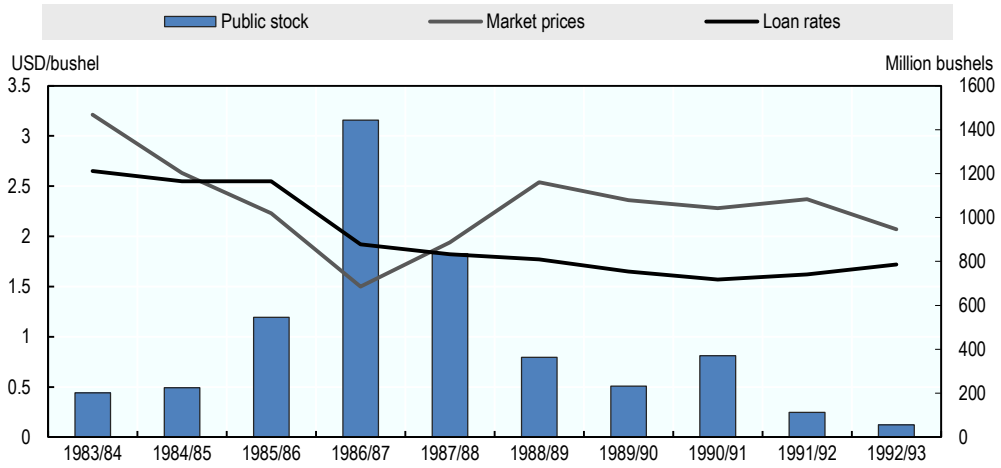
(i) Interest rate subsidies

During the 1980s, in **Latin America** and the **United States** support for storage was provided through interest rate subsidies. These programmes generally involved granting loans at subsidised interest rates using part of the borrower's stored produce as collateral. The primary aim of these programmes was to provide working capital to producers, however, they did support the development of a private storage market indirectly as the loans enabled producers to store and postpone the sale of their harvest until prices were more favourable. These programmes have changed considerably in the wake of national agricultural policy reforms but continue to represent a major budget cost in certain countries.

In the **United States**, the *marketing loan* (former commodity loan) ranges from nine to ten months at a preferential interest rate. The harvest serves as a guarantee for the loan in case of non-repayment. The amount of the loan is calculated on the volume stored and a regulated "loan rate" (an official unit price). Once the loan is due, the producer has the choice of selling their stock and repaying the loan with the sales revenue, or providing their stock to the government as repayment. The decision to do so rests on the difference between the loan amount (effectively the official unit price) and the potential sale revenue (market price). The stocks transferred to the government support the public stockholding held by the Commodity Credit Corporation (CCC).

By the mid-1980s, the marketing loan system gave rise to an over-accumulation of public stocks. In 1986, the stocks of corn held by the CCC reached more than 1.4 billion bushels (16% of annual consumption) (Figure 1). The system underwent far-reaching reforms from 1986 onwards for rice and cotton, and from 1993 for wheat and corn, within the framework of the Uruguay Round. To encourage payment in cash and limit the accumulation of public stocks, producers now have the possibility of repaying the loan at a lower rate. By means of "compensatory loan payments", they can also benefit directly from the difference between the loan rate and the market price ("marketing gain") without having to borrow and thus repay the loan. The reforms have helped create a strong incentive among farmers to sell their produce on the market at market price instead of transferring it to the CCC, thereby reducing the distortionary effects of the programme. Nevertheless, the possibility of a "marketing gain" implies that the production decision is linked more to the lending rate than to the market price, thus creating an incentive to produce which remains potentially distortionary.

Figure 1. Subsidised loans and public stocks in United States

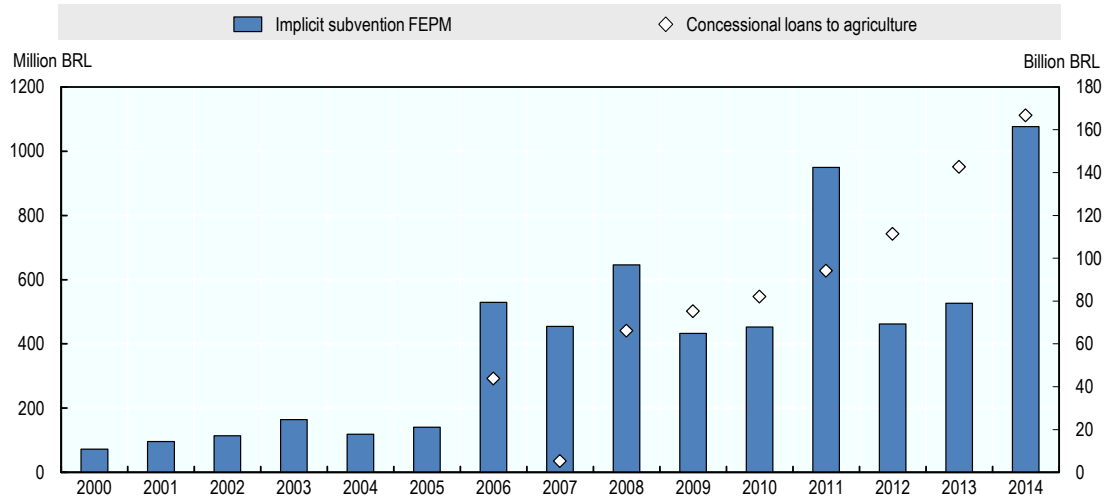


Source: USDA.

In **Brazil**, the national rural credit system (SNCR) – a cornerstone of the government's agricultural policy – has a mechanism relatively similar to the American system in the FEPM (*Financiamento para Estocagem de Produtos Agropecuários Integrantes da Política de Garantia de Preços Mínimos)* (ex *Empréstimo do Governo Federal*). Stored produce is used as collateral for the loan, with the amount determined according to the quantities produced and a guaranteed minimum price. This price is equal to the producer purchasing price (from which farmers also benefit). Until the 1990s, the borrower had the possibility of repaying the loan by transferring the stock. As in the United States, this led to a high accumulation of public stocks as the guaranteed minimum prices were generally higher than market prices. Now repayment is only possible in cash. In addition to promoting storage among producers, the government also grants loans to downstream players in the value chain, on condition that they pay the producer a price equivalent to the minimum guaranteed price. Finally, two storage credit programmes are specifically allocated for coffee and ethanol. The credit is allocated for a period ranging from five to seven months at a preferential rate. Coffee storage is financed by a fund (FUNCAFE) that is financed by a consortium of businesses.

At the end of the 1980s, faced with major macroeconomic shocks of hyper-inflation accompanying interest rates, the system of subsidised loans led to producers becoming over-indebted. In 1995, the share of loans at risk of payment default stood at some 30% of rural loans and the state was forced to undertake a massive debt rescheduling for producers. Today, some loans have still not been repaid. Subsidised agricultural loans continue to increase on a regular basis. In 2014, the sector benefitted from loans worth BRL 160 billion (USD 46 billion). It is estimated that the implicit subsidisation arising from reduced interest rates within the framework of the FEPM represented more than BRL 1 billion in 2014, creating an increasing discrepancy between the market and subsidised interest rate (Figure 2). In addition to the risk of over-indebtedness, this system contributes to curbing the development of the financial markets, in particular because the funding for the subsidised loans comes from "mandatory" resources (*Exigibilidade dos Recursos Obrigatórios*) of commercial banks – that is, banks are required either to hold their deposits in the form of non-remunerated required reserves with the central bank or to provide equivalent funding for agricultural projects at subsidised interests rates. Since June 2012, 34% of farmers' loans must be provided by bank deposits with the remaining 66% financed through rural savings deposits (*Poupança Rural*).

Figure 2. Implicit subvention from interest rate subsidies in Brazil



Source: PSE database (2015).

(ii) Direct storage subsidies

Rather than subsidising private storage indirectly through interest rate subsidies, another possibility involves subsidising private storage directly through subsidies paid to the storer in proportion to the quantities stored. Gouël (2013) underlines that such support is relatively simple to calculate. Nevertheless, this type of policy has not been implemented in many countries. The only policy response that can be characterised in this way is the Private Storage Aid policy currently implemented by the European Union, with the major difference that the subsidy is not constant and depends on price levels.

The Private Storage Aid programme is one of the market price support instruments available under the **European Union's Common Agricultural Policy** (CAP). This support only applies to certain agricultural products. When prices on commodity markets reach sufficiently low levels in relation to a reference price, and appear likely to remain at this level, the European Commission can decide to grant a subsidy for private storage. Operators are then authorised to store their produce for a given period. Allocated directly to the producer, the subsidy is based on a flat rate per unit stored, applied to the quantities in stock at the end of the authorised storage period.

The reforms introduced within the framework of the CAP since 1992 have reduced market intervention mechanisms and increased payments made directly to producers. In this context, private storage aid plays an increasingly important role in EU budget spending.

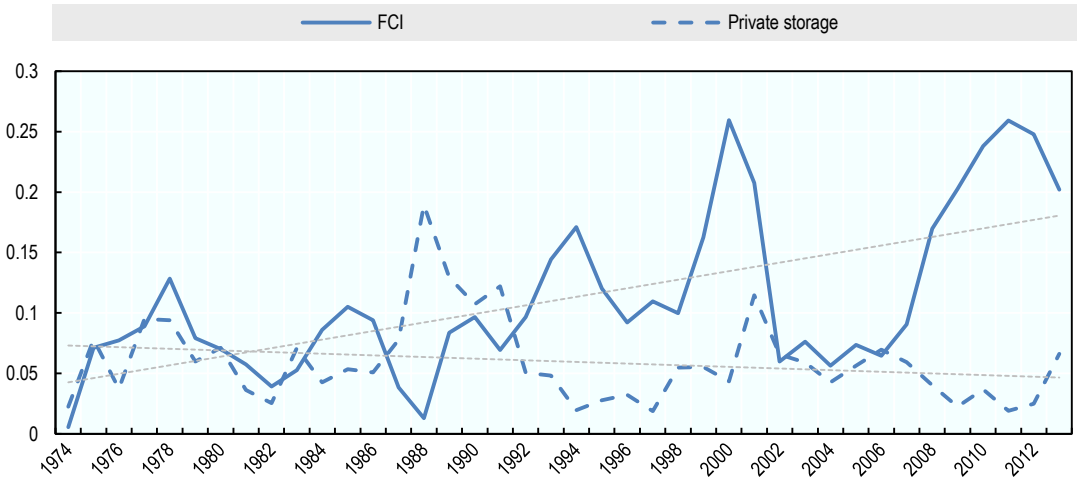
The experience of **Brazil** and the **United States** shows that interest rate subsidies support commercial stocks but at a cost. Further, relative to direct subsidies for storage costs, interest rate subsidies appear less effective. One of the main disadvantages of an interest rate subsidy, unlike direct storage cost, is that the opportunity cost increases with the price of agricultural products: the income foregone by the producer by opting to stock rather than sell increases with the price. This has two consequences for storage behaviour. First, for a given level of average subsidy, an interest subsidy provides less incentive to acquire stocks in low-price years. Thus, less is placed in stocks in abundant years than under the direct storage-cost subsidy. Second, when a price-increasing shock occurs, a high interest rate automatically increases the cost of storage and increases the incentive to release stocks. An interest-rate subsidy blunts this incentive (Gardner et al., 1996). Thus, while both an interest-rate and storage cost subsidy increase the demand for storage, an interest rate subsidy limits the reactivity of storage in relation to prices compared to a storage cost subsidy. By performing simulations on the soya market in the United States, Gardner et al. (1996) demonstrate that an interest rate subsidy is less efficient that a direct subsidy for storage costs for two reasons: it leads to a price stabilisation per unit of public spending of less than 10% and a budget cost of more than 11% to achieve the same level of stabilisation.

Box 4. Policy effects: The impact of public buffer stocks on private stocks

Countries which have attempted to develop private storage despite the continued presence of interventionist agricultural policies have encountered certain difficulties. Public buffer stocks, in particular, reduce the incentives for the development of commercial storage. Public storage leads to prices that do not fluctuate enough to cover private storage costs. Further, price uncertainty is increased as the public storage operator's decision-making rule is often unknown. Public storers can be subject to political interference (because of rent-seeking behaviours or misuse of the policy by actors for their own gain) or their actions can be excessively rigid as public authorities may be unable to follow rapid changes in national and international conditions. This often means that prices can fluctuate unpredictably and can result in loss of well-being for society (Williams and Wright, 1991). This is referred to as the crowding out effect: in the presence of public storage designed to ensure that prices remain within a predetermined band, private storage is weaker. This is an essential argument in the literature on the adverse effects of public buffer stocks (Newberry and Stiglitz, 1981).

Brockhaus et al. (2015) analysed the determinants of private storage of rice in **India** for the period 1974-2014 to test a potential crowding out effect. The authors found that total supply had a positive impact on the levels of stocks while, conversely, increases in local and global demand tended to reduce stocks as they increased prices. Importantly, public stocks had a significantly negative effect on private storage consistent with the crowding out effect posited by theory (Figure 3).

Figure 3. Public and private storage in India (stock to use ratio)



Source: Adapted from Jan Brockhaus (2015); FCI data for FCI Stock, USDA data for Private stocks.

Zulauf et al. (2014) analysed the determinants of private storage of corn, soya and wheat in the **United States** between 1952 and 1971. This period is particularly interesting when analysing the crowding out effect as the government accumulated stocks until 1972, after which public stocks disappeared and were sold to the Soviet Union. The incentive to stock depends on the price differential, measured as the price difference between forward contracts expiring no later than during the agricultural season t and those expiring no earlier than during season t+1, the opportunity cost estimated using the interest rates of treasury bills and the physical costs of storage. Public storage is also incorporated into the model. The econometric tests performed confirm that private storage is determined significantly by each of these different variables. It increases with the expected income minus the storage costs and decreases with the level of public stocks. More precisely, it would appear that the crowding out effect of public storage on private storage is greater for products with a low elasticity of demand – the very products most likely to be subject to public storage, but also those for which the effect of private storage on reducing price volatility is higher.

Outsourcing of storage: Warehouse receipts

Interest rate subsidy policies and direct storage cost subsidy policies both have the same objective: reducing the storage costs borne by the producers and traders when they are responsible for their own storage activity. However, another alternative is to encourage the outsourcing of this storage activity to professional storers who already have lower storage costs. The Warehouses Receipt System (WRS) provides an example of such an approach.

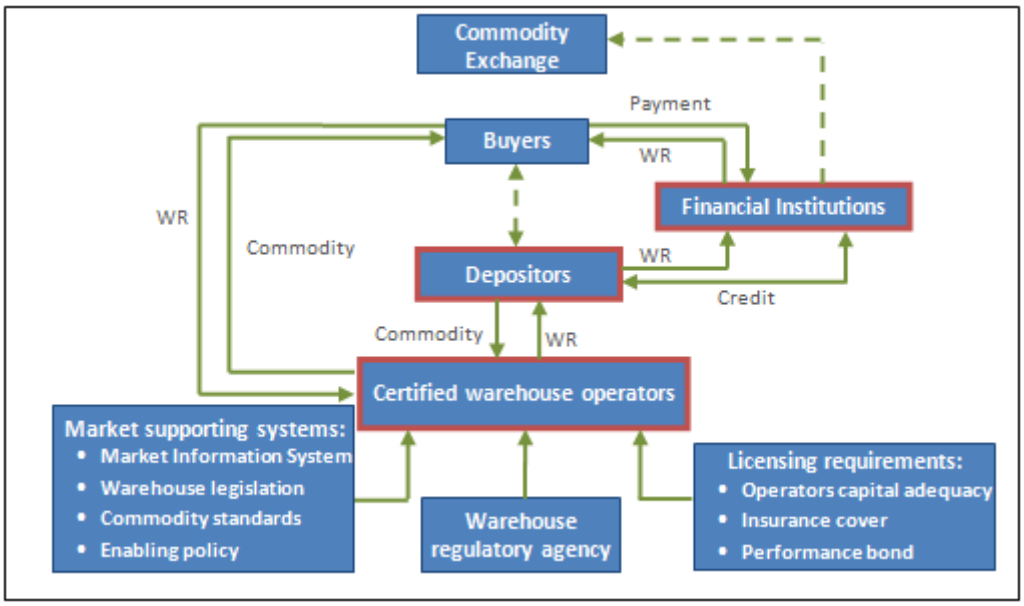
As for subsidised loan programmes, the initial aim of WRS is to facilitate access to credit for farmers and other owners of cereals using the production stored as collateral, but allowing the storage to be contracted

out. Loans aim at providing cash to producers to enable them to store and postpone the sale of their harvest until prices are more favourable.

WRS provides a borrower with access to a loan upon presentation of a warehouse receipt, guaranteeing the bank that the production stored in a reliable warehouse. The procedure for granting the loan, storing the produce and repaying the loan can be presented as follows:

- Before the harvest, the borrower submits a request for a loan to be granted upon presentation of warehouse receipts. The bank approves (or rejects) the request and sets a loan amount which will remain in force until the following season.
- At harvest time, borrowers take the cereals that they have produced or purchased to a registered warehouse. If the cereals satisfy the minimum quality standards, they are stored and the borrower receives a warehouse receipt comprising two documents: a certificate of ownership and a certificate of pledge.
- The borrower presents the receipt to the bank as a guarantee for a loan. The bank grants a loan representing a percentage of the current market value of the cereals stored. The borrower can now use the funds to invest in the next season's crop, or buy more cereals with a view to selling them or increasing their stocks. In this way, the borrower increases the funds invested in cereal stocks significantly. If before the loan matures, the borrower sells their cereals, the bank transfers the certificate of ownership to the buyer.
- When the loan matures, the buyers repay the loan and the banks provide them with the certificate of pledge. Only when in possession of both these documents is the buyer the owner of the goods. In practice, however, the bank can allow privileged customers to withdraw the cereals before repaying the loan. If borrowers do not pay the loan back in full by the date set, the bank is authorised to seize the cereals and sell them at auction.

Figure 4. Operators involved in Warehouses Receipt System



Source: Adapted from Onumah (2010).

Country experience with warehouse receipts

In **Malawi**, IFPRI (2015) compared the average costs of a farmer storing cereals on their property in the absence of any stock losses and a warehouse certified by the Agriculture Commodity Exchange for Africa (ACE). Table 1 shows that certified operator warehousing generates initial warehouse costs 26% higher than warehousing made on farm. This is made up of additional costs due to certified operators providing additional handling and bagging costs. However, when the costs of stock losses are taken into account, the cost structure changes. As on farm storage is generally associated with higher stock losses, total storage costs are significantly higher. Comparing on farm and certified warehouse storage on farmer net incomes when sales are made either at harvest (June) or after a storage period (December or February) shows the farmer's net income is consistently greater by outsourcing the storage activity to a certified warehouse operator. This occurs for even relatively modest levels of stock losses on farm (the authors suggest storage loss level of around least 5% is highly probable for a six-month storage period). In contrast, stock losses in certified storage are likely to be zero.

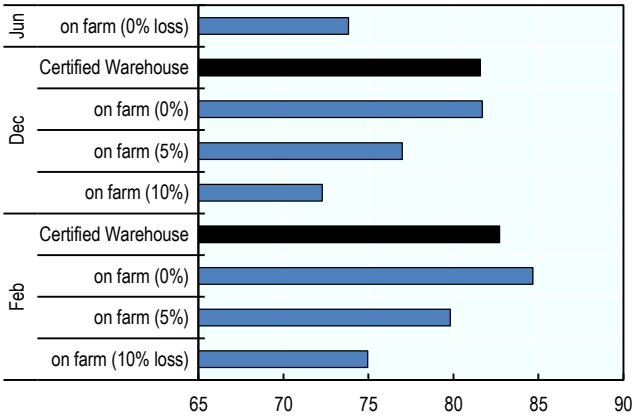
Table 1. Initial warehousing cost in Malawi

Malawian Kwacha (MWK)/mt

Certified warehouse	
Handling	1 300
Bags	2 500
Bagging	2 300
Storage fees (MWK/month)	1 339
Total storage costs	**7 439**
On Farm	
Bags	2 500
Chemicals	2 720
Storage fees (MWK/month	685
Total storage costs	**5 905**

Source: IFPRI (2015).

Figure 5. Effect of storage outsourcing on farmers in Malawi ('000 MWK)



Box 5. Typology of Warehouse Receipt System (WRS)

Category 1: **"warehousing open to the public"**: this term does not mean that the storer is a public company but refers to a company tasked with storing cereals belonging to all types of actor and providing warehouse receipts which can be resold or used as a guarantee to obtain a loan. The method of managing the warehousing activity can thus take different forms.

Uncertified and independent warehousing: these are often foreign companies which set up business and invest in cereal professing and storage activities and use them to provide a range of other services including warehousing. These companies generally benefit from a comparative advantage over local companies as they enjoy excellent risk coverage provided by international insurance companies.

State-certified warehousing: in this scenario, the warehouse operator is certified by a state certification agency which grants licences on the basis of clear and transparent rules. These state companies have the authority to suspend or confiscate licences or to take control of failing warehouse operators.

Warehousing certified by a commercial partner: the certifying company is not a public entity and can be linked to the warehouse operator either by purely contractual relations or be the public service delegation.

Warehousing by grouping existing intermediaries: intermediaries of all kinds present on the market and more or less informal (inputs distributers, commission agents, traders) work together in a formal structure and store produce in exchange for payment. In general, this is the first step towards a regulated WRS.

Category 2: **"private warehousing"**: the certification entity does not grant a licence to a specialist warehouse operator but to traders or processors enabling them to issue warehouse receipts for their own stock. The receipt should enable them to obtain loans or trade the receipts on the financial markets.

Category 3: **"Local warehousing**": this involves storage and financing activities specifically intended for producers as opposed to operators in the value chain, the aim of which is to satisfy local foods needs in rural areas during the hunger gap or to collect produce before it is released onto the market. Local storage can be assimilated with a WRS when a bank guarantees the repayment of a collective loan using the village produce stored by a producer organisation and controlled by an inspector appointed by the bank. Experiments based on the allocation of loans involving an individual/PO and a micro-finance institution holding a guarantee for the produce stored in a warehouse closed by means of a "double lock system" (one for the borrowed and one for the creditor) cab also be compared to a WRS.

Source: Adapted from UNCTAD, 2009.

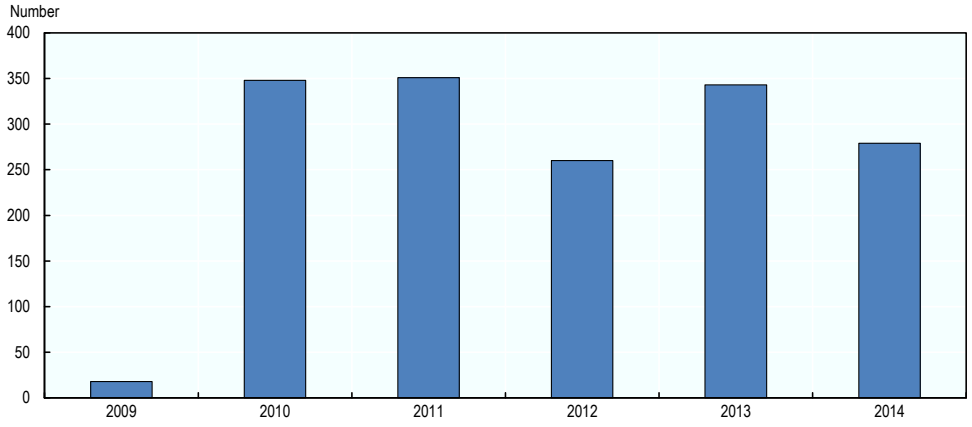
During the 1990s and at the beginning of the 2000s, the countries in transition in **Eastern Europe and Central Asia** attempted to develop WRS based on the state-certified warehouse model. Results were mixed (FAO et al., 2009). In **Poland**, a new law providing a legal framework for the WRS took several years to be developed, primarily due to the co-existence of two different parliamentary initiatives which were contradictory in several respects, thereby preventing a consensus from being reached. When the law was finally adopted, both the credibility of the initiative and the motivation of private operators were greatly reduced. The development of the WRS was also restricted by the continued existence of interventionist agricultural policies. For example, the government maintained an intervention price, coupled with relatively high interest rates which increased storage costs, limiting the benefits for producers. Conversely, some countries in the region reached initial consensus between public institutions and private actors on the essential reforms to ensure that the WRS functioned correctly. In **Kazakhstan**, a 2002 law gave banks the right to take possession of the cereals without a court injunction in the event of the borrower defaulting. Furthermore, a guarantee fund jointly financed by the state and the fourteen leading warehouse operators provided the banking sector with additional insurance. Loans granted by the banks on the basis of warehouse receipts increased from USD 16 million in 2003 to USD 1.5 billion in 2011. Over the same period, the volume of cereals stored covered by the guarantee fund virtually tripled (OECD, 2013b). In 2010, the country boasted 222 certified warehouses.

Countries in **Latin America** also have extensive experience in the development of WRS based on a state or private sector certification model. In **Colombia**, four to five warehouse operators have been variously certified by banks and the WRS benefits from a high level of credibility among private operators. In **Brazil**, certification was – until recently – under the aegis of the local office of the Ministry of Trade (present in all 96 states), but the certification system did not operate satisfactorily. The state had no certification standards for storage of agricultural products, cereals processing was not differentiated according to the storage method (bulk or bagged) and warehouses had no equipment enabling them to differentiate cereals by quality. Warehouse operators did not have sufficient training (they were used to managing public stocks that suffered from low management standards) and the involvement of the warehouse owners in the political arena compromised effectiveness. During the 1990s, the agricultural sector underwent far-reaching reforms. Inefficient warehouses were closed and two new laws were adopted. The first, published in 2000, transferred certification to the Ministry of Agriculture and introduced specific regulation for the storage of agricultural products. Published in 2007, the requirements for certification of agricultural warehouses took effect at the end of 2009. While the country had only twenty certified warehouses in 2009, they were nearly 350 in 2010 (Figure 6). The second law, published in 2004, created two new instruments for warehouse receipts for agricultural products: the Certificate of Agricultural Deposit (CDA) and the Agribusiness Warrant (WA) which have the particularity of being *negotiable*, thereby contributing to financialisation of the agricultural sector. The creation of these new instruments is in line with the approach currently adopted by the Brazilian government which involves developing new private financing instruments for the agricultural sector with the aim of reducing the increasing budget cost of its interest rate subsidy policy (FEPM).

South Africa currently boasts an efficient WRS based on a private sector warehouse certification model. At the end of the 1990s, the new ANC government liberalised the grains market by supporting the development of market institutions such as the market information systems (SAGIS), the "Silo Certificates" mechanism and the implementation of an agricultural commodities exchange (SAFEX) (since incorporated to the Johannesburg Stock Exchange [JSE]). The absence of interventionist agricultural policies and the presence of strong market institutions provided the ideal economic context for the development of a WRS. South Africa does not have specific legislation concerning WRS but relies on Silo Certificates based on contractual relations and framed by general laws relating to contract and commercial law. Regulations are largely issued and controlled by JSE, which certifies about 256 silos (2013) where farmers, processors or traders store their stocks in exchange for a certificate issued on behalf of either the warehouse operators or the JSE. The Silo Certificates are negotiable on financial markets and can be exchanged like any other financial product. When they are used to obtain a loan, they are accompanied by risk coverage instruments

(futures and options), allowing both parties to be protected against future price variations. The connection of the silo certificates to financial markets has made a significant contribution to financialising the agricultural market. Before the stored cereals are actually delivered, the silo certificates are traded several times. In 2013, the contracts traded (in tonnes) on the JSE represented eleven times the production volume of South Africa. The increase in contracts traded is not only the result of speculation. It also reflects an increase in the physical volumes actually stored by certified warehouses issuing silo certificates. In 2012, the physical volumes backed by silo certificates traded on the JSE reached 25% of national production while 235 warehouses were certified by the JSE (Figure 7).

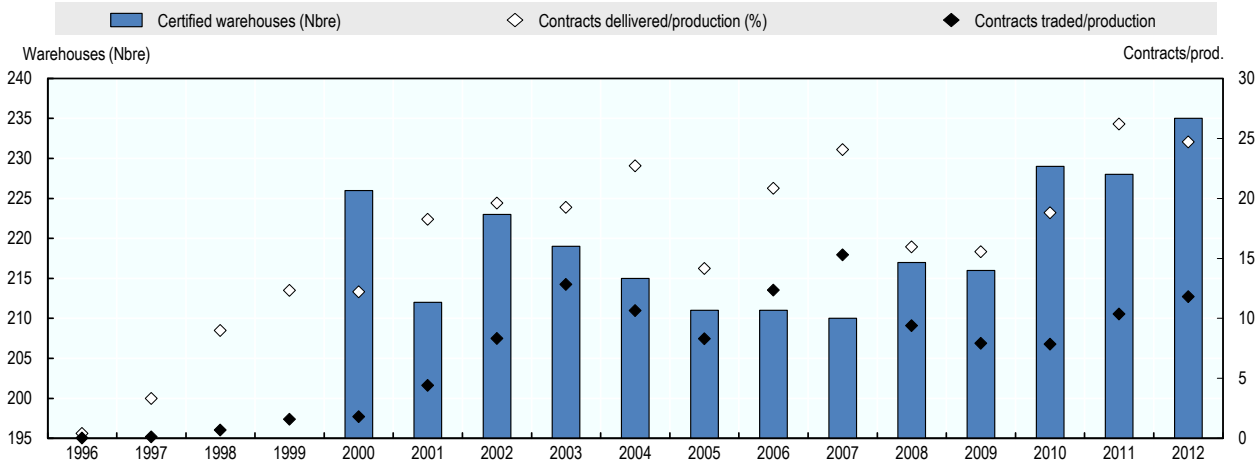
Figure 6. Warehouses certified by the Ministry of Agriculture of Brazil



Source: CONAB (Companhia Nacional de Abastecimento), 2015.

Figure 7. Warehouses certified by the Johannesburg Stock Exchange in South Africa

Number of Certified Warehouses and contracts linked to Silo Certificates traded/delivered as a share of production



Source: JSE, 2015.

1.6. Lessons learned on support for private stock holding

Supporting private stocks can provide a less distortionary alternative depending on implementation. Further, such policies have the potential to be significantly less expensive and more effective than public buffer stocks. From the case studies above, a number of observations can be made around the design of policies to minimise budgetary costs, limit unintended effects on the market and ensure effectiveness.

During the 1980s, policies focused on providing loans to producers to encourage them to store produce and postpone the sale of their harvest until prices were more favourable. These programmes often failed to have an impact on reducing price volatility as storers did not behave in a way that helped smooth price movements. In the **United States**, allowing producers to provide their stocks to the government as repayment for loans, combined with a relatively generous regulated loan rate (price paid for the harvest) led to over-accumulation of public stocks. In **Brazil** the subsidised loan system suffered from similar problems and led to unmanageable budget costs and considerable crowding out of the banking sector. In contrast, those countries which have supported commercial storage by creating a legal and institutional environment conducive to the outsourcing of private storage have witnessed the emergence of a group of certified warehouse operators with low storage costs. These programmes led to more commercial cereals stored and encouraged participant to adopt behaviours that helped stabilise food prices (that is, to store when prices are low and sell when prices are high). Nevertheless, the success of the WRS is heavily dependent on the broader economic, legal and political context. Four prerequisites essential to the development of the WRS can be identified and are set out below.

Limited interventionist policies in agriculture

Experience shows that an effective and competitive business environment, facilitated through limited and predictable government interventions in commodity markets, is an essential prerequisite for the development of the WRS. In the early 1990s, European and Central Asian (ECA) countries started to develop legislation for WRS, but their efforts were hampered by the persistence of interventionist policies and an incomplete process of liberalisation.

In Poland, for example, several interventionist agricultural policies executed by the Agricultural Marketing Agency (AMA) contributed to reducing the system's potential efficiency, and there was insufficient political will to remove disruptive market interventions (FAO et al., 2009). A high intervention price blocked further development of the system, while high interest rates for loans made borrowing against warehouse receipts unattractive for producers.

By contrast, in South Africa, which has the most advanced receipt system and commodity exchange on the continent, the government has consistently maintained a policy of non-intervention since 1996 when liberal market reforms in the agricultural sector were initiated.

Robust contractual rights and certification of warehouses

When the legal aspects of the WRS were not sufficiently stringent for contract enforcement and surety or conditions of storage, WRS schemes failed – for example in Brazil and Poland. Conversely, countries such as Kazakhstan which successfully introduced a sound legal framework from the very outset of the initiative witnessed a rapid development of their WRS.

The legal properties relating to the warehouse receipt need to be clearly established at the outset to provide the banks with sufficient confidence to take the stored products as collateral and therefore to offer loans. A robust certification process is required, either implemented by public authorities or through private markets. A credible certification system should enable all warehouse receipts to be handled identically by the banks and other stakeholders, irrespective of their origin. In Brazil, the inefficiency of the certification and control entities contributed to discrediting the system. The success of Kazakhstan shows that a certification system operated by public institutions responsible for granting licences can work, although precautions must be taken to avoid potential conflicts of interest or licences being issued according to less than transparent criteria, as was the case in Brazil. When market institutions are sufficiently well developed, certification can be carried out on a contractual basis between the warehouse operator and a private institution. For example, certification can be provided directly through the banks as in Colombia or by the commodities exchanges and futures markets as in South Africa.

Another important element is the ability of the creditor to seize the stored goods in the event of a default. This right needs to be supported by legislation or by the common law framework. In addition, the experience of Brazil shows that it is preferable to have a specific law for the WRS relating to agricultural products, given the particular requirements of storage conditions for agricultural products. It is also preferable for the warehouse

receipt to be not only transferable but also negotiable in value, allowing for trading to occur. Commodity exchanges, as in South Africa, have facilitated this. However, to be effective, markets need to be sufficiently "thick", which requires the other fundamentals to be in place first.

High-quality storage infrastructure

The warehouses themselves play a central role. In many countries, for example, Brazil, the warehouses and their staff were inherited from public intervention stocks and the warehousing techniques and location of the warehouses were not suitable for the WRS for which maintenance and conservation standards were more restrictive. Furthermore, as these structures no longer benefitted from the public funding necessary for their upkeep, they can be in poor condition. In Brazil, reforms introduced to boost the WRS included closing numerous inefficient warehouses. Warehouses must also satisfy technical and quality standards relating to humidity, fumigation, pest control, etc.). Outsourcing of the management of public food stocks to private warehouse operators could help to build the capacity of the private market in delivering warehousing services and contribute to development of the sector. In Ethiopia and Zambia, the WFP already obtains its cereals by purchasing warehouse receipts.

Complementary market institutions

More generally national experience underscores that the successful development of WRS can be significantly aided by the existence of commodity markets for the stored commodities. While a viable WRS contributes the development of commodity markets, the converse relationship also holds. JSE/SAFEX offers the most visible example, as the silo receipts issued in South Africa back trading contracts on the exchange. An efficient and reliable market information system is needed to monitor price movements and trends and allow banks more objective valuation of collateralised stocks. A commodity exchange with sufficient volumes of spot, forward and futures contracts is an ideal price information and forecasting mechanism. Commodity exchanges also provide a reliable means by which lenders can liquidate collateralised commodities and so make inventory-backed financing more attractive. Furthermore, as an exchange matures from a spot market into offering various risk management instruments, including futures and options contracts, lenders are able to use such instruments to hedge price risks. By so doing, they reduce credit risks, leading to a lower cost of borrowing.

The availability of insurance services is also a key element in supporting the development of private warehousing companies. When warehouse receipts are not issued by reputed international warehousing companies (Box 5), financial intermediaries may require additional guarantees from the warehouse operators. In addition to official warehouse certification, local operators need to have professional indemnity insurance against such risks as theft, fraud or negligence. The operator can take out insurance against this specific risk with an insurance company (through a "warehouse bond") or by contributing to an indemnity fund. The choice of the most appropriate method should be based on analysis of the risk assessment and the availability of insurance services and products. In the case of Kazakhstan, the creation of an indemnity fund by the 15 largest grain elevators was an efficient method of providing the banking sector with additional insurance.

Finally, a reliable financial sector willing to commit to the WRS is a critical condition for the success of the system. If all the elements of a warehouse receipt system described above are in place, warehouse receipts constitute high-quality collateral, and banks face limited risks. However, for different reasons, banks may have little or no incentive to develop new innovative financing mechanisms such as receipt-based financing. To reduce this risk, bankers may need to be involved at the beginning of the process where they can contribute to identifying business and process risks associated with the WRS, and can help institute appropriate mitigation mechanisms. Banks may also be willing to lend a small share of the collateral value and gradually increase this share as confidence in the system grows. It is worth noting that banks are not the only possible financiers of warehouse receipts. For example, in South Africa, there have been several financing mechanisms in which investors provide finance against the security of commodity stocks.

2. Safety nets, an *ex ante* risk management strategy

2.1. Alternative policies to mitigate the effects of price volatility

The price smoothing functions performed by buffer stocks are argued to be essential to ensure the food security of vulnerable producers and consumers. This important public policy objective is also cited as the reason for government intervention as the profit-oriented private market may ensure that the poorest and most vulnerable households are adequately protected.

An alternative approach for governments seeking to protect the most vulnerable from price fluctuations is to target reduction of the impact of price volatility on poor households through mitigation mechanisms. Indeed, the fundamental problem is not price volatility in itself, rather its potential effects on household incomes and available budgets (OECD, 2013a). Volatility in their incomes can lead producers to favour self-consumption (which causes narrow surplus markets and thereby increases price volatility on these markets) and to underinvest in production. Similarly, food price hikes in the face of limited income can cause some households to reduce their food consumption. Mitigation measures aimed at stabilising the incomes of poor households (producers and consumers) rather than stabilising prices may be considered "first best" policies because they address the "heart of the problem" (Gouël, 2014a).

There are a wide range of measures employed by governments aimed at stabilising the incomes of poor households, many of which have a range of broader development objectives beyond ensuring food security (e.g. they may be aimed at preventing intergenerational poverty, at promoting health or increased participation in education). Even within food security focused programmes, income-based measures can take many forms – including, for example, government-supported insurance schemes (such as crop revenue insurance programmes), guarantee funds or credit facilities.

Programmes can be aimed primarily at coping *ex post* with a food security shock, or can also form part of *ex ante* risk management. The latter is increasingly seen as preferable: social safety nets are gradually becoming an essential instrument of risk and vulnerability management policies (WB, 2015), and to be seen as instruments that can contribute to an improvement in long-term food security, in particular by improving investment conditions for the most vulnerable families (Gertler, 2012). Recent safety net programmes aim to improve capital accumulation through predictable, multi-annual transfers and appropriate obligation placed on the recipient (Devreux et al., 2004). Rather than only react once risks materialise, the aim is now to protect and restore the other forms of capital. Additionally, the programmes are designed with a view to promoting the efficient functioning of the factors of transformation of these forms of capital. This is seen as in contrast to food aid, which also aims to avoid both capital depletion and reduction in consumption of the targeted households, but which can also have other effects on market operations (food product markets can be destabilised) or the cohesion of local authorities (whose dynamics can be affected by the food aid itself).

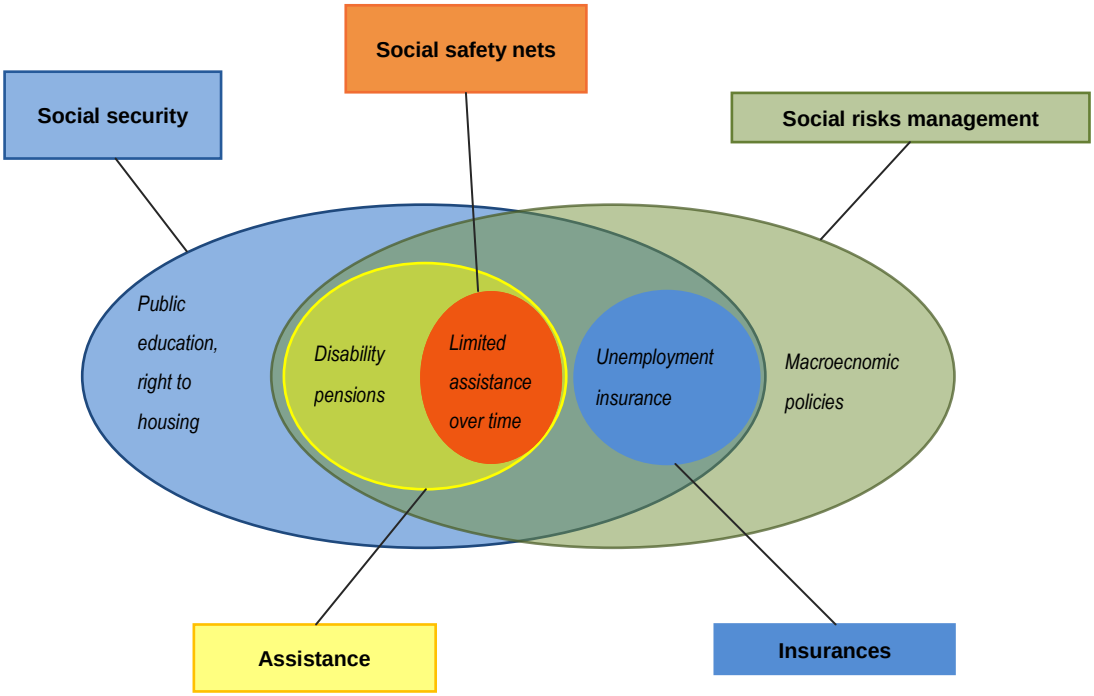
This section thus focuses on the use of government social safety nets, as instruments used to smooth incomes and target food security of both producers and consumers. The section begins by outlining the key features of safety nets and compares them with buffer stocks policies. It then looks at means of implementing social safety nets, drawing on country case studies. Case studies range from programmes more narrowly focused on smoothing producer and consumer incomes in rural areas among very poor households (Ethiopia, India) to social safety nets aimed at a broader range of development objectives but which have nonetheless had important impacts on food security (Mexico). The section concludes with observations from the case studies on critical factors for effective implementation of programmes.

2.2. Typology of social safety nets

Social safety nets describe a diverse group of instruments and actions. Figure 8 provides a broad picture of the types of social protection instruments and places social assistance and insurance mechanisms at the intersection of social risk management tools and social safety net tools. Social safety nets are at the very heart of these mechanisms and correspond to social assistance measures which are limited in time, as distinct from more permanent social assistance measures such as disability pensions. Social safety nets sometimes include endogenous mechanisms and risk sharing arrangements (temporary reduction in consumption or assets depletion, assistance from social networks, etc.). In this paper, social safety nets refer specifically to public programmes.

Social safety nets are highly diverse in both form and objectives, and are characterised by: (i) the nature of the transfer, be it in kind or money; (ii) the nature of the obligation on recipients (none, work requirements, or the use certain services such as education or health); and (iii) targeting (Ecowas Commission, 2012).

Figure 8. Social safety nets among social protection policies



Source: Adapted from Haddad & Sabates-Wheeler (2008).

The types of transfer

Transfers can be provided to beneficiaries in cash, in kind, as a mix of the two, or as vouchers. Other types of transfers, such as the free provision of nutritional and healthcare services, are also common.

- *In kind transfers:* suitable when household vulnerability to food insecurity is caused by an inability to source foodstuffs from the market at a reasonable (or any) price, or when specific nutritional deficiencies exist.
- *Cash transfers:* are increasingly used to address food insecurity (WB, 2015). When food insecurity results from problems of accessibility (that is, food is inaccessible while nevertheless available on the market), financial transfers are preferable. Cash transfers provide beneficiaries with a greater degree of flexibility, can be distributed quickly and at lower cost, and reduce the risks of market disruption.

Nature of the obligation placed on recipients

Generally speaking, the transfers offer a direct response to the main objective of the programme (level of consumption and nutrition), while the obligation placed on recipients attempts to achieve a secondary objectives (improved productivity, improved enrolment in school among children, etc.). Broadly, transfers can be grouped into two, conditional and unconditional transfers:

- *Unconditional transfers:* transfers without particular co-responsibilities are suitable when programmes do not pursue specific objectives or need to reach particular categories of people unable to meet obligations such as the elderly, infirm and disabled, orphans etc. (WB, 2015).
- *Conditional transfers:* transfers with an obligation placed on recipients pursue objectives which go beyond simply protecting assets, and instead target the social promotion of individuals. The nature of the obligation placed on recipients depends on their specific vulnerabilities: if monetary poverty is linked to low levels of human capital, transfers may be conditional upon child schooling; to address limited or degraded levels of physical or natural capital, programmes requiring labour to be employed in rehabilitation programmes may be more appropriate (Harvey and Bailey, 2011). Obligations can

generate opportunity costs for beneficiaries. For example, requiring individuals to work on public infrastructure projects in rural areas could lead to a reduction in labour supplied to agricultural activities. The net effect on income is therefore uncertain (Imbert, 2012).

Targeting

Targeting is a fundamental question in designing safety nets. Exclusion and inclusion errors in particular are key determinants of effectiveness. Four targeting methods are possible:

- *Geographic:* choosing to focus the action on certain geographic area based on the average vulnerability level criteria.
- *Administrative:* targeting criteria at household level and using household surveys or other means to check the eligibility of each household within a given geographic zone.
- *Self-targeting:* leaving each household the option of whether or not to request support from the programme (usually by setting benefits at a level where they are attractive to only the truly needy).
- *Community:* giving responsibility for choosing beneficiaries to the communities targeted, based on the premise that they are best informed about the true situation of their members.

Box 6. Social safety nets compared with buffer stock policies

The ability of government to target poor households with social safety nets means that they are often more cost-effective than buffer stocks in addressing food security issues. Without targeting, buffer stock policies can be economically inefficient; most of their benefits are not received by poor consumers or producers but are "leaked" to high-income individuals. Small-scale producers benefit the least from the guaranteed minimum price (floor price) because their marketable surplus is low (AFD, 2014). Similarly, for poor consumers, guaranteed maximum prices (celling prices) benefit consumers in proportion to their food consumption, which is lower for poorer households (Newbery, 1989). Moreover, guaranteed minimum prices often translate into higher consumer prices, which are difficult to offset by food distribution programmes at subsidised prices (OECD, 2015).

Table 2. Spending for social safety nets and buffer stock (Share of GDP, %)

Countries	Spending for social safety nets	Spending for buffer stock	Spending on agriculture	Spending on agricultural R&D
India	0,24% (2009)	1,5% (2008/2009)	1.2% (2008/2009)	0.06% (2008/2009)
Indonesia	0.76% (2009)	0.5% (2008-2010)	0.8% (2008)	0.05% (2003)
Philippines	0.34% (2009)	1% (2009)	0.8% (2005)	0.06% (2002)
Zambia	0.2% (2011)	1.9% (2011)	0.6% (2010)	0.15% (2010)

Source: World Bank, 2012a; 2013; 2014.

In addition, the opportunity cost of buffer stock policies is high. Total fiscal costs (procurement, storage and distribution costs) ranged from 0.5% of GDP in Indonesia to 1.5% in India and 1.9% in Zambia in previous years (Table 2), the highest cost being in countries where higher procurement prices were not matched by higher sales prices (World Bank, 2012a). These costs can crowd out spending on other measures which are fundamental to improve food security. In India, the Philippines and Zambia, public spending on buffer stocks largely exceeds spending allocated to social safety nets, agricultural research and other agricultural programmes.

Kozicka et al. (forthcoming) simulated the medium-term consequences of alternative measures to the current Indian buffer stock policy and found that implementation of food safety nets instead of buffer stocks would result in significant savings. Within the current National Food Security Act (NFSA), the government stores wheat and rice through public procurements from farmers at a guaranteed minimum support price (MSP) and release stocks at subsidised prices through a range of public distribution schemes (PDSs). As an alternative policy, the authors simulated the implementation of deficiency payments instead of procurement and cash transfers instead of physical food delivery. Public stocks would be limited to emergency reserves. In a first scenario, the share of the population covered by the programme remains unchanged compared to the NFSA (67%) and beneficiaries receive the equivalent of the NFSA ration in cash. In a second scenario, only poor households (those below the poverty line) receive transfers (30%) but the amount of cash per person is higher. In both scenarios, the deficiency payment is the difference between market price and the current MSP. Results show that while the current NFSA in India caused the fiscal cost to grow by 52% over the simulation period, cash transfers targeting the poor (Scenario 2) are the cheapest option and lead to fiscal costs being reduced by 56.3%. In addition, even if the population coverage remains unchanged compared with the current policy (Scenario 1), cash transfer policies lead to fiscal costs falling by 21.2%, mainly due to procurement, storage and distribution cost savings.

While geographic, self-targeting, and community targeting enjoy the advantage of incurring few management costs, they involve a risk of inclusion or exclusion errors. The administrative method allows for more precise targeting and the pursuit of more specific objectives but generates higher costs and requires efficient information systems, posing challenges for resource- and capacity-constrained governments. Social safety nets can, however, remain more cost-effective than other policies such as buffer stocks (Box 6).

2.3. Methods of implementing safety nets

As discussed above, social safety nets provide a workable alternative to buffer stock programmes as they can couple reductions in income risks for households with, if well-designed, incentives for investment. While experience in using safety nets in this way is still limited, this section explores the experiences of Ethiopia, India and Mexico which have made use of such programmes.

The choice of case studies was based on the nature of the food insecurity targeted, the risk management strategies employed, including obligations placed on recipients, the type of recipients, the scale of the programme and the length of time in operation.

- *Nature of food insecurity:* programmes primarily use cash transfers and endeavour to address income smoothing for food access. Like storage policies that attempt to reduce price volatility, these programmes aim to reduce the food insecurity of both producers and consumers.
- *Risk management strategies*: programmes aim to increase recipients' consumption while strengthening their ability to independently manage risks. Like buffer stocks, they are therefore *ex ante* risk management strategies.
- *Scale*: the programmes selected are all implemented on a large scale. Those in Ethiopia and India are the two largest public works programmes in the world by number of beneficiaries. The Mexican programme is the third largest conditional cash grant programme in the world by number of beneficiaries.
- *Time of operation*: the programmes selected are among the first instruments of this new generation of safety nets to have been implemented.

The social safety nets mentioned below have numerous direct and indirect impacts on vulnerable households. In light of the main criticisms levelled at buffer stock policies, the case studies focus on the following issues: What are the impacts on the consumption of vulnerable households? What are the impacts on recipients risk management? Do these policies lead to unintended crowding out of private opportunities (in particular for labour when work obligations are imposed)?

Review of country case studies

In Ethiopia, the food crisis caused by the drought of 2002 and the relatively negative results of the food distribution programmes of the 1990s led the government in 2005 to redirect its strategy towards regular, multi-annual transfers, primarily via two programmes: the Productive Safety Nets Programme (PSNP) and the Household Asset Building Programme (HABP).

At present, the PNSP covers 7 million households, approximately 14% of those in the lowest income quintile. The PNSP is primarily designed to prevent households selling their productive assets by providing work during the low season when financial and food resources are scarce and the population is not occupied with agricultural activities. The programme pursues a secondary objective of increasing agricultural productivity by requiring recipients to work on rural road and irrigation infrastructure. Households must work six days a month for up to six months. The work is paid either in cash (60%) or food, primarily from the Ethiopian public stock, with participants incapable of working receiving the same level of transfers. The wage, maintained at a level below the market rate, is determined with a view to ensuring a minimum dietary calorie intake (of 1.8 Kcal per day per person). The PNSP targeting strategy combines (i) geographic targeting of the *woredas* (districts in Ethiopia) in a situation of food insecurity; (ii) rural communities providing lists of beneficiaries; and (iii) conditionality and wage level, which represents a form of self-targeting.

The aim of the second programme – the HABP – is not to protect but to increase the productive assets of the households by granting subsidised loans purchase inputs such as livestock and fertiliser and by providing farmers with technical assistance. The aim of this programme is to facilitate graduation of beneficiaries by generating asset accumulation.

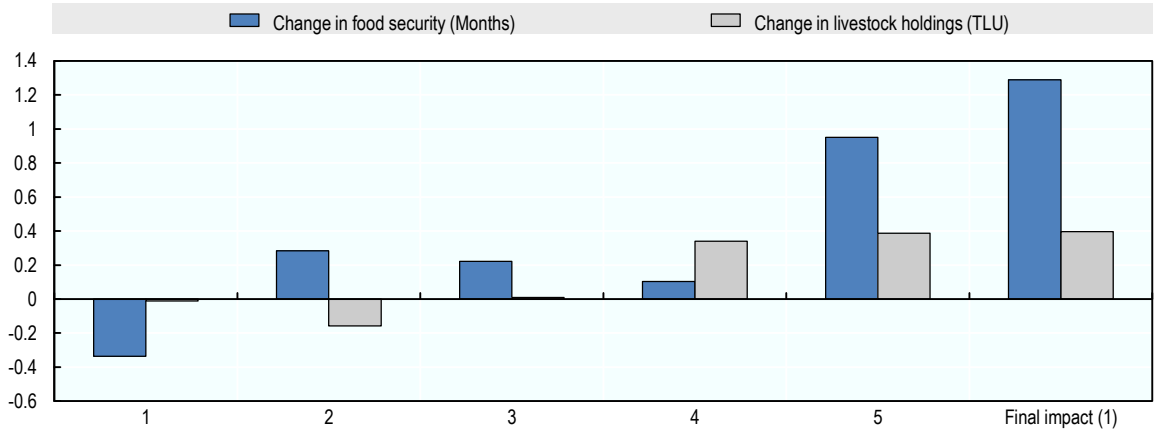
Impact on consumption. The most recent evaluations of the PNSP show that the positive shock on household income generated by the transfers allows household consumption to increase modestly but

significantly. Berhane et al. (2014) found that the impact on food security increased the longer the household remained in the programme. A household that received transfers for three years increased the annual period of food security by 0.2 months and one that received transfers for 5 years increased the period of food security by 1.3 months compared to non-beneficiaries (defined as households which only participated for one year) (Figure 9). This represents a reduction of 1/3 of the absolute period of food insecurity compared to 2004 levels. This result may appear modest, but the evaluation period included numerous periods of drought and the price spike of 2008. On nutrition, Holden et al. (2014) use survey data from 2006 and 2010 to demonstrate that children aged five and under have a higher height-for-height ratio among beneficiary households.

Impact on risk management. Berhane et al. (2014) shows that additional income from transfers enabled beneficiaries to increases their assets. As shown in Figure 9 below, after five years, livestock ownership among beneficiaries is 0.397 TLU (Tropical Livestock Units) higher than that of non-beneficiaries. However, in term of agricultural productivity, Hoddinott et al. (2012) conclude that the cash transfers provided and public works projects completed were insufficient to increase output significantly.

Figure 9. The impact of PNSP on food access and productive capital accumulation

Change regarding the number of years HH received public works payments



1. Difference between beneficiaries and non-beneficiaries in number of month of food access, t-stat=1.96, significant at level 5%; Change in livestock holding t-stat=5.5, significant at level 10%.

Source: Berhane et al. (2014).

The HABP had replaced a programme titled the "Other Food Security Programme" (OFSP) in 2009. The OFSP had run for four years with inconclusive results, suffering from high rates of late loan repayments (more than 25%) and failing to graduate beneficiaries to new independent income levels via accumulation of productive assets (the main objective). In 2010, almost half of the districts had no graduations and only 5% had graduated more than 10% of their beneficiaries (Berhane et al., 2013). Despite this, households which benefitted from both the PNSP and the HABP/OFSP appeared to have experienced a greater increase in both the number of months of food security and in total assets than households having only benefitted from the PNSP. Furthermore, when participation in the HABP/OFSP was accompanied by transfers from the PNSP for at least five years, recipients had improved yields significantly, increasing their productive capacity (Hoddinott et al., 2012, Berhane, 2013).

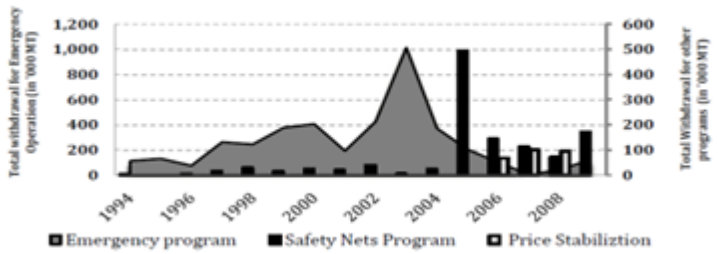
Crowding out of private activities. The potential negative effects of the programme on the labour market are limited insofar as the work is performed outside the main agricultural period. Furthermore, as wages are maintained at a level below market prices, the programme does not run the risk of attracting workers already engaged in another activity. Some studies have examined the possible effects of the programme on discouraging beneficiaries from working their own land in favour of creating new, non-agricultural activities. Rodrigo (2013) analysed the period 2005-09 and found that community work projects reduced child labour on farms significantly but not adult labour within beneficiary households. Berhane (2014) analysed the extent to which the length of participation in the programme influenced the motivation to create non-agricultural activities over the period 2005-10, finding no significant difference between beneficiaries and non-beneficiaries.

Box 7. Adaptive safety nets in Ethiopian storage policy

While Ethiopian public stocks were originally intended for use exclusively within emergency plans, since 2000, the PSNP has also called on public stocks and, more recently, the national agency responsible for market regulation has begun to use public stocks to stabilise prices. Currently, the main users of the stock are (i) the government's risk management programme for emergency food operations; (ii) the food security directorate to supply the PSNP; (iii) the market regulation agency for price stabilisation operations; and (iv) the WFP and NGOs for emergency aid and PSNP operations. The stock essentially comprises imported cereals as the WFP and NGOs have been prohibited from purchasing local goods since 2007 and local produce finds it difficult to satisfy the stock quality standards. Maintaining a food reserve in Ethiopia is primarily justified by of its status as a landlocked market with relatively long import times. One of the major objectives of preventive social safety net mechanisms such as the PSNP is to ensure their predictability and durability. The availability of guaranteed long-term funding for these instruments is therefore a key aim to guarantee that the instruments are both relevant and effective. Ethiopian public stock is primarily intended for the implementation of social safety nets which focus more on structural vulnerability than on economic crises. However, technical rotations of public stock represent a source of quality goods with relatively predictable flows allowing, at least in part, the safety net programme to be supplied. The aim of both public stock and social safety nets is to ensure the implementation of a guaranteed flow of supplies from the stock (which will need guaranteed outlets for the technical rotation) towards the social safety nets (which will need a guaranteed source of supply).

There is a consensus to favour cash transfers rather than transfers in kind and it is also in this spirit that the PNSP was designed. Nevertheless, this instrument also has its limits in periods of high inflation. In 2006, inflation rose from 8% to 20% before reaching 100% in 2008 and the wheat equivalent of daily wages for beneficiaries of cash transfers were divided by three over the same period (Rashid et al., 2011). This shows the need also to keep an efficient and reactive supply system of emergency stocks. The Ethiopian government has presented new ambitions for its national stocks policy, expanding the stock management agency's mandate to the task of price stabilisation. However, the performance of the stabilisation measures implemented in 2007, 2008 and 2009 shows that approximately 30% of the sums invested were absorbed by the operators within the value chain and not redistributed to the consumers (Dorosh et al., 2009). Furthermore, the impact was to reduce the quantities available for emergency operations. In the past, physical stocks fluctuated around 250 000 MT after the harvest. Since 2007, the stocks have been exhausted on two occasions (2008 and 2011), when the regulation agency borrowed significant volumes for price stabilisation operations and only returned them after a relatively long delay (Figure 10).

Figure 10. Trend in withdrawals from public stock by programme type



Source: Rashid et al. (2011).

In summary, the results indicate a modest but significantly positive impact of the PSNP and the HABP on improving consumption and protecting assets while improving household productivity. A doubt nevertheless remains with regard to the graduation capacity of the HABP. Moreover, the national coverage of the programme is still very limited; current beneficiaries account for only a small portion of Ethiopian households. In addition to available resources, coverage also reflects the targeting strategy: while geographic targeting helped reduce inclusion errors, it also restricted coverage of the programme.

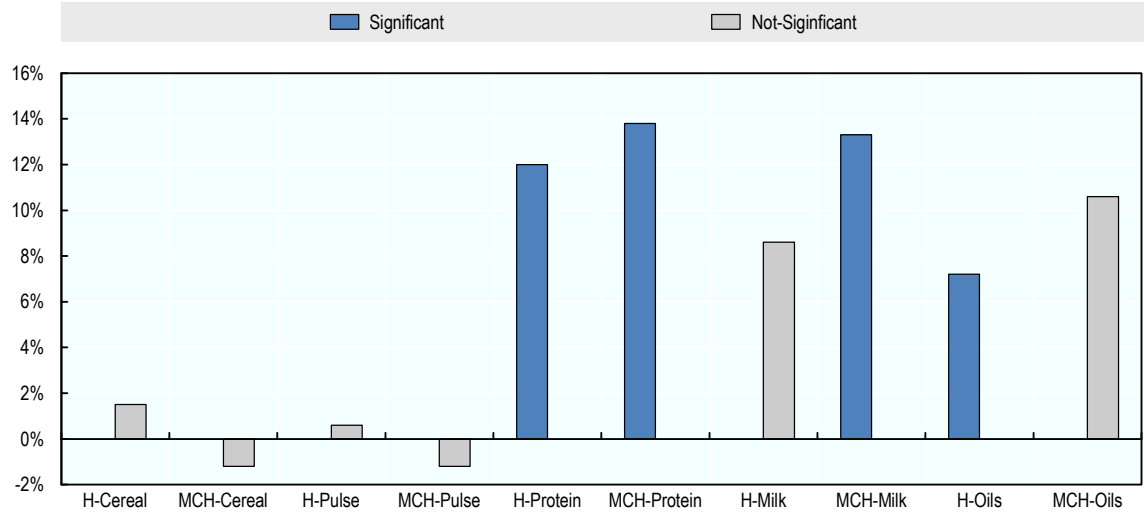
In **India**, the government has implemented the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) since 2006. With more than 36 million beneficiaries, this programme initially covered 200 districts (phase I), with a further 130 added in 2007 (phase II) before being extended to the entire territory in 2008 (phase III). It is now the largest public works programme in the world. The programme is based on the National Rural Employment Guarantee Act (NREGA) which guarantees every rural household 100 days of community work per year paid in cash and based on the minimum wage for agricultural workers. Participation in the programme is a universal right which can be claimed by every citizen living in rural areas and is not based on specific eligibility criteria. The work obligation (at minimum wage) is seen as a self-targeting mechanism. Households not capable of working can also take advantage of the programme. The programme prioritises road infrastructure and agricultural water supply networks. Like the PNSP, the programme pursues the twin objectives of raising the income of poor agricultural workers during the dry season and increasing

agricultural productivity. By paying beneficiaries the minimum wage, the programme also pursues a third objective of consolidating the application of the Minimum Wages Act at national level (Bhargava, 2014).

Impact on consumption. Numerous analyses show that the additional income resulting from the cash transfers have a significant impact on food consumption. For beneficiary districts with a particularly high proportion of Scheduled Castes and Scheduled Tribes,[6] Klonner et al. (2014) found an average increase of 37.3% in consumer spending attributable to the programme during the hunger gap. Bose et al. (2013) apply a differences-in-differences method to 209 districts, taking the phase I districts as a treatment group, and obtained similar aggregate results in terms of the increase in consumption. By disaggregating spending per product, the authors demonstrate an increase in food consumption, in particular an increase of 12% in the consumption of proteins for beneficiaries as a whole and 14% for the marginal caste (Figure 11). The positive impacts of the programme on the consumption of food products are confirmed by other analyses in specific districts (Deininger, 2013).

Figure 11. The impact of MGNREGS on food consumption

Significance of change in food consumption depending on food items



Note: H=Household, MCH=Marginal Cast Household; Difference is significant at the 1%, 5%, or 10% level.

Source: Bose (2013).

However, some studies suggest that impacts on consumption should be larger. Using the district of Bihar – one of the poorest in the country – as an example, a study conducted by the World Bank in 2014 showed that if, as promised, the programme had been able to provide 100 hours of work to every rural inhabitant paid at the minimum wage, the programme would have been able to reduce the poverty rate by 14%. The authors show that, in reality, the reduction totalled only 1%. Several factors contribute to this result. On the demand side, poor and sometimes marginalised households did not always know or understand their rights and were not always capable of visiting local administrations to assert them. On the supply side, effective use of the funds available remained very limited. At the national level, fund allocation is not predetermined on the basis of states' income but according to the annual work plan and budget submitted by each state to the Ministry of Rural Development. The poorest states, such as Bihar, which have low capacity for planning, managing and forecasting demand for labour, tend to receive fewer resources. Finally, the benefits to the recipient can be lower than expected as, in certain cases, the wage offered is well below the minimum salary or part of it is used to bribe the local administrator.

6. The Scheduled Castes and Scheduled Tribes are official designations given to various groups of historically disadvantaged people in India.

Impact on recipients' risk management. Recent studies do not allow the change in yield to be compared directly, although they do show that the programme has a positive impact on productive investments. In particular, the programme increased the average wage of agricultural workers, creating an incentive among producers to make greater use of labour- saving technologies. Bhargava (2014) shows that the programme resulted in the 20% substitution of labour-intensive technologies by labour-saving ones. Investments in labour-saving technologies occur mostly on small-scale farms.

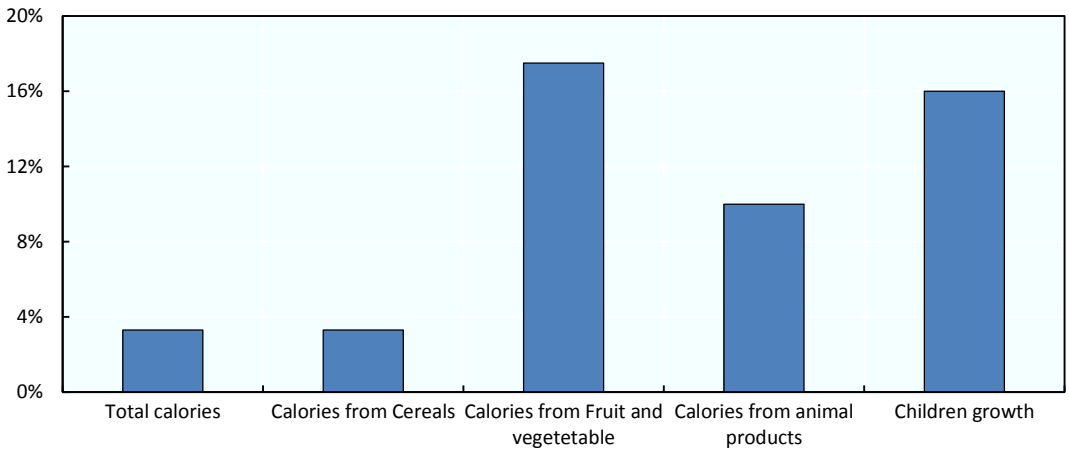
Crowding out of the private sector. The Indian public work programme runs a greater risk than in Ethiopia of the private sector being crowded out. Work takes place during period when the beneficiaries are not occupied by agriculture, but salaries are based on the minimum legal wage which is often higher than the rate actually applied. Consequently, all recent studies have found that MGNREGS led to increased wages in the private sector, with women's wages increasing more than those of men (Azam, 2012). The impact of the wage increase on employment in the private sector is less clear. Based on the same data but using different analysis methods, Zimmermann (2012) observes no significant impacts on employment while Imbert (2012) concludes that the programme gives rise to a reduction in the employment of unskilled labour in the private sector by 1.6%.

Mexico currently boasts one of the oldest conditional cash grant programmes – *Prospera* – which has been so successful that it has been reproduced in numerous countries worldwide (IEG, 2011). Since it was introduced in 1997, the scope of the programme has regularly been extended both in terms of its field of application and its geographic coverage, increasingly targeting urban populations. *Prospera* reaches 26 million beneficiaries. The long-term aim of the programme is to end to intergenerational transmission of poverty by implementing cash transfers to poor households for a renewable duration of three years on condition that they adopt behaviours facilitating accumulation of human capital. Until 2014, this programme – previously known as Oportunidades – comprised three components: education, nutrition and healthcare. An initial cash transfer was allocated on condition that primary and secondary school age children attend school for at least 85% of the school year, with the level of payment increasing with the level of schooling. The programme also provided for a food transfers based on regular health check-ups, nutritional sensitisation sessions, and the provision of dietary supplements for pregnant women and young or undernourished children. Since 2014, *Prospera* has added new components to strengthen the inclusion of beneficiaries in production activities by facilitating access to employment and financial services.

Impact on consumption. Numerous studies have illustrated the positive effects of cash transfers on the consumption and nutrition of beneficiaries. Using surveys conducted in 1999, one year after the initial payment, Hoddinot (2004) noted that the impact of the programme on total calorie intake among beneficiaries was at 3.3% very positive. This increase was much more significant for the consumption of meat (10%), and fruit and vegetables (17.5%) than it was for cereals (3.3%) (Figure 12). Controlling the effects of income, the difference remained significant, suggesting that awareness sessions had an impact on the change in consumption. Later analyses confirm the positive impacts on household consumption (Angelucci, 2009; Ruiz-Arranz, 2006). On nutrition, the programme increased the average growth in consumption per year of children of beneficiaries aged 1 to 3 by one-sixth compared to children of non-beneficiaries (Hoddinott, 2005).

Figure 12. The impact of *Prospera* on food consumption and its nutritional outcomes

Impact (%) one year after first transfer

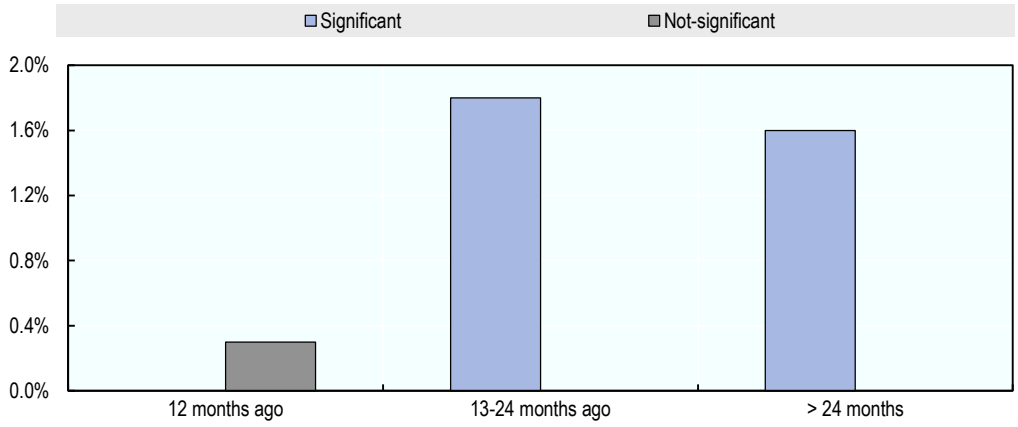


Source: Hoddinott et al. (2004; 2005).

Impact on recipients' risk management. The positive impacts on child nutrition and education would suggest long-term effects on household income and food security. Within the framework of Progresa, some cash transfers are also invested in production activities thereby also contributing to increased long-term household security. Gertler (2012) shows that for each peso transferred, the beneficiary household consumed 74% and invested the remainder in production activities. Beneficiaries invested significantly more in agricultural assets (draught animals) than in non-agricultural activities (micro-enterprises, handcrafts). The author demonstrates that transfers invested by beneficiaries in production activities four years earlier to a level of consumption 5.6% higher than in new beneficiaries who had not yet made these investments. As shown in Figure 13, transfers received more than one year previously enabled beneficiaries to increase current consumption significantly compared to non-beneficiaries (+1.8%) in contrast to transfers received more recently, consistent with the notion that investments take time before they become productive.

Figure 13. The impact of *Prospera* on long-term consumption

Transfer effect (%) depending on the date of transfer receipt



Note: Significant at the 1% level.

Source: Gertler (2012).

Crowding out of the private sector. Progresa has had a significant impact on schooling and reducing child labour (Schultz, 2001; Doran, 2012). This in turn may have had the potential effect of bidding up adult wages if these two types of labour are substitutable. Angelucci (2009) examined this at national level by testing whether the average wage differed between beneficiary and non-beneficiary districts. However, the results did not enable any conclusions to be drawn as child labour represents too small a proportion of total labour to have a significant impact on the average wage.

2.4. Lessons learned on implementing social safety nets

Impact on consumption. In the three countries studied, the increase in income generated by cash transfers enabled beneficiaries to increase and smooth their food consumption compared to non-beneficiaries. In Ethiopia, for beneficiaries who participated in the programme for at least five years, the number of months of food insecurity per year was reduced by a third. In India, consumption of protein increased by 12% while calorie intake increased by 6.4% in Mexico. Even more importantly, the increase in consumption was accompanied by a significant improvement in nutrition, especially in Mexico where the obligation placed on recipients specifically targets this element of food insecurity.

Impact on recipients' risk management. The long-term effects on the food security of the beneficiaries are more difficult to estimate. Many programmes have only been recently implemented with only a few providing longer windows of operation from which conclusions can be drawn. Five years after the PNSP/ HABP was introduced, only 5% of the districts had observed graduation of more than 10% of beneficiaries. Nevertheless, the HABP has given rise to a significant increase in agricultural yields as well as an accumulation of production assets. Likewise in India, the increase in the general wage level resulting from the community work projects has encouraged producers to invest in new labour-saving technologies. In Mexico, beneficiaries invest a proportion of the transfers received in production activities, thereby offering them a higher level of consumption in the future.

Potential crowding out of the private sector. When safety net mechanisms involve large food transfers and include obligations to supply labour to public works programmes, there is a potential risk of crowding out private earning activities. To limit this risk, cash transfers – where possible – can be used instead. Cash transfers have the added potential benefit of making local food product markets more dynamic. In all three countries, the programmes have potential impacts on the labour market (although the link is less clear for Progressa than for the other programmes). In Ethiopia, possible crowding out effects have been largely avoided by conducting community work projects outside the periods of agricultural activity and by maintaining wages at a sufficiently low level to be unattractive to those already employed in the private sector. In India, while the final effect on employment is uncertain, it is certain that setting wages at a higher level than the market wage has contributed to increasing wages in the private sector.

Targeting

The case studies illustrate a wide range of practices. Ethiopia combines three different targeting methods and Mexico two, while the approach in India is based on universal provision (no targeting). The main disadvantage of universal provision is cost. This approach can make such policies untenable in most developing countries. Alternatively, relatively precise targeting requires an efficient information system monitoring food insecurity at national level which can also represent a considerable cost for low-income countries. Data collection on under-nourishment and malnutrition in particular is expensive and the data are very heterogeneous depending on the lifestyles of the households and socioeconomic groups. Targeting proved relatively successful in Mexico where the government has a database relating to household poverty. This has not only enabled beneficiaries to be targeted effectively but has also facilitated co–ordination between the different programmes.

Nevertheless, even when the states have relatively efficient information systems, means-testing can also be subject to political and institutional constraints. In Ethiopia, the targeting process was initially based on the identification of real needs using a bottom-up approach whereby villages identified poor households. However, it quickly became apparent that the administrative and financial resources for the programmes would be insufficient to meet demand requiring the federal government to apply quotas to the total number of beneficiaries.

Type of transfer

When the problem is accessibility but not availability of food and markets are relatively well developed, cash transfers are generally preferred. They have the advantage of contributing to the operation of the agricultural markets, leaving beneficiaries to choose their food products themselves and most importantly, of being less expensive to implement. Nevertheless, the review of the case studies shows that in certain macroeconomic contexts, a combination of cash and food can sometimes be desirable.

For example, during the design phase of the PNSP, Ethiopian government and some sponsors argued for the programme to be essentially composed of cash transfers. Others, primarily the United States and the WFP, favoured transfers in kind. In the end, the compromise was found that, initially, half the transfers would be in cash and the other half transfers in kind, with the latter gradually phasing out as food insecure zones became increasingly integrated with markets of the excess zones within the country, in the sub-region and at the global level. However, in the wake of the period of high inflation between 2006 and 2008 and the subsequent fall in purchasing power for the beneficiaries of the programme, the gradual elimination of the transfers in kind was scaled back considerably. Today, 40% of transfers remain in kind.

Financial and administrative capacities

The coverage of the programme is largely determined by the financial capacity of the state. Programmes also vary considerably in term of the level of outside funding. In India and Mexico, governments financed the safety net programmes with their own resources. In Ethiopia, while the contribution of the state accounts for 1.2% of GDP, donors finance 90% of the USD 2.2 billion budgeted for the programme, leading to a stronger involvement by donors in the initial design.

Administrative capacity of the governments is also decisive for the correct implementation of the safety nets. A model of safety nets based on demand, such as NREGS can only be envisaged if the administration has local representation which is sufficiently well developed. The NREGS is designed on the principle of significant accountability of local governments (*gram panchayats*) and village communities (*gram sabhas*). More particularly, they are responsible for collecting work requests submitted by the population, preparing lists of community work projects to be implemented with the accompanying supervision and managing financial

resources. For transfer programmes based on supply such as the PNSP and Progresa, the accountability of local administrative entities is also important but not developed enough.

The case studies show that insufficient administrative capacity can greatly reduce the impact of the programme. In the state of Bihar, one of the poorest in India, NREGS faced demand rationing, in part caused by the paucity of information and awareness of the programme, as well as supply rationing resulting in particular from problems of corruption. In contrast, in the state of Andhar Pradesh, the implementation of a series of technological innovations allowing corruption and of wage payment problems to be mitigated has helped improve the efficiency of the programme.

Conclusion

Buffer stock policies can be costly means to stabilising prices and are often unable to increase consumption among vulnerable populations. Support for private storage, if well designed, provides a less distortionary and cheaper alternative to buffer stocks. By stocking (destocking) when they predict price increases (decreases), storers contribute to reducing price volatility while reducing the cost to the public purse of storage costs. However, for private storage to be effective, governments must first remove other price stabilisation policies – including buffer stocks, which can crowd out private sector activity.

The effectiveness of support policies for private storage depends on their design and supporting environment. The case studies examined here show that interest rate subsidies have proved to be relatively less effective than other possible interventions. Both past design flaws and issues with the incentives created have shown that such programmes have not had sufficient impacts on price volatility to be considered effective. Conversely, past experience with the use of warehouse receipt systems suggests some promise. Experience in using such policies has seen the emergence of a group of certified operators subject to very low storage costs which has promoted the quantity of product stored. Critical however, are robust contractual arrangements (including enforcement) and certification of warehouses. Promoting transferability of rights over stored product through commodity exchanges can also bring additional benefits, but this first requires the market to be sufficiently developed so trading is not thin.

Large scale adaptive safety nets have shown that they are capable of increasing consumption in vulnerable households significantly while creating the conditions conducive to a sustainable reduction in food insecurity. The adaptive element of these programmes has allowed recipients to accumulate productive capital (both physical and human). Further, in contrast to buffer stocks, experience shows that the potential crowding out effects on the private sector, that can be created through obligations such as work requirements, can be avoided if the necessary precautions are taken when the programme is designed. The effectiveness of these programmes is nevertheless highly dependent on predictable and regular transfers.

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Annex A

When private storage destabilises the market

The expected effects of private storage on price volatility depend on the operators' expectations. The competitive storage model is based on the initial hypothesis that storers make their choices based on forward-looking rational expectations, it assumes that operators do not make systematic errors in their forecasts: the decisions of merchants to stock or destock their produce are made on the basis of price forecasts for the period t+1 on average. In these models, the behaviour of storers has a stabilising effect and only supply and demand shocks exogenous to operators' behaviour can destabilise prices.

However, other work also attempting to explain price dynamics assumes that operators have no knowledge of future prices and systematically commit errors when forecasting prices. In these models, a large proportion of price volatility observed is generated directly by the operators whose behaviour, based on incorrect forecasts, tends to destabilise the economy. As operators do not know future prices, they base their forecasts on past prices (backward looking). If Pt is high, many producers increase their farmed areas or intensify production thereby leading to a low Pt+1, discouraging production and pushing Pt+2 up, etc. This results in an alternating surplus and shortage of supply without any fundamental instability. This is a cobweb rationale.

Models based on past prices argue against private storage. All inter-temporal decisions create deadweight losses for the economy as they are based on incorrect forecasts. In such a context, support for private storage is equivalent to subsidising a negative externality for the economy. The conclusions of some recent work support this. Femenia F. (2012) attempted to analyse the effects of private storage subsidies in offsetting the disappearance of direct price support following successive reforms of the CAP. Using a dynamic computable general equilibrium model and assuming that operators base their forecasts on past prices, the study concludes that a private storage subsidy allows the level of stocks to be increased with the accompanying effect of exacerbating price instability and causing a general loss of well-being for the economy. Using the same rationale, analyses based on backward-looking forecasts tend to consider the development of futures markets for agricultural raw materials as one of the key factors explaining price instability and in particular the price hike of 2008.

Numerous criticisms have been levelled at the standard version of the model based on past prices as it includes two major theoretical inconsistencies. In the configuration where the elasticity of supply is greater than demand, which is most often the case, the model generates explosive price oscillations. The economy never returns to equilibrium after a shock, thereby leading to divergent and negative prices. Furthermore, an economy based on divergent and unstable price mechanisms with systematic forecasting errors implies that producers suffer more losses than they make profit, thereby putting into question the incentives for new producers to enter the market. The most recent version of the model has in part answered the problem of the explosive price dynamics by noting that the elasticity of supply could be lower than that of demand. Akeman (1957) notes that producers do not adapt immediately to price variations, but adjust their production after a certain delay. Nerlove (1958) formalises this idea by putting forward the hypothesis of adaptive forecasting: producers revise their forecasts according to previous forecasting errors. While this modification reduces the situations in which the dynamics of the model are explosive, thinking of the major dynamics of prices as the result of systematic forecasting errors on the part of the operators remains a problem in its own right.

Until now, models based on past prices also suffered from an absence of empirical validation. Several analyses have attempted to demonstrate empirically whether forecasts are adaptive or rational, but these are not conclusive. Another strategy involves testing the extent to which the two models generate price series with the same statistical characteristics as that observed in reality, in particular the strong autocorrelation of prices. While recent studies show that the simulated series based on the rational forecasting model displays statistical characteristics very similar to the observed series, most adaptive forecasting models failed to replicate these stylised facts. The empirical analyses conducted on the link between the futures markets (index funds) and the prices of agricultural products do not make it possible to validate the hypothesis that price instability is caused by operators' forecasting errors as none of the studies demonstrates that increased financial speculation led to an increase in the prices of agricultural products (Irwin and Sanders 2011; Meijerink & Shutes, 2012; Glauben, Prehn, Pies & Will, 2013).